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Gender-Specific Facilitators And Barriers To Health-Related Quality Of Life In Adults With Cystic Fibrosis: A Mixed Methods Study

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GENDER-SPECIFIC FACILITATORS AND BARRIERS TO HEALTH-RELATED QUALITY OF LIFE IN ADULTS WITH CYSTIC FIBROSIS: A MIXED METHODS STUDY

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DOCTOR OF PHILOSOPHY IN NURSING

ABSTRACT

BACKGROUND: With the life expectancy of individuals with cystic fibrosis (CF) doubling over the last two decades, it is critical that healthcare providers address both quantity and quality of life. Health-related quality of life (HRQoL) encompasses physical, social, psychological, and functional aspects of daily living and how CF impacts each one. Women with CF consistently report having an overall poorer quality of life across international studies, but the cause of the gender difference is unknown. The purpose of this study was to explore gender differences in HRQoL and then build upon those results to better understand gender-specific facilitators and barriers to HRQoL.

METHODS: Gender-specific facilitators and barriers to HRQoL were explored using a sequential Quan□ QUAL mixed methods design. The sample included 123 adults with CF who were recruited within a tertiary care center in the southeastern United States. Data collected included the 50-item CF Questionnaire-Revised (CFQ-R), which is a disease-specific HRQoL questionnaire, a demographics form, and CF Foundation Patient Registry data. The CFQ-R has 12 domains of HRQoL. The CFQ-R scores and descriptive statistics were analyzed using SPSS Statistical Software v. 23. A subsample of 15 men and 15 women, who responded to the quantitative questionnaire, subsequently completed a 30-45 minute, semi-structured interview to further explore gender-specific facilitators and barriers to HRQoL. The interviews were transcribed verbatim and analyzed using Braun and Clarke's method of thematic analysis with the help of NVivo 11 Pro software.

RESULTS: Fifty-seven men and 66 women with CF, aged 19-67, were included in the quantitative analyses. Women reported a better HRQoL compared to men in the areas of body image (63.97 vs. 62.38), weight (73.74 vs. 57.31), and digestion (72.39 vs. 71.54). In the remaining nine areas, women reported a poorer HRQoL than men, with statistically significant differences ($p < 0.05$) in the areas of physical functioning ($p = 0.02$), social functioning ($p = 0.03$), emotional functioning ($p = 0.02$), and weight ($p = 0.02$). Five main themes emerged from the qualitative analysis of the interview data that describe facilitators and barriers to HRQoL: 1) Biological and Physiological Factors; 2) External Factors; 3) Functional Status; 4) Perceptions of Preferences, Values, and Mental Health; and 5) Perceived Symptom Status. Having a positive perspective, spirituality, and support were reported as contributing factors to a better HRQoL, whereas negative reactions from others, the treatment burden of CF, and experiencing anxiety and/or depression were reported as contributing to a poorer HRQoL.

CONCLUSIONS: Factors that contribute to HRQoL are complex and diverse between genders. Results showed where the differences in HRQoL occur between genders, and also provided insight into potential interventions that could improve the HRQoL of adults with CF.

Keywords: cystic fibrosis, quality of life, gender, adults, mixed methods research

DEDICATION

I would like to dedicate this dissertation to my parents, Maury and Darlene, who have been there to support me through every step of every journey throughout my life. Thank you for being both my parents and best friends and for always pushing me to be the very best person that I can be. Lastly, thank you for teaching me the importance of higher education and independence and always making sure that I knew that I was capable of achieving any of my dreams, incuding a PhD. Secondly, my grandma, who spent time with me every single day of my life and molded me into the person I am today. Also, the men and women with cystic fibrosis who not only allowed me to be their nurse, but also inspired me to want to conduct research studies to improve their quality of life. Lastly, thank you to every person who took the time to participate in this dissertation study. You all have inspired me to dedicate my career to better the lives of those who have cystic fibrosis.

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CHAPTER 1

INTRODUCTION

Cystic fibrosis (CF) is a chronic, genetically transmitted disease that affects approximately 70,000 people worldwide (Arrington-Sanders et al., 2006; Cohen-Cymberknoh, Shoseyov, & Kerem, 2011). The disease results from an abnormality in the cystic fibrosis transmembrane conductance regulator (CFTR) gene that produces abnormal chloride transport across cell membranes (Schindler, Michel, & Wilson, 2015). This abnormal transport generates thickened secretions that interfere with mucus clearance in the gastrointestinal, respiratory, and reproductive tracts. CF requires an extensive treatment regimen that includes chest physiotherapy, digestive enzymes, oral and inhaled antibiotics, and high fat diet requirements (Abbott, Morton, Hurley, & Conway, 2015). Cystic fibrosis interferes with all aspects of life, including clinical health and social development (Arrington-Sanders et al., 2006; Uchmanowicz, Jankowska-Polańska, Rosińczuk, & Wleklik, 2015). There is currently no cure for CF, making it imperative to not only improve quantity but also quality of life. The purpose of Chapter 1 is to: 1) introduce the problem of gender differences in health-related quality of life (HRQoL) within the CF population; 2) provide the background and significance of the problem; 3) state the purpose of this dissertation study; 4) list the research questions; 5) introduce the conceptual framework guiding the study; and 6) provide definitions of key terms.

Problem, Background, and Significance

As recent advances in CF treatment have emerged, the life expectancy of this patient population has doubled over the past two decades, along with great variability in survival (Abbott et al., 2009; Korzeniewska et al., 2009). Now that life expectancy has doubled, it is important for the healthcare community to focus on improving the HRQoL of this population. HRQoL is defined as encompassing physical, social, psychological, and functional aspects of daily living and how CF impacts each one (Havermans, Colpaert, Vanharen, & Dupont, 2009). Evidence indicates that there is a large gap between the HRQoL of men versus women, but few studies have been conducted to determine how gender may influence HRQoL (Arrington-Sanders et al., 2006). Women with CF are over 50% more likely to die of CF before age 20 compared to men (Berge, Patterson, Goetz, & Milla, 2007). Women with CF are also subject to more frequent pulmonary exacerbations and infections and have shorter life expectancies (Arrington-Sanders et al., 2006). When controlling for age and disease severity, the gender gap continues to exist (Arrington-Sanders et al., 2006).

Research has demonstrated that gender influences how people view their HRQoL, as well as overall health status, and plays a more significant role in the variability in health than socioeconomic class differences (Arrington-Sanders et al., 2006). Currently, the variability in HRQoL remains unexplained and no causal inferences have been made (Abbott et al., 2015). Additionally, the gap in CF survival between men and women has been reported internationally in India, Spain, Germany, and the United States (Dill, Dawson, Sellers, Robinson, & Sawicki, 2013; Groeneveld et al., 2012; Kir et al., 2015; Schmidt, Wenninger, Niemann, Wahn, & Staab, 2009).

The aim of therapies for the CF population is to increase survival since there is currently no existing curative treatment for the disease. Therefore, it is not feasible for the primary end-point of research studies to be survival. Research needs to prioritize other equally important outcome measures such as HRQoL (Abbott & Hart, 2005). The gold standard used to measure the effectiveness of interventions in CF is changes in lung function. However, lung function only measures clinical lung health and excludes the social, emotional, and psychological health domains (Abbott & Hart, 2005). Beginning in 2005, efforts have been focused on the inclusion of quality of life measures in clinical trials. A seminal study by Abbott and colleagues (2015) reported that HRQoL is a predictor of survival in the CF population. Moreover, HRQoL is commonly used as an outcome measurement in clinical trials (Forte et al., 2015). The disease process, symptoms, and extensive treatment regimen may often lead to poor HRQoL. However, to develop interventions focused on improving HRQoL in the CF population, a better understanding of the components of HRQoL is needed.

Age and gender are the two variables most consistently associated with HRQoL. HRQoL declines with age due to CF being a progressive disease, yet the gender differences remain unexplained. The decline in HRQoL that occurs as age increases places an amplified importance on gathering the perspectives of people with CF to develop targeted clinical practice guidelines related to HRQoL (Arrington-Sanders et al., 2006; Uchmanowicz et al., 2015). The importance of measuring HRQoL in people with

CF has been espoused by the Cystic Fibrosis Foundation and the National Heart, Lung, and Blood Institute (Arrington-Sanders et al., 2006).

Administration of a HRQoL instrument to CF patients in the clinical setting could provide a more individualized care plan and subsequently optimize both quantity and quality of life (Royce & Carl, 2011). Identifying facilitators and barriers to gender-specific HRQoL can aid development of targeted interventions that will ultimately improve the lives of people with CF (Arrington-Sanders et al., 2006). This sequential Quan → QUAL mixed methods study provided a more comprehensive understanding of the differences in HRQoL between men and women through a quantitative questionnaire, with the addition of interviews to determine the most common facilitators and barriers that affect HRQoL. Specifically, the quantitative phase was used to extract the gender differences in the domains of HRQoL, and the qualitative strand elaborated upon those domains through a semi-structured interview with adults with CF. This study identified gender-specific facilitators and barriers in order to inform future intervention development to address the gender gap in HRQoL of those with CF.

Purpose Statement and Research Questions

The purpose of this sequential Quan → QUAL mixed methods study was to better understand the gender differences in HRQoL of adults with CF through exploring gender- specific facilitators and barriers to HRQoL. The goal of the quantitative strand of the study was to examine the gender differences in HRQoL by administering the CF Questionnaire-Revised (CFQ-R) to adults with CF ages 19 and older. The goal of the qualitative strand was to build upon the results of the questionnaire to better understand the gender-specific facilitators and barriers to HRQoL through individual interviews using a subsample of those who completed the questionnaire.

Overall Mixed Methods Question

How do quantitative questionnaire results and qualitative interviews jointly explain the gender differences in HRQoL by identifying gender-specific facilitators and barriers to HRQoL in adults with CF?

Quantitative Research Question

What gender differences are present in adults with CF within the 12 domains of HRQoL as measured by the CFQ-R?

Qualitative Research Question

What are the common gender-specific facilitators and barriers to HRQoL in adults with CF?

Conceptual Framework

The conceptual framework for this study was an adaptation of Wilson and Cleary's (1995) model of quality of life incorporating individual and environmental characteristics of the CF population. The concepts depicted in Wilson and Cleary's model integrate the foundational components of HRQoL, including biological and physiological variables, symptom status, functional status, general health perceptions, and overall quality of life, along with how individual and environmental characteristics affect each.

This adapted model guided the study to better explain gender differences in HRQoL.

Definitions of Terms

The terms listed below will be used throughout the dissertation.

1. *Connecting approach*: A way to mix qualitative and quantitative data in which the second study strand, either qualitative or quantitative, is developed based on the results of the first strand (Creswell & Plano Clark, 2018).
2. *Cystic fibrosis*: A chronic disease resulting from an abnormality in the cystic fibrosis transmembrane conductance regulator (CFTR) gene that produces abnormal chloride transport across cell membranes, causing the production of thickened secretions that interfere with mucus clearance in the gastrointestinal, respiratory, and reproductive tracts (Abbott et al., 2015; Schindler et al., 2015).
3. *Health-related quality of life*: A concept that encompasses physical, social, psychological, and functional aspects of daily living and how CF impacts each one (Havermans et al., 2009).
4. *Meta-inferences*: Conclusions of a mixed methods study drawn from the integration of inferences from the results of the quantitative and qualitative data (Ivankova, 2015).
5. *Mixed methods research*: A research approach that combines the collection of both quantitative and qualitative data, integrates both types of data, and draws the study conclusions based on combined strengths of both the quantitative and qualitative components (Creswell, 2015).

Chapter Summary

The dissertation study yielded vital information on specific facilitators and barriers to HRQoL in adults with CF. Due to the chronic nature of this disease, for which there is no cure, improving the quality of life of this aging population is imperative.

Using a sequential Quan → QUAL mixed methods design further built on a disease-specific HRQoL questionnaire in order to not only better explain results from the questionnaire, but also explore the gender-specific facilitators and barriers to HRQoL. Using a mixed methods approach, this study made critical steps toward improving the quality of life of this population by bridging the gap in HRQoL between men and women with CF. Chapter 2 includes an integrative review of the literature that explains the current state of the science regarding HRQoL in those with CF, the conceptual framework guiding the study, and the need for the study.

CHAPTER 2

LITERATURE REVIEW

The purpose of this integrative review of the contextual literature was to present evidence regarding health-related quality of life (HRQoL) and the factors that influence it. The rationale for the study was presented through the epidemiology, review of the literature, conceptual framework, and design and methods based on the problem that while it is known that HRQoL between men and women with cystic fibrosis (CF) varies drastically, with women reporting a poorer overall HRQoL, little is known about the cause of the gender differences and no causal inferences have been made.

Search Strategy

An integrative review of the literature was conducted in Scopus, PubMed, and PsycINFO databases with the search terms “health-related quality of life AND cystic fibrosis.” The range of publication dates was limited to the last 10 years because: 1) publication of articles in this field began to peak in 2008, and 2) the constant evolution of treatments drastically impacts HRQoL, making it necessary to include the most current literature. The initial search yielded a total of 1,105 articles. After removing duplicates, 855 sources remained. After reviewing the abstracts according to the inclusion and exclusion criteria, a total of 104 articles were selected for full review. Articles were included if they were available in the English language, included adolescents and/or adults (> 12 years) with CF and were related to their HRQoL or included factors affecting HRQoL in those with CF, and were published in the last 10 years.

Articles were excluded if they were duplicates, secondary sources including review articles, involved diseases other than CF such as asthma or COPD, HRQoL was not examined or measured, participants were post-transplant, focus was not all domains of HRQoL, not available in English, focused on caregivers of those with CF, or only included children < 12 years. The age range was chosen because the gender differences in HRQoL in the CF population do not emerge until adolescence. Additionally, articles that focused on post-transplant participants were excluded because of the drastic differences in HRQoL pre- vs. post-transplant. See Appendix A for PRISMA diagram.

Epidemiologic Basis and Concepts of Interest

Cystic Fibrosis

Cystic fibrosis is a chronic, progressive disease that is the most common recessive disease among Caucasians (Bodnar et al., 2014). The incidence of CF varies by country and ranges from approximately 1 in 2,000 to 1 in 5,000 live Caucasian births in the United States, Canada, and Europe (Cohen et al., 2011). In Brazil, the incidence decreases to approximately 1 in 9,600 Caucasian births (Cohen et al., 2011). Over 70,000 people worldwide are living with CF (Cystic Fibrosis Foundation [CFF], 2017). The abnormality in the cystic fibrosis transmembrane conductance regulator protein results in abnormal transport of chloride across cell membranes. The resulting thickened secretions obstruct the airways, gastrointestinal tract, and reproductive tract and contribute to the heavy treatment burden of CF that includes chest physiotherapy, pancreatic enzymes, oral and intravenous antibiotics, and high fat diet requirements, adding up to two to four hours per day for routine maintenance (Abbott et al., 2015; Forte et al., 2015).

Health-related Quality of Life

Currently, greater than 50% of the CF population has reached adulthood, with an average life expectancy of 47 years as of 2017 (CFF, 2017; Dill et al., 2013; Forte et al., 2015). Because quantity of life has increased, it is imperative to correspondingly improve quality of life (Forte et al., 2015). Due to the complexity of the disease and multiple organ systems affected, improving quality of life must focus on not only the physical aspects of the illness but also the emotional and social aspects (Forte et al., 2015).

There is currently no cure for CF; thus, the focus of available treatments is to increase survivability. Pulmonary function values are used as a gold standard measure of intervention effectiveness; however, this measurement excludes vital aspects of health such as social, emotional, and psychological health (Abbott & Hart, 2005). This places further importance on more holistic outcome measures such as HRQoL (Abbott & Hart, 2005). Clinical trials for CF patients incorporate quality of life measures, and Abbott and colleagues demonstrated that HRQoL is a predictor of survival in the CF population. Yet, to inform interventions to improve HRQoL, additional research on the components of HRQoL is needed.

Health-related quality of life in the CF population has been defined as a subjective assessment of overall quality of daily life incorporating disease-specific symptoms and the interference of those in activities of daily living (Abbott et al., 2009; Borawska-Kowalczyk & Sands, 2015). Previous research has operationalized HRQoL using both disease-specific and non-disease specific instruments. With increasing life expectancy of people with CF, healthcare providers have benefitted from the administration of an HRQoL instrument in order to administer a more individualized care plan to optimize both quality and quantity of life (Royce & Carl, 2011). The measurement of HRQoL could help improve the efficiency of current medical treatments while also minimizing the side effects of medical therapies on HRQoL (Uchmanowicz et al., 2015). The significance of HRQoL has been noted by the Cystic Fibrosis Foundation and the National Heart, Lung, and Blood Institute in their recommendation to incorporate quality of life as a measure of outcomes for people with CF (Arrington-Sanders et al., 2006). Variability in HRQoL between men and women with CF remains unexplained, and no causal inferences have been made (Abbott et al., 2015).

Measurement. Previous studies featured two commonly used disease-specific instruments to measure HRQoL. The first was the Cystic Fibrosis Questionnaire-Revised (CFQ-R). This instrument has been most widely used for two reasons: 1) there were versions for every developmental level from age 6 years and older; and 2) it has been translated and validated in 35 languages (CFQ-R, 2008). The CFQ-R includes 50 items and 12 domains (Quittner et al., 2012). The second instrument was the Cystic Fibrosis Quality of Life Questionnaire (CFQoL), which was developed and used in the United Kingdom. It includes nine domains and 52 items (Abbott et al., 2009). The scores for both questionnaires range from 0-100, with 0 representing the worst possible HRQoL and 100 representing the best HRQoL. Therefore, as the score increases, HRQoL improves. See Appendix B for conceptual and operational definitions for all domains included in both instruments.

Gender

HRQoL varied between men and women across the CF literature. Women are over 50% more likely to die of CF before age 20 when compared to men (Berge et al., 2007).

The progressive decline in lung function also has an onset of age 12-14 years in women compared to approximately 19 years in men (Patterson, Wall, Berge, & Milla, 2008). In addition, women were subject to more frequent pulmonary exacerbations and infections and had shorter life expectancies (Arrington-Sanders et al., 2006). When the data were controlled for age and disease severity, the gap between genders continued to exist (Arrington-Sanders et al., 2006). Furthermore, gender has been shown to influence how people view their HRQoL and overall health status and play a more significant role in health variability than socioeconomic class differences (Arrington-Sanders et al., 2006). Additionally, the gap in survival between men and women has been reported internationally in India, Spain, Germany, and the United States, indicating a lower survival rate in women (Dill et al., 2013; Groeneveld et al., 2012; Kir et al., 2015; Schmidt et al., 2009). There is currently no confirmed explanation for the poorer outcomes in women (Habib et al., 2015). Future research needs to focus on holistically explaining the gender differences so that interventions can be developed to improve the lives of people with CF (Arrington-Sanders et al., 2006).

Age

As previously noted, more than half of the CF population is now over the age of 18 years (CFF, 2017). As age increases, people with CF can develop complications such as cystic fibrosis-related diabetes and osteoporosis, further impacting quality of life. In the literature on this topic, age and gender were two variables most consistently associated with HRQoL. While it is known that HRQoL declines with age since CF is a progressive disease, the gender differences remain unexplained. Age-related decline in HRQoL underscores the importance of gathering the perspectives of people with CF for the development of relevant clinical practice guidelines for improving HRQoL (Arrington-Sanders et al., 2006; Uchmanowicz et al., 2015).

Lung Health

Infections, such as *Pseudomonas aeruginosa* (*P. aeruginosa*), can severely diminish HRQoL and are known to be associated with increased risk for morbidity and mortality in the CF population (Ashish, Shaw, McShane, Ledson, & Walshaw, 2012). Once a person with CF is infected with *P. aeruginosa*, there is a progressive decline in lung function (Bradley, Blume, Balp, Honeybourne, & Elborn, 2013). Additionally, lung function, measured by the amount of air that a person can exhale in the first second of forced expiration (FEV_1), is the well-established gold standard clinical measure for the medical status of a person with CF (Blackwell & Quittner, 2015). An FEV_1 of $\geq$70% is considered mild lung disease, an FEV_1 of 41% to 69% is considered moderate lung disease, and an FEV_1 of 40% or less is considered severe (Riekert, Bartlett, Boyle, Krishnan, & Rand, 2007). Pulmonary exacerbations were often associated with hospital admissions, intravenous antibiotics, and a decrease in respiratory health indicated by the respiratory symptoms domain of the HRQoL questionnaires (Sawicki, Rasouliyan, et al., 2011). Lung disease was the most common cause of death in CF; therefore, optimizing lung health was essential to not only improve quantity but also quality of life (Hegarty, MacDonald, Watter, & Wilson, 2009).

Nutritional Status

The thick secretions associated with CF can clog the pancreatic ducts, thereby preventing enzymes from reaching the intestine to properly absorb and digest food (Abbott, Hart, Morton, Gee, & Conway, 2008). Additionally, increased energy expenditure associated with chronic inflammation in the lungs and increased work of breathing associated with chronic presence of mucus in the lungs further complicates maintaining an ideal weight and optimal nutritional status (Groeneveld et al., 2012). Ideal growth and nutritional status are associated with better pulmonary health, and in turn, better HRQoL scores (Shoff, Tluczek, Laxova, Farrell, & Lai, 2013). Often measured by body mass index (BMI), nutritional status is known to impact self-reported HRQoL scores (Abbott et al., 2008).

Mental Health

Anxiety and depression were more common in those with CF than in the general population (Blackwell & Quittner, 2015; Havermans et al., 2009; Yohannes, Wilgoss, Fatoye, Dip, & Webb, 2012). In fact, anxiety and depression are common co-morbidities affecting 19% and 32% of the CF population, respectively (Pakhale et al., 2015). In comparison, the rates of anxiety and depression were 6.7% and 5.2%, respectively, in those without CF, showing a drastic increase in those with the disease. In addition, psychological distress was linked to negative impacts on functional impairment, HRQoL, and pulmonary function, leading to an increase in healthcare utilization (Pakhale et al., 2015). These data illustrated the need for HRQoL measures that include both physical and psychological health domains.

Literature Review

Biological and Physiological Variables and HRQoL

Gender. Female gender has been more commonly associated with a lower HRQoL than that of men with CF (Abbott et al., 2009; Dill et al., 2013; Groeneveld et al., 2012; Schmidt et al., 2009). Although men self-report having a lower HRQoL in the area of body image, women consistently self-report having a lower quality of life in the areas of physical functioning and emotional functioning (Abbott et al., 2015; Berge et al., 2007; Dill et al., 2013; Groeneveld et al., 2012; Hebestreit et al., 2014; Platten, Newman, & Quayle, 2013; Schmidt et al., 2009). Likewise, other studies have reported that men have scored significantly higher than women in the area of physical functioning ($p < 0.05$) (Borawska-Kowalczyk & Sands, 2015; Dill et al., 2013; Forte et al., 2015). In addition to physical and emotional functioning, women have also been reported to score lower in the domains of health perception, respiratory symptoms, social functioning, treatment burden, digestive symptoms, and energy/vitality when compared to men (Arrington-Sanders et al., 2006; Dill et al., 2013; Groeneveld et al., 2012; Schmidt et al., 2009).

Moreover, women self-reported more burden-related issues with CF in the areas of physical and emotional strains and physical appearance, reinforcing evidence as to why women report a poorer HRQoL in physical and emotional functioning (Patterson et al., 2008). To qualitatively elaborate on these domains, Berge and colleagues (2007) reported three themes that could contribute to these findings: treatment compliance/regimen, concerns about other health-related problems, and personal outlook on CF.

Treatment compliance/regimen. In previous studies, women with CF reported needing encouragement and support from someone else in order to be compliant. Yet, they indicated that being treatment compliant made them feel different from peers and they, therefore, intentionally missed treatments to spend time with friends and appear “normal” (Berge et al., 2007). In contrast, men with CF chose to be compliant after learning from their mistakes and took charge of their treatments independently (Berge et al., 2007). In addition, men did not feel different from peers and instead often took the approach of explaining their treatments to their peers, whom they found to be accepting (Berge et al., 2007). This was consistent with the findings of Simon and colleagues (2011), who reported that 45% of women were inconsistent with their treatments compared to 8% of men. In addition, 45% of women wanted a smaller body size despite already having a lower BMI than recommended (Simon et al., 2011). These findings shed further light on why women tend to report a poorer HRQoL in both physical functioning and emotional functioning.

Concerns about other health-related problems. Women explained that they experienced depressive symptoms because of CF (Berge et al., 2007). However, women also reported that they had accepted their disease and related body image, a finding not shared by men (Berge et al., 2007). These nuanced reports suggest why women may report a better HRQoL in the area of body image, but still have a poorer HRQoL in the area of emotional functioning.

Personal outlook on CF. In terms of outlook, women reported acceptance of their CF while men reported optimism and a positive attitude, indicating positive outlooks from both genders (Berge et al., 2007). Women needed support in order to deal with the depressive symptoms that they experienced due to CF. This included not only friends and family, but also mental health providers (Berge et al., 2007). Conversely, men more easily incorporated CF into their identity as a part of them for which they took full responsibility (Berge et al., 2007).

Interestingly, Arrington-Sanders et al. (2006) observed that once they controlled for the clinical variables of lung function and age, gender was no longer associated with physical functioning. This result indicated that clinical variables could partially account for the gender differences in HRQoL. Similarly, two other studies also reported no significant gender differences in HRQoL (Chevreul, Brigham, Michel, Rault, & Network, 2015; Shoff et al., 2013). In contrast, the work of Groeneveld et al. (2012) and Hegarty et al. (2009) reported that women had a better HRQoL (74.69) when compared to men (54.82) in the domain of treatment burden, meaning that women perceived their treatment burden as lower than men did. Because of these findings, it is important to look not only at HRQoL but also at how clinical characteristics, such as age, FEV_1, and BMI interact with HRQoL.

In contrast to the above findings, Uchmanowicz et al. (2015) and Thomas, Mitchell, O'Rourke, and Wainwright (2006) reported that women had a poorer HRQoL in the area of body image. Despite the difference in the body image domain, the other domain findings were similar in that women reported a poorer HRQoL in the domains of physical functioning, vitality, social functioning, and emotional functioning. Because Uchmanowicz and colleagues (2015) used a HRQoL instrument that was not disease-specific, other HRQoL domain comparisons were not possible.

Comparison to healthy peers. In comparison to healthy peers, those with a chronic illness, including those with CF, have a poorer HRQoL in both child and adult samples (Arabiat & Al Jabery, 2013; Efficace et al., 2011; Varni, Limbers, & Burwinkle, 2007). In addition, when comparing healthy men to healthy women, there were slight gender differences in HRQoL. For instance, when the disease-specific HRQoL questionnaire for those with CF was tested in a sample of nearly 500 healthy individuals, ages 6-20 years, there were no gender differences in the age group of 6-11 years (Tibosch et al., 2011). In adolescence, specifically ages 12-13 years, girls reported more issues in emotional functioning (Tibosch et al., 2011). In the 14-20 years of age group, boys reported a slightly better HRQoL in the areas of physical functioning, overall health perceptions, and emotional functioning (Tibosch et al., 2011). In all categories observed, however, the differences were small and noted as statistically insignificant (Tibosch et al., 2011). These findings were corroborated in two studies in both Europe and the United States, which included a total of over 21,000 healthy children and adolescents (Michel et al., 2009; Tibosch et al., 2011). There were no significant gender differences in children approximately ages 6-8 years (Michel et al., 2009; Tibosch et al., 2011). However, as age increased, HRQoL decreased in both girls and boys, and at age 12-13 the gender differences became prominent and the HRQoL of adolescent and adult women decreased at a faster rate than men (Michel et al., 2009; Tibosch et al., 2011). These findings for healthy children showed that puberty and psychosocial development must be taken into account when conducting a study involving HRQoL in CF (Michel et al., 2009; Tibosch et al., 2011; van Horck et al., 2017).

Comparison of HRQoL across other chronic illnesses. When comparing the healthy cohort to a cohort with chronic illnesses (e.g., heart disease, sickle cell disease, COPD, asthma, autoimmune diseases, pulmonary fibrosis, and cancer), having a chronic illness had a more significant deleterious impact on quality of life in women compared to men (Dampier et al., 2010; da Rocha, Schuch, & Fleck, 2014; Efficace et al., 2011; Ferrari et al., 2010; Han et al., 2010; Katsura, Yamada, Wakabayashi, & Kida, 2007).

Multiple studies suggested that the gender differences could be associated with greater psychosocial burden perceived by women (Amr, Amin, & Al-Omair, 2011; Arabiat & Al Jabery, 2013; da Rocha et al., 2014; Efficace et al., 2011; Varni et al., 2007).

Differences in other illnesses parallel to CF. Similar to those with CF, the survival rates in other chronic diseases, such as cancer, have also increased, and as a result, the prevalence of people suffering from a chronic illness has increased (Cantrell & Kelly, 2015; Janse, Sinnema, Uiterwaal, Kimpen, & Gemke, 2008). Consequently, there has also been a push to improve and measure quality of life in other chronic illnesses (Janse et al., 2008).

Trends seemed to be parallel between the CF population and those with other chronic illnesses. All in the chronically ill populations report a poorer HRQoL than their healthy peers (Arrington-Sanders et al., 2006; Groeneveld et al., 2012; Patterson et al., 2008; Stephenson et al., 2011). In addition, those with other chronic illnesses and those with CF both showed a more drastic decline in HRQoL than the slow decline that occurs in healthy children and adolescents as part of normal growth and development. However, there were also certain disease-specific differences noted, for instance, in asthma and CF. Because of the chronic, progressive nature of CF, HRQoL was poorer when compared with asthma across age groups (Bodnar et al., 2014). However, the gender differences were noted to develop at approximately age 12 in CF as well as across other chronic illnesses (Arrington-Sanders et al., 2006; Groeneveld et al., 2012; Patterson et al., 2008; Stephenson et al., 2011).

Gender differences in CF across developmental stages. The gender differences in HRQoL varied by developmental stage because of two primary etiologies: 1) the chronic progressive nature of CF; and 2) the developmental changes that occur, such as puberty. Studies of children ages 6 to 11 years did not report gender differences in HRQoL. In the few studies that report the younger age group alone by gender, no differences were found in any domains of HRQoL (Kir et al., 2015; Tibosch et al., 2011). When children were compared to adolescents and adults, children reported a better HRQoL in all domains, and then as age increased, HRQoL inversely declined (Bodnar et al., 2014; Hegarty et al., 2009; van Horck et al., 2017). When a cohort of individuals with CF were followed over a 10-year period, an increased rate of respiratory-related hospitalizations was found to occur in adolescent women, compared to men (Stephenson et al., 2011). This increase remained in adulthood (Stephenson et al., 2011). The decline in lung function occurred earlier in adolescence for girls (12-14 years) when compared to boys (19-20 years), occurred at a steadier rate, and correlated with more frequent hospitalizations in women (Groeneveld et al., 2012; Patterson et al., 2008; Stephenson et al., 2011). In addition, the risk of mortality was higher for women when compared to men up to age 20 (Patterson et al., 2008). While certain factors such as pulmonary function, body mass index, and airway microbiology are known to be predictors of mortality, the reports of these factors explaining the gender differences have been largely inconsistent (Patterson et al., 2008). Both adolescent and adult women reported a poorer HRQoL than men in all domains of HRQoL other than body image (Abbott et al., 2008; Besier, Schmitz, & Goldbeck, 2009; Dill et al., 2013; Patterson et al., 2008; Uchmanowicz, Jankowska-Polańska, Wleklik, Rosinczuk-Tonderys, & Dębska, 2014). The survival difference between men and women appeared to be not significant after age 20 (Berge et al., 2007).

The reason women report a poorer HRQoL beginning in adolescence has not been well explained. Several hypotheses have been posited, including: 1) women have a more accurate perception of their health status compared to men (Stofa et al., 2016); 2) adolescent girls are more self-conscious and pay more attention to how peers perceive them and their CF-related symptoms or treatments such as coughing or taking enzymes (Patterson et al., 2008); 3) women with CF have poorer prognoses than men (Salek et al., 2012); 4) puberty and hormonal fluctuations in women due to high estrogen levels can reduce the regulation of airway surface liquid volume homeostasis, which then results in decreased mucociliary clearance (Stephenson et al., 2011); 5) women self-reported more burden-related problems to CF in the areas of physical and emotional strains and physical appearance (Patterson et al., 2008); and 6) women have a higher rate of CF-related diabetes, which causes an additional layer of treatment burden (Stephenson et al., 2011).

When compared to those with other chronic illnesses and healthy peers, the CF population uniquely self-reported gender differences in body image. Due to the stunted growth and difficulty digesting and absorbing nutrients that is part of CF disease, this population is usually thinner and shorter than their peers (Simon et al., 2011). Men tended to report a poorer body image than women beginning in adolescence. This was possibly due to society's view that it is acceptable for women to be smaller and thinner than their peers, but undesirable for men (Abbott et al., 2015; Dill et al., 2013; Groeneveld et al., 2012; Salek et al., 2012; Stofa et al., 2016).

Estrogen and the gender gap. The CF disease process includes chronic airway inflammation and abnormally high levels of neutrophils, interleukin eight (IL-8), and tumor necrosis factor alpha (TNFα), which cause the increase in inflammation (Sweezey

& Ratjen, 2014). Inflammatory responses can either be adaptive (respond to pathogens) or innate (present naturally) (Sweezey & Ratjen, 2014). A higher level of E2 (Estradiol) leads to a decreased innate immune response in the lungs of those with CF, which increases the risk of pulmonary exacerbations and susceptibility to infections (Chotirmall, 2012; Raghavan & Jain, 2016).

As previously noted, CF results from a defect in the cystic fibrosis transmembrane conductance regulator (CFTR) (Sweezey & Ratjen, 2014). The abnormality in the CFTR gene produces abnormal chloride transport across cell membranes (Schindler et al., 2015). This abnormal transport generates thickened secretions that interfere with mucus clearance in the lungs (Sweezey & Ratjen, 2014). In the lung, there is a film called the airway surface liquid (ASL) that includes the cilia, which assists in removing pathogens and particles from the airway (Saint-Criq, Kim, Katzenellenbogen, & Harvey, 2013). Estrogen has been shown to reduce the height of the ASL through dysregulation of chloride and potassium, which further dehydrates the ASL and thereby has a deleterious effect on airway clearance (Saint-Criq et al., 2013).

Estrogen has been shown to amplify lung infections (Sweezey & Ratjen, 2014). Estrogen worsens lung infections in those with CF in two ways: 1) levels of estrogen have been shown to be related to pulmonary exacerbations due to infections; and 2) higher estrogen levels are related to increased growth of the common infective bacteria *P. aeruginosa*. Bacterial infections in the lungs are common in those with CF and lead to inflammation and pulmonary exacerbations (Sweezey & Ratjen, 2014). Infection with *P. aeruginosa* is associated with a poorer prognosis because of the resulting decline in lung function. Estrogen causes the conversion of *P. aeruginosa* from non-mucoid to mucoid form, meaning that the bacteria are coated in a mucoid layer, which enhances antibiotic resistance (Sweezey & Ratjen, 2014; Wang, Cela, Gagnon, & Sweezey, 2010). Additionally, antimicrobial peptides (AMPs), which are part of the immune system, often fight infections, and estrogen has been shown to depress the formation of these helpful AMPs (Sweezey & Ratjen, 2014). The presence of more AMPs is correlated with having a higher lung function in those with CF (Sweezey & Ratjen, 2014). These effects of estrogen, paired with progesterone inhibiting the rate of cilia movement in the airway of women with CF, inhibit proper mucociliary clearance and increase the risk of pulmonary infection (Raghavan & Jain, 2016).

Age. In a sample of women included in the study by Uchmanowicz et al. (2015), women over age 25 years scored lower in all domains of HRQoL compared to women aged 25 or younger. In addition, healthcare costs have been illustrated to increase as age increases (Chevreul et al., 2016). This was supported by Abbott et al. (2015), who reported that increasing age by 10 years was associated with a three to five percent decrease in the HRQoL domain of physical functioning. Older age in the CF population also tends to be associated with lower HRQoL scores in the areas of physical functioning, emotional functioning, body image, and treatment burden (Dill et al., 2013; Forte et al., 2015; Groeneveld et al., 2012; Hegarty et al., 2009; Stofa et al., 2016; van Horck et al., 2017). Cystic fibrosis patients who had high levels of anxiety and depression were found to be significantly older than those who did not have anxiety and depression, supporting the decline in emotional function as age increases (Olveira et al., 2016).

Lung health. Lung function, measured by FEV_1, was widely documented in the literature as an indicator of HRQoL scores. Poor lung health, evidenced by more frequent pulmonary exacerbations, lower FEV_1, and infections with *P. aeruginosa*, was associated with higher levels of anxiety and depression (Olveira et al., 2016). The literature was consistent in reporting that any of these indicators of poor lung health were associated with a lower HRQoL score (Abbott et al., 2015; Ashish et al., 2012; Bodnar et al., 2014; Borawska-Kowalczyk & Sands, 2015; Bradley et al., 2013; Cohen et al., 2011; Dębska & Mazurek, 2015; Dill et al., 2013; Forte et al., 2015; Havermans, Colpaert, and Dupont, 2008; Havermans et al., 2009; Kir et al., 2015; Moço et al., 2015).

$FEV_1$was found to significantly predict the HRQoL domains of physical functioning and respiratory symptoms but was not consistently associated with the HRQoL domain of body image (Abbott, Hurley, Morton, & Conway, 2013; Abbott et al., 2015; Bodnar et al., 2014; Borawska-Kowalczyk & Sands, 2015; Sawicki, Sellers, & Robinson, 2011; Thomas et al., 2006). Additionally, lower FEV_1 was consistently associated with a lower HRQoL across multiple tools used to measure HRQoL (Dill et al., 2013; Kir et al., 2015; Solem, Vera-Llonch, Liu, Botteman, & Castiglione, 2016). Furthermore, as FEV_1 declined or number of pulmonary exacerbations increased, depressive symptoms increased (Olveira et al., 2016; Riekert, Bartlett, Boyle, Krishnan, & Rand, 2007).

In terms of lung infections, people with CF infected with *P. aeruginosa* consistently have a decreased HRQoL in the domains of physical functioning, respiratory symptoms, treatment burden, role function, health perception, and emotional functioning (Ashish et al., 2012; Bodnar et al., 2014; Kir et al., 2015).

Drastic declines in lung function have also been shown to be associated with *P. aeruginosa* infection (Dębska & Mazurek, 2015). Dill et al. (2013) reported that pulmonary exacerbations were associated with lower HRQoL scores.

Nutritional status. Nutritional status was measured by height, weight, and BMI across published studies. Decreased nutritional status, or lower BMI, was associated with more frequent hospitalizations, increased likelihood of being infected with *P. aeruginosa*, decreased lung function, and lower scores on the HRQoL measurement tools in the areas of treatment burden, body image, and weight (Bodnar et al., 2014; Borawska-Kowalczyk & Sands et al., 2015; Dill et al., 2013; Forte et al., 2015; Havermans et al., 2009; Rozov et al., 2010; Salek et al., 2012; Shoff et al., 2013).

Symptom Status

Treatment burden. The literature showed an interrelationship among increasing age, decreasing lung function, increasing frequency of pulmonary exacerbations, and increasing treatment burden (Dębska & Mazurek, 2015; van Horck et al., 2017). Women reported a higher treatment burden in addition to a higher respiratory and psychological symptom burden (Groeneveld et al., 2012; Sawicki, Sellers, & Robinson, 2008).

Pain intensity, duration, and number of episodes were associated with a higher treatment burden and more pulmonary symptoms ($p < 0.01$). When the pain was related to CF treatment, the treatment burden increased and pulmonary symptoms worsened compared to pain unrelated to CF treatment (Blackwell & Quittner, 2015). Strikingly, 21% of the variability in treatment burden was accounted for by pain (Blackwell & Quittner, 2015).

Functional Status

Physical functioning. The physical functioning domain of HRQoL was most strongly correlated with lung function. A decline in lung function was associated with a decline in physical function in 70% of adults (Abbott et al., 2013). Across the literature, HRQoL scores trended with FEV_1, wherein as lung function declined physical function scores also declined (Abbott et al., 2013; Bodnar et al., 2014; Borawska-Kowalczyk & Sands, 2015; Dill et al., 2013; Havermans et al., 2008; Havermans et al., 2009).

Social functioning. Higher lung function was also positively associated with social function domain, meaning that those with higher lung function were more likely to participate in social activities (Forte et al., 2015). In terms of social variables, friends, family, and CF status all played a part in shaping social function. Those who were able to work reported a higher social functioning score than those who were disabled or unable to work (Havermans et al., 2009). Additionally, when people with CF were admitted to the hospital, their HRQoL in terms of social function declined because of contact isolation used to prevent cross-contamination (Hegarty et al., 2009). Lower levels of negative traits, such as conflict and criticism, in friendships and less psychological strain at personal, family, and peer levels were associated with better treatment adherence (Helms, Dellon, and Prinstein, 2014; Patterson et al., 2008). Conversely, higher levels of positive friendship qualities were associated with a better HRQoL (Helms et al., 2014). Also, physical HRQoL was stable over time while various measures of psychosocial HRQoL varied, indicating that social support and social functioning may have a higher impact than any single clinical variable (Bradley et al., 2013; Dębska & Mazurek, 2015; Dill et al., 2013).

General Health Perceptions

Sociodemographic characteristics. In adults with CF, lower socioeconomic status was associated with a poorer HRQoL in all domains other than digestion (Quittner et al., 2010).

Education. Those with CF who had less education had higher prevalence of elevated symptoms of depression and anxiety compared to those with more education (Olveira et al., 2016). Higher HRQoL scores were also associated with higher educational level; more specifically, those who had a college level of education had higher HRQoL scores in the domain of physical functioning. Conversely, individuals who had no primary or secondary education scored significantly lower than those who had a college education in the domains of treatment burden, chest symptoms, and emotional functioning (Stofa et al., 2016).

Income. When considering income by Medicaid status, those with CF who had Medicaid had poorer lung function in all age groups (Quittner et al., 2010). In addition, those who had Medicaid were more likely to have positive *P. aeruginosa* cultures (Quittner et al., 2010). Children from lower socioeconomic status reported lower HRQoL in all domains of the CFQ-R other than eating difficulties and digestive symptoms (Quittner et al., 2010).

Race/ethnicity. When comparing ethnicities, Hispanic teens with CF reported a significantly lower HRQoL than other groups in physical functioning, social functioning, body image, health perceptions, and role function (Quittner et al., 2010). Interestingly, these differences remained significant after controlling for socioeconomic status (Quittner et al., 2010). In addition, low socioeconomic status and being a minority were still strongly associated with a poorer HRQoL when controlling for clinical variables (Quittner et al., 2010).

Clinical variable interactions. Minority status and low socioeconomic status were strongly associated with poorer HRQoL even after controlling for clinical variables, such as BMI and FEV_1 (Quittner et al., 2010). Additionally, HRQoL was stable over time; however, psychosocial characteristics were always evolving (Dill et al., 2013). Understanding the differences in the trajectory of physical versus psychosocial characteristics was vital in improving patient outcomes (Dill et al., 2013).

Mental health and HRQoL.

Pain, depression, and anxiety. Symptoms of depression and anxiety were significantly related to pain and HRQoL. Also, patients with higher levels of depression and anxiety rated their pain level as higher (Blackwell & Quittner, 2015). As much as 21% of variability in treatment burden and 38% of variability in respiratory symptoms were accounted for by pain (Blackwell & Quittner, 2015). Pain affected a person's ability to complete the prescribed treatment regimen, which could further increase treatment burden and worsen respiratory symptoms (Blackwell & Quittner, 2015).

Sleep. When compared to a control group, those with CF had significantly worse sleep quality (Bouka et al., 2012). Poorer HRQoL in the areas of emotional functioning, social functioning, role functioning, and vitality domains of the CFQ-R was found to be associated with poor sleep quality. Anxiety and depression may lead to decreased sleep quality in those with CF (Bouka et al., 2012; Forte et al., 2015).

Depression and anxiety. Patients who screened positive for depression and anxiety and also had an $FEV_1 < 50\%$ self-reported a poorer HRQoL (Olveira et al., 2016).

In fact, patients with elevated symptoms of depression and anxiety reported a poorer HRQoL across all 12 CFQ-R domains (Olveira et al., 2016). Those with less education had higher prevalence of symptoms of depression and anxiety compared to those with more education (Olveira et al., 2016). Depression and anxiety were both associated with a decreased HRQoL in the areas of interpersonal relationships, poorer lung function, lower BMI, older age, and increased severity of respiratory symptoms (Yohannes et al., 2012). Increased age was also significantly associated with elevated depression and anxiety ($p = 0.013$) (Olveira et al., 2016). Screening for depression and anxiety may help develop medical and psychosocial treatment programs while also improving patients' perceptions of their HRQoL (Havermans et al., 2008).

Depression. In terms of depressive symptoms, acceptance of CF was related to less depressive symptoms at baseline as well as six months later, and it was associated with a better HRQoL (Casier et al., 2011). Those with poorer lung function were more likely to have a high level of depressive symptoms (Yohannes et al., 2012). In addition, those with poorer HRQoL were more likely to present with high levels of depressive symptoms (Yohannes et al., 2012). Various studies showed that approximately 30% or more of people with CF suffered from depression (Knudsen et al., 2016; Pakhale et al., 2008; Riekert et al., 2008). Of those who had depression, 20% were considered to have moderate or severe depression (Knudsen et al., 2016). In addition, participants who reported depression and work or education disability scored significantly lower on all domains of CFQ-R other than treatment burden. Symptoms of depression were also shown to be associated with worse treatment adherence ($p < 0.001$), which supports the notion that people with CF may not perform their prescribed treatment regimen due to mental health issues (Knudsen et al., 2016). Across the literature, depression was related to a poorer HRQoL on the CFQ-R (Havermans et al., 2008; Knudsen et al., 2016; Riekert et al., 2007; Yohannes et al., 2012). Higher levels of depressive symptoms were associated with more pulmonary exacerbations (Olveira et al., 2016). Additionally, depressive symptoms and FEV_1 were inversely related ($p < 0.05$). Those with CF who had an $FEV_1 < 70\%$ were three times more likely to have depression (Riekert et al., 2007). Higher HRQoL was associated with lower levels of depressive symptoms on all domains of the CFQ-R (Riekert et al., 2007). Those with depressive symptoms reported a significantly lower HRQoL on all CFQ-R domains than those without depressive symptoms ($p < 0.01$) (Riekert et al., 2007).

Anxiety. The rate of anxiety among those with CF was 13% (Pakhale et al., 2015). Acceptance, defined as accepting a chronic illness and believing that one can adapt to the unpredictable, was unrelated to anxiety symptoms (Casier et al., 2011). In contrast, Oliver and colleagues (2014) found that optimism was protective for the emotional functioning domain, particularly in those with elevated levels of stigma, distress, and anxiety. Even after controlling for lung function, those who reported symptoms of anxiety had poorer HRQoL in the domains of vitality, emotional functioning, social functioning, treatment burden, health perceptions, and respiratory symptoms. Additionally, being unemployed was associated with higher anxiety levels (Olveira et al., 2016).

Mental health services. Approximately 30% of those who said they had never used psychological services had symptoms of depression (Pakhale et al., 2015). In addition, over 50% of participants reported that they would utilize psychological services if they were available at their CF clinic (Pakhale et al., 2015).

Coping. Optimistic acceptance and distraction coping were significant predictors of how participants self-reported their HRQoL (Abbott et al., 2008). Optimism and acceptance were consistently associated with a better HRQoL, while distraction was associated with a poorer HRQoL (Abbott et al., 2008; Casier et al., 201l; Mc Hugh, Mc Feeters, Boyda, & O'Neill, 2016). Optimism and distraction were important in predicting social functioning, emotional functioning, interpersonal relationships, and future concerns (Abbott et al., 2008). More specifically, optimism was a protective factor for emotional functioning (Oliver et al., 2014). In addition, religious coping was positively associated with social aspects of HRQoL and has been linked to positive HRQoL outcomes (McHugh et al., 2016). Across studies, coping was a significant factor in predicting social and emotional HRQoL (Abbott et al., 2008; Casier et al., 201l; McHugh et al., 2016).

Summary of Review of the Literature

The number of studies on HRQoL in those with CF has increased drastically in the last 10 years. The literature illustrated that gender differences in HRQoL of those with CF range from areas of clinical characteristics and survivability to more abstract psychosocial characteristics. Overall, women reported a poorer HRQoL in more domains than men; however, the domains varied slightly from study to study. With CF affecting approximately 30,000 people in the U.S. and only 70,000 people worldwide, the population is small (CFF, 2017). As a result, the existing literature is necessarily limited in scope because almost all studies are cross-sectional in nature and most rely on small sample sizes. While the findings offered a basis for future work to be done to further investigate the gender gap in HRQoL, the cross-sectional design described associations between variables and could not infer causation (Polit & Beck, 2012). Qualitative results corroborated the quantitative findings that multiple issues, including treatment compliance, concerns about other health-related problems, and personal outlook on CF, play a role in the gender differences.

Prior findings were acquired using a homogeneous, small sample with unequal representation of men and women. This constitutes a gap in the literature because only one qualitative study has been done on gender differences in HRQoL among those with CF (Berge et al., 2007). In addition, there were no known causes of the gender differences, pointing to a need for a better understanding to inform the future development of interventions to improve HRQoL. The included studies in this review did not all use the same measurement tool for HRQoL. The slight variations in the domains of the instruments and results concerning gender differences by domain make it difficult to characterize HRQoL and its contributing factors. Despite the recent increase in publications in this area, no studies to date have offered a holistic understanding of HRQoL differences between men and women.

Conceptual Framework

The framework for this study (see Appendix C) is an adaptation of Wilson and Cleary's (1995) model of quality of life (see Appendix C), incorporating individual and environmental characteristics of the CF population. The concepts depicted in Wilson and Cleary's model incorporate the foundational components of HRQoL, including biological and physiological variables, symptom status, functional status, general health perceptions, and overall quality of life, along with how individual and environmental characteristics affect each.

In the conceptual framework (Appendix C), the characteristics of both the individual and the environment act on each of the key components, including biological and physiological variables, symptoms status, functional status, general health perceptions, and overall quality of life. Moving from biological and physiological variables (left) to HRQoL (right), the components are increasingly integrated within one another. For example, HRQoL incorporates all of the components in the boxes to the left of it and is the most abstract term. The model was adapted to include a circle enclosing the components of HRQoL and the factors that influence it to show that all factors within the circle work together to make up HRQoL. Next, a thicker arrow was added to emphasize that the concepts in the circle all work together to form HRQoL. Lastly, the circle for HRQoL was enlarged to depict it as the overarching concept.

Concepts Within the Model

Biological and physiological variables. Individual characteristics including age, gender, and race impact biological and physiological variables, which are defined as the most basic determinants of health including the assessment of organ systems (Wilson & Cleary, 1995). For example, as age increases, lung function declines and more organ systems are affected by CF. In terms of individuals, biological and physiological variables would include their physical assessment including their lung function, which is measured by FEV_1. In terms of gender, men report a higher HRQoL than women. Furthermore, CF is most commonly found in Caucasians, but does affect other racial groups. Exposure to pathogens in the environment, such as methicillin-resistant *Staphylococcus aureus* (MRSA) and *Burkholderia cepacia* complex, can greatly shorten the lifespan of people with CF (Dasenbrook et al., 2011; Drevinek & Mahenthiralingam, 2010).

Symptom status. This concept within the model shifts from the fundamental and molecular makeup of a person to looking at the person as a whole. Symptom status is subjective and a self-report of a patient's symptoms. Symptoms include physical, emotional, and cognitive components of CF as they are perceived by the person (Wilson & Cleary, 1995). By the time a person presents with symptoms, multiple environmental and individual characteristics influence perception, such as family support, ease of access to healthcare, and perception of interference of symptoms with social life and friends (Wilson & Cleary, 1995).

Functional status. This concept has been defined as the ability of a person with CF to carry out activities of daily living (Wilson & Cleary, 1995). Functional status incorporates physical function, role function, and social function (Wilson & Cleary, 1995). Support of family and friends with daily treatment regimen components, as well as access to care and medications, can greatly impact functional status. Without these components, adherence to the daily treatment regimen suffers and functional status declines.

General health perceptions. In the model, general health perceptions came from a self-report rating that includes all components that precede it in the model with the addition of mental health status. This concept has been one of the strongest predictors of the need for medical care and could be used to explore potential interventions to improve HRQoL (Wilson & Cleary, 1995). This concept also includes sociodemographics and how they can influence a person with CF's perception of his or her health.

HRQoL. Overall, HRQoL describes subjective well-being that incorporates how health, illness, and treatment regimen affect quality of life (Wilson & Cleary, 1995). An empirical indicator specific to HRQoL in the CF population is the CFQ-R. The tool has been shown to be reliable and well validated within the CF population (Sawicki et al., 2011). The domains of the CFQ-R include the measurement of biological and physiological variables, symptom status, functional status, and general health perceptions shown in the presented model. Each was measured separately in this study, allowing the researcher to see the gender differences by domain.

Individual characteristics. Individual characteristics include variables such as age, gender, and race. These characteristics interact with all other concepts in the model.

Environmental characteristics. As mentioned above, biological and physiological variables include environmental characteristics such as exposure to infective pathogens like *P. aeruginosa*, which can decrease the HRQoL (Ashish et al., 2012). Infection status, more specifically *P. aeruginosa* and *Burkholderia cepacia* status, were collected via the Cystic Fibrosis Foundation Patient Registry's provider portal because both of these infections have been shown to decrease survival and HRQoL (Ashish et al., 2012; Drevinek & Mahenthiralingam, 2010). Other external characteristics, such as social supports, that were collected for this study included employment and marital/dating status.

Rationale for the Selection of the Framework

An adapted version of Wilson and Cleary's model was chosen because the domains of HRQoL included in the CFQ-R, which is the HRQoL instrument used for the current study, correspond closely with the components in the center of the model (biological and physiological variables, symptom status, functional status, and general health perceptions). Conceptually, the literature review was driven by the model to look at how individual and environmental factors impacted the various domains of HRQoL of a person with CF.

Empirical Indicator

The CFQ-R is an empirical indicator specific to HRQoL in the CF population (see Appendix E). The tool has been shown to be reliable and well validated within the CF population (Appendix D). The CFQ-R could be used to collect data on any subgroup of the population because there are multiple versions depending on the target population, including child, parent, adolescent, and adult versions (Sawicki et al., 2011). In addition, the instrument has been translated into over 30 languages and utilized in multiple countries (Quittner et al., 2012).

HRQoL cannot be observed but is inferred through the self-report proxy instrument. An umbrella term for several different aspects of life including physical, social, emotional, and psychological health, the concept of HRQoL reflects the overall quality of life associated with the health of a person who has CF. The concept of HRQoL has been defined as having subjective and objective components that encompass all disease-related emotions and perceptions, professional and personal life aspects, and test results reflecting the health status of the person with CF (Uchmanowicz et al., 2015). All variables used in this study were defined and paired with the corresponding empirical indicator and concept within the conceptual model (see Appendix F).

Summary of Conceptual Framework

HRQoL is an abstract term that cannot be fully described using psychosocial or clinical factors alone. Individual factors and environmental characteristics surrounding CF must be taken into consideration when studying HRQoL. Wilson and Cleary's model was the best fit for this study because not only does it take into consideration the individual and environmental characteristics impacting HRQoL, but the concepts in the model become more abstract moving from left to right, showing that each box incorporates the one that precedes it; this demonstrates how interrelated the concepts are and how they all come together to make up HRQoL. Lastly, the concepts included in the model correlate closely with the domains of the CFQ-R, which was the instrument used in the study to operationalize HRQoL.

Design and Methods

Design

Four designs were evaluated for use in the current study. These include: qualitative descriptive, descriptive correlational (quantitative), convergent, and sequential Quan → QUAL designs (mixed methods).

Qualitative. Qualitative research offers a holistic picture of the phenomenon by conducting the study in a natural setting and closely interacting with the population of interest (Creswell, 2012). A qualitative approach is warranted when a researcher needs to explore a phenomenon, gain a holistic or complex understanding of the phenomenon, empower the population of interest to share their stories in order to address the concept of power relationships, or understand the context around the studied phenomenon (Creswell, 2012). While HRQoL can be measured by quantitative instruments, a more detailed understanding is needed in order to fully describe the contexts, settings, and day-to-day HRQoL of the adult CF population to inform intervention development.

A strength of a qualitative descriptive design is that it would help comprehensively describe HRQoL and minimize inferences in order to remain as true to the data as possible (Sandelowski, 2000). Additionally, a descriptive approach would assist in answering the research questions by offering a summary of the HRQoL of adults with CF and the surrounding events in order to inform the development of useful, yet practical, interventions. A drawback is that the descriptive approach is less compelled to oblige with pre-existing philosophical and theoretical views compared to other qualitative approaches. This approach is influenced by naturalistic inquiry (Sandelowski, 2000). Naturalistic inquiry allows the researcher to look at HRQoL in a manner that is as close to day-to-day occurrences as possible (Sandelowski, 2000). Because HRQoL is such an abstract construct that varies greatly from person to person as well as between genders, staying close to the data and using a naturalistic theoretical orientation would help best describe and explore HRQoL in this population. The drawback of using this design is that while it could offer a holistic picture of HRQoL, a quantitative questionnaire would be required in order to get a baseline of the HRQoL of the adults with CF. Additionally, knowing other factors included in the theoretical model such as biological and physiological characteristics (FEV_1, BMI, etc.) would be essential prior to conducting an interview. While the disease-specific CFQ-R has been administered and validated many times in different languages, the differences between men and women varied slightly from location to location. Due to these differences, it was decided that administering the CFQ-R would be the best first step.

Quantitative. Next, a descriptive correlational design was considered because the objective of this design is to look at relationships between variables rather than infer causality (Polit & Beck, 2012). This design would be useful in order to evaluate the interaction between CFQ-R domain scores (body image, physical functioning, social functioning, etc.) and clinical and sociodemographic variables (lung function, BMI, ethnicity, education level, etc.) in order to examine which participant characteristics are correlated with certain domains of HRQoL. A strength of this design is that it allows the researcher to collect large amounts of data and explore different interrelationships between variables in a short amount of time (Polit & Beck, 2012). The drawbacks to this design pertinent to the current study include: 1) the design does not support causality, so it would not be possible to know if the sociodemographic and clinical variables of interest shaped the person's self-report of his or her HRQoL; and 2) the participants in this type of non-experimental design are not chosen at random but instead comprise a preexisting group, which introduces selection bias (Polit & Beck, 2012). While the interrelationships between HRQoL and the variables of interest are pertinent to the current study, a holistic view of the interrelationships would be impossible with the closed-ended questionnaire and statistical analysis involved in a descriptive correlational design.

Mixed methods. Mixed methods studies combine both qualitative and quantitative research approaches in terms of viewpoints, data collection strategies, analysis, and study inferences in order to add depth to the understanding of the research problem (Curry & Nunez-Smith, 2015). Mixed methods research allows the researcher to verify known information while also using an exploratory approach (Ivankova, 2015).

A convergent design was considered, within which the qualitative and quantitative data are concurrently collected and have equal priority. In addition, the qualitative and quantitative data are kept independent through analysis, and then are mixed in the results and interpretation phase (Creswell & Plano Clark, 2018). A strength of this design is its efficiency because the quantitative and qualitative data are collected at the same time. However, merging the data during the interpretation phase can be difficult because different samples and different sample sizes are used for the two study strands. In addition, contradictions in the qualitative and quantitative data can be difficult to interpret and can at times require the researcher to collect additional data (Creswell & Plano Clark, 2018).

On the other hand, a sequential Quan → QUAL mixed methods design includes two study phases. First, quantitative data are collected and analyzed. Then, the second phase is built upon the quantitative findings. In the current study, the researcher utilized this approach to confirm the gender differences in HRQoL in the domains of the CFQ-R and to explore clinical and sociodemographic variables. Then, in-depth, semi-structured interviews were conducted in the qualitative phase to offer a more holistic picture of HRQoL in relation to the clinical and sociodemographic variables to explore and provide a comprehensive understanding of factors that impact HRQoL.

The advantages of the sequential Quan → QUAL design are that the study can easily be conducted by one researcher, the qualitative phase can provide more in-depth information regarding the findings in the quantitative phase, and lastly, the methodological flexibility of the second phase is shaped by the first phase (Ivankova, 2015). Drawbacks associated with the design include that it takes more time to implement the strands sequentially. The researcher must wait until one phase is complete before being able to start the second, and an amendment to the Institutional Review Board (IRB) approval form is necessary before beginning the second phase due to the development of the interview guide based on the questionnaire results (Ivankova, 2015). In addition, collecting the qualitative data from a subsample of those who completed the quantitative phase increases the burden on study participants.

Mixed methods research was chosen over the stand-alone qualitative and quantitative approaches because it combines the strengths of both types of data in order to explain different aspects of HRQoL between genders. In addition, a sequential design was chosen over a convergent design because the convergent design does not allow the researcher to first establish trends in the quantitative data and then learn more about those trends through interviewing the participants.

Summary. Descriptive correlational and qualitative descriptive designs were considered, but neither of these designs alone can fully address the research questions. Therefore, the strengths of both quantitative and qualitative research were realized by utilizing a sequential Quan → QUAL design. While a sequential Quan → QUAL design also has drawbacks, the benefits outweigh the drawbacks.

Parent Study

The parent study was titled "Coping and Health in Adults with Cystic Fibrosis." It was funded by the UAB Center for Palliative and Supportive Care, and the principal investigator is Dr. Sylvie Mrug. The purpose of the parent study was to learn how to help people with CF cope with their disease and also to look at different coping styles that contribute to health and well-being. A convenience sample of 123 participants were enrolled in the study. The benefits to adding the current study to the parent study included: 1) data from the HRQoL instrument, the CFQ-R, were already collected as part of the parent study; 2) the PI of the current study was added to the IRB approval form and helped recruit participants and collect data; 3) the PI of the current study had experience in recruiting from both the inpatient and outpatient adult facilities for three different research studies and had established rapport with the population. In order to use the data for the current study, an IRB amendment was submitted and approved to access the quantitative data for dissertation purposes. In addition, a second IRB amendment was submitted and approved to incorporate the questions for the qualitative strand of the current study into the existing protocol (See Appendix G).

Data Collection Techniques

Quantitative strand. Quantitative data from the parent study (*n* = 123) that were utilized included: 1) Cystic Fibrosis Foundation patient registry data; 2) sociodemographic questionnaire; and 3) Cystic Fibrosis Questionnaire-Revised (CFQ-R). A benefit of utilizing this data was that the PI of the current study was part of all aspects of recruitment and data collection. While it is recognized that the sociodemographic data and CFQ-R relied on self-report, which is a drawback, the Cystic Fibrosis Foundation registry information was based on clinic and hospital records.

Qualitative strand. Semi-structured interviews were conducted with 30 purposefully selected participants from the quantitative strand. It was a benefit that the interviews added a more holistic understanding of HRQoL in adults with CF by incorporating the patient perspective with open-ended questions. The questions for the current study were added to the interview guide of the parent study.

Chapter Summary

Women with CF are subject to more frequent pulmonary exacerbations and infections and have shorter life expectancies than men with CF (Arrington-Sanders et al., 2006). When controlling for age and disease severity, the gap between genders continued to exist (Arrington-Sanders et al., 2006). Additionally, the gap in survival between men and women was reported internationally in India, Spain, Germany, and the United States, indicating a lower survival rate in women (Dill et al., 2013; Groeneveld et al., 2012; Kir et al., 2015; Schmidt et al., 2009). However, previous research offered no confirmed explanation for the poorer outcomes in women (Habib et al., 2015). It was suggested that future research needs to focus on the gender differences using a holistic approach so that interventions could be developed to improve the lives of people with CF (Arrington-Sanders et al., 2006).

The literature review supported the current study by showing that not only is qualitative data lacking on HRQoL in those with CF, but the gender differences in domain scores of the disease-specific HRQoL instruments varied based on individual and environmental characteristics such as sociodemographic variables. In addition, HRQoL was shown to be stable over time; however, psychosocial characteristics were always evolving (Dill et al., 2013). Understanding the differences in the trajectory of physical vs. psychosocial characteristics is vital in improving patient outcomes (Dill et al., 2013).

The adapted version of the Wilson and Cleary (1995) quality of life model was used to drive the current study by not only illustrating the need to incorporate individual and environmental characteristics in addition to measuring HRQoL, but also helping the researcher understand how the domains of the HRQoL interact with the individual and environmental characteristics to form the overall HRQoL. Because of evolving psychosocial characteristics and slight variation of gender differences in domain scores in the literature, in the current study the HRQoL instrument, the CFQ-R, was first administered and analyzed. The need for a more holistic understanding of the gender differences in HRQoL makes a sequential Quan → QUAL design the best choice for this study. The CFQ-R was administered first, and then the interview guide for the qualitative strand was built upon the HRQoL scores. Neither the quantitative nor the qualitative data alone would be sufficient to offer a holistic explanation.

To date, no study has incorporated the strengths of both qualitative and quantitative methods to holistically explain gender differences in HRQoL within the adult CF population. The current literature in this area is largely cross-sectional, with only one qualitative study. By using the sequential Quan → QUAL design, qualitative data were collected to expand on the results of the CFQ-R to help fill the gap and offer preliminary causal inferences that simple cross-sectional data cannot.

CHAPTER 3

METHODS

This chapter will discuss the specific methods used for the study, including: 1) research design, 2) purpose statement and research questions, 3) philosophical assumptions that guided the study, 4) discussion of the quantitative phase of the study, 5) how the quantitative and qualitative phases were connected, 6) discussion of the qualitative phase of the study, 7) integration of the quantitative and qualitative findings, and 8) how potential ethical issues were mitigated and addressed.

Research Design

The mixed methods research approach employed in this study included the collection of both quantitative and qualitative data, the integration of the two forms of data in addition to their corresponding results, and the framing of the study within theory and philosophy (Creswell & Plano Clark, 2018). Timing (concurrent or sequential) and priority of the quantitative and qualitative strands were considered (Creswell, 2015). Timing and priority were decided based upon the study purpose and research questions. Because the current study sought a more thorough explanation of gender-specific facilitators and barriers to HRQoL of adults with CF than the data generated from the CFQ-R could offer alone, a sequential quantitative → qualitative design was used; with this approach, the individual interviews could explain the quantitative results by elucidating gender-specific facilitators and barriers to HRQoL (Curry & Nunez-Smith, 2015). Priority was given to the qualitative phase because the collection and analysis of this phase provided insight into the main outcome, which was the most common facilitators and barriers to HRQoL.

The notation for this specific design was sequential Quan → QUAL (see Appendix H for procedural diagram). The arrow shows the sequence of the quantitative and qualitative strands, while the capitalization of QUAL shows that the qualitative phase was given priority. In this study, the interview sample for the qualitative phase was based upon the findings from the quantitative questionnaire data. The goal of using mixed methods was to combine the strengths of both types of data in order to explain different aspects of HRQoL between genders.

Purpose Statement and Research Questions

The purpose of this sequential Quan → QUAL mixed methods study was to better understand the gender differences in HRQoL of adults with cystic fibrosis through exploring gender-specific facilitators and barriers to HRQoL. The goal of the quantitative strand of the study was to examine the gender differences in HRQoL by administering the CFQ-R to adults with CF ages 19 and older within a tertiary care center in the southeastern United States. The goal of the qualitative phase was to build upon the results of the questionnaire to better understand the common gender-specific facilitators and barriers to HRQoL through individual interviews using a subsample of those who completed the questionnaire.

Overall Mixed Methods Question

How do quantitative questionnaire results and qualitative interviews jointly explain the gender differences in HRQoL by identifying gender-specific facilitators and barriers to HRQoL of adults with CF?

Quantitative Research Question

What gender differences are present in adults with CF within the 12 domains of HRQoL as measured by the CFQ-R?

Qualitative Research Question

What are the common gender-specific facilitators and barriers to HRQoL in adults with CF?

Philosophical Assumptions

This study was approached from the position of pragmatism (Morgan, 2007). The reasoning behind this was that this approach focused on using both qualitative and quantitative approaches together so that each can complement the other (Morgan, 2007). It was the researcher’s epistemological belief that by using both approaches the research problem could be more comprehensively understood. Also, research cannot be completely subjective or completely objective, and the mixed methods research approach helped balance the two (Morgan, 2007).

Mixed methods research was the most appropriate design to answer the research problem because, while the instrument used for the quantitative strand has been administered to those with CF and shows that there are gender differences in HRQoL, the domains of HRQoL within which women report a poorer or better HRQoL than men varied by demographic location. In addition, no research had been done to elaborate on the CFQ-R to explore what could be causing this difference, or what potential interventions would help bridge the gap in both survival and HRQoL. The advantage of applying mixed methods research to this research problem was that it offered a more comprehensive understanding of the gender-specific facilitators and barriers to HRQoL than a Likert scale instrument could provide alone. Adding the qualitative piece allowed members of the population who have lived with the disease to share their day-to-day lives and the facilitators and barriers to HRQoL that they have experienced.

Study Phase I: Quantitative

In this section, the methods used in Study Phase I, the quantitative phase, were described by discussing the study population and sample, recruitment, data collection, data analysis, and reliability and validity of the quantitative data. Then, the connection of the quantitative and qualitative phases was explained.

Study Population and Sample

Access to the population was gained through recruiting participants for the parent study, “Coping and Health in Adults with Cystic Fibrosis.” Access was gained to the adult cystic fibrosis clinic and inpatient unit through two of the investigators being pulmonologists within the system. In addition, rapport was formed with the research coordinator who forwards the clinic lists of eligible people with either a clinic visit or admission to the inpatient unit. Convenience sampling was used to select men and women with CF within a single healthcare system to assess their perception of their HRQoL. This sampling method was chosen because of the need to select participants from a small, close-knit group of individuals with a predefined characteristic, such as those who receive their primary CF care at a specific CF center (Ivankova, 2015). All participants were included who met the inclusion criteria of the parent study: 1) research coordinator-confirmed diagnosis of CF; 2) age of 19 years or older; and 3) recipient of care within the specified CF center.

Recruitment

Any patient who was either seen at the clinic or admitted as an inpatient to the specified CF center and met the inclusion criteria was approached for recruitment either by the researcher or by other graduate students who are members of the research team. All participants were approached in a private area within the CF clinic or in their private inpatient room. The participants received a copy of the consent form, and the purpose of the study was explained. Also, rights of the participants and their role in the study, including risks and discomforts, benefits and alternatives, confidentiality, and voluntary participation and withdrawal, were explained. At the time of initial recruitment, the qualitative portion of the study was also explained and the opportunity to be contacted for participation in the interview was presented. If the participant consented to participate, the researcher obtained his or her phone number, e-mail address, and preference of either electronic or paper questionnaires via a paper demographics form.

Data Collection

The quantitative data consisted of the CFQ-R, demographics form, and patient registry data. Participants completed the demographics form at the time of recruitment. The CFQ-R included 50 questions assessing HRQoL (see Appendix E). The questionnaire was administered online via the Qualtrics program. A link to the questionnaire, the CFQ-R, was sent via e-mail or mail to an address provided by the participant at the time of consent. The participant then completed the questionnaire by clicking on the link. When finished, the questionnaire was submitted electronically via Qualtrics or mailed back in a provided envelope, if the participant chose to complete a paper questionnaire. The data were then accessible and available for download into an Excel spreadsheet. A total of 123 participants completed the CFQ-R as part of the parent study. All domains of the CFQ-R have been defined (see Appendix F). Lastly, the researcher collected the Cystic Fibrosis Patient Portal data via an online database and placed in into an Excel spreadsheet for analysis.

Instrument. To measure HRQoL, the CFQ-R has 12 domains, eight quality of life domains, three symptom domains, and one overall health perceptions domain. The quality of life domains include: 1) emotional functioning (to what extent the participant feels worried or upset about CF), 2) physical functioning (limitations in physical activity related to CF), 3) social functioning (how CF and associated treatments have affected socialization), 4) role functioning (how CF interferes with school, work, etc.), 5) vitality/energy (how energetic a participant is able to be), 6) treatment burden (to what extent the prescribed treatment regimen makes life more difficult), 7) eating difficulties (having to make themselves eat), and 8) body image (how people who have CF feel the disease has made them look and feel different from peers). Additionally, there are three symptom domains: 9) respiratory function (how often respiratory symptoms such as coughing are present), 10) weight (difficulty gaining weight), and 11) digestion (presence of abdominal pain). The twelfth domain was the overall health perceptions domain (how people with CF feel about health status in terms of whether they feel healthy) (Quittner et al., 2012). Each domain was standardized during the scoring procedures to elicit a score between 0 and 100. The higher the score on the domain, the better HRQoL was within that domain (Quittner, 2009).

Data Analysis

The researcher used the software SPSS v. 23 to analyze the quantitative data. First, each of the 12 domains of the CFQ-R were scored in accordance with scoring guidelines provided by the creator of the instrument (see Appendix E). Then, descriptive statistics and correlations were calculated among the demographic variables and domain scores of the CFQ-R. Mean and standard deviations were calculated for all continuous variables, and frequencies and percentages were conducted for all categorical variables. In addition, the Shapiro-Wilk test for normality and Levene's test for homogeneity of variance were conducted. Mann-Whitney U test was conducted to compare the HRQoL of men and women within the 12 domains of HRQoL included in the CFQ-R. Cohen's *d* was then used to examine the magnitude of the differences between groups.

Reliability and Validity

To ensure the validity of the quantitative strand, the CFQ-R, which has been widely tested and validated, was administered. In a development study by Henry, Aussage, Grosskopf, and Goehrs (2003), convergent validity was illustrated by showing that the CFQ-R performed similarly with another well-validated HRQoL instrument in that similar domains of the instruments, physical dimensions, energy, and emotions, were closely correlated (0.43 to 0.75), while the correlations of the unrelated domains were much lower, showing discriminant validity (Henry et al., 2003). Reliability of the instrument has been shown through test-retest reliability, examined in a subset of 37 stable adolescents and adults with CF by administering the CFQ-R on two different days, resulting in intra-class correlation coefficients that ranged from 0.72-0.97. When test-retest was done with a group of children, the intra-class correlation coefficient ranged from 0.66-0.96 (Henry et al., 2003). To ensure consistency, the Qualtrics program was used.

Connecting Quantitative and Qualitative Phases

In a sequential Quan → QUAL mixed methods design, qualitative data were collected after the quantitative data in order to elaborate on and provide a deeper understanding of the quantitative results (Ivankova, Creswell, & Stick, 2006). In order to do this, the two phases were connected at two points: selecting the sample for the qualitative phase and developing the interview protocol based on the quantitative phase.

Selection of Sample

The results from the quantitative phase informed the sample selection for the qualitative phase. While selection was limited by the inclusion criteria of the parent study, all participants who met the inclusion criteria for the parent study were examined, and a subsample was chosen to be as representative as possible in the domains of the CFQ-R that indicated a statistically significant difference between genders. Once the 12 CFQ-R domains were scored and the quantitative analyses were completed, the researcher looked at the domains in which statistically significant differences in the HRQoL of men and women were present. Then, the interview participants were chosen in order to include those who had a higher HRQoL score and those who had lower HRQoL scores in each of the domains to increase representativeness and best elucidate gender-specific facilitators and barriers to HRQoL. In addition, the subsample was split evenly between men and women and, as a result, 15 men and 15 women were chosen to participate in the interview.

Interview Protocol Development

While all HRQoL domains included in the CFQ-R had to be included on the protocol in order to explore both facilitators and barriers to HRQoL, the interview protocol was developed based on the quantitative results; the researcher grouped questions by the domains that illustrated statistically significant differences in HRQoL between men and women in order to provide more detail on those domains (see Appendix E). Also, general questions asking the participants how they felt their gender did or did not contribute were added based on the presence of significant gender differences in the quantitative phase. The interview guide consisted of five overarching questions with additional probes and sub-questions to elicit rich description of the facilitators and barriers to HRQoL. First, two general questions were asked regarding living with CF and what a typical day looked like for the participant. Then, sub-questions probed into potential facilitators and barriers to their HRQoL. Next, a transition question was asked in order to move from broad to more specific questions about the CFQ-R domains. Then, 10 sub-questions were asked about the 12 CFQ-R domains. Lastly, the participants were specifically asked if they thought their gender played a role in their quality of life. To ensure that the participants were able to share all that they wanted to, the final question allowed them to speak about anything they felt was important that was not previously discussed in the interview.

An amendment was submitted to the IRB after the questions were reviewed by three dissertation committee members. Then, one person with CF, who was included in the interview sample, gave feedback on the interview questions to ensure ease of understanding. The participant stated willingness to review the protocol prior to beginning the first interview and read through the questions for clarity and ease of understanding. The participant stated that the protocol was easily understood; therefore, no changes to the protocol were made.

Study Phase II: Qualitative

The qualitative phase of the study was conducted through use of a subsample of participants included in the quantitative phase. This section will describe the qualitative methods including the sample, data collection, data analysis, credibility and trustworthiness of the qualitative findings, integration, and validity of mixed methods inferences.

Sample

Participants for the qualitative phase of the study were purposively selected from the quantitative sample (*N* = 123). The target sample size of the parent study was 30 participants or when saturation was reached. In order to ensure equal representation of men and women, the researcher recruited 15 men and 15 women for the interviews. Once saturation was met for the parent study at 27 interviews, three participants who did not meet the inclusion criteria for the qualitative portion of the parent study (taking one of the newly developed drugs to treat CF, Kalydeco or Orkambi) were included in the current study. This increased the representativeness of the subsample chosen based on the CFQ-R results.

CFQ-R scores of the subsample were reviewed and found to be representative of all disease severity levels. The research coordinator at the CF clinic forwarded the researcher the list of those with CF being both seen in the clinic and admitted to the hospital. When a participant from the subsample was seen on the list, the researcher contacted the participant by telephone from a private area. The consent form was reviewed and explained to the participants, and if they agreed to participate, a date and time was scheduled in concordance with their clinic or hospital visit. If the participant was not local and did not have an appointment during the data collection period, a phone interview was scheduled.

Data Collection

The informed consent for the quantitative strand included contacting participants for interviews; therefore, another informed consent was not needed for the qualitative strand. The interviews were performed in a private area within either the CF clinic, hospital, or the department of psychology, based on participant preference, or via telephone. The interviews were semi-structured, based on the interview guide, and lasted approximately 30-45 minutes. With the introduction of each interview, the participants were informed that the interviews would be audio recorded, and permission was obtained prior to beginning the interview. Each participant was compensated with a $30 gift card.

Data Analysis

The interviews were transcribed and analyzed by the researcher using the NVivo 11 Pro computer program. Electronic data were stored on a secure drive of a password-protected computer. Following Braun and Clarke (2012), the researcher conducted an inductive thematic analysis involving six steps: 1) becoming familiar with the data; 2) generating initial codes; 3) searching for themes; 4) reviewing potential themes; 5) defining and naming themes; and 6) producing the report (Braun and Clarke, 2012).

First, for the initial preparation of the qualitative data, the interviews were transcribed and read by the researcher. In addition, transcription accuracy was ensured by reading through the interviews while listening to the audio recordings. Through reading and listening to the interviews multiple times, the researcher became familiar with the data.

Second, once familiar with the data, the researcher began to form codes as part of a codebook. According to Braun and Clarke (2012), codes are succinct and descriptive in a way easily understood by the researcher. Initially, codes were chosen that were more descriptive and stayed close to the participants' words (Braun & Clarke, 2012). Also, as new codes were generated, they were compared to existing codes to see if each piece of data fit within an existing code or warranted the creation of a new code. The researcher began grouping codes by the conceptual framework (Braun & Clarke, 2012).

Third, the researcher began to look for patterns within the data, and as a result, codes began to be grouped into broader subthemes. According to Braun and Clarke (2012), relationships should begin to emerge between potential themes at this point in the process, and the researcher should look into how the themes will work together to tell the overall story.

Next, the researcher then began looking at the emerging themes and how they were grouped in accordance with the major concepts depicted in the adapted version of Wilson and Cleary's (1995) quality of life model used to guide the study. After grouping the themes, the researcher reread all data to ensure that the themes captured all data (Braun & Clarke, 2012). Then, the researcher used Braun and Clarke's (2012) criteria for good thematic analysis to make sure themes had a single focus, did not overlap, and helped address the research question.

Fifth, theme names were chosen that were “informative, concise, and catchy” (Braun & Clarke, 2012, p. 67). Lastly, the final step, producing the report, has been done by completing Chapters 1-5.

Credibility and Trustworthiness of Qualitative Findings

Quality assurance of the qualitative findings was ensured by using the following procedures: 1) rich, thick description; 2) dissertation committee audit; and 3) inter-coder agreement. To provide rich, thick description, the participants, setting, and quotes of participants were described in detail in order for others to be able to read the results and determine whether the findings are transferrable because of shared characteristics (Creswell, 2015). Secondly, there was an external check of the entire qualitative process by the dissertation committee members. The dissertation committee asked comprehensive questions about the methods, analyses, and interpretations, from which the researcher kept written accounts. In addition, the methodologist on the dissertation committee provided detailed feedback on data analysis and integration in order to ensure that the research process was as rigorous as possible (Creswell, 2015). Lastly, inter-coder agreement was used to help ensure reliability by examining stability of codes when compared to another member of the research team’s coding of the interview transcripts (Creswell, 2015). A colleague, also trained to conduct qualitative research, who worked closely with the researcher on the current study, independently coded two interview transcripts. There was approximately 90% agreement between the coding of the two researchers using the established coding scheme. This illustrated a high level of inter-coder agreement (Miles & Huberman, 1994).

Integration of Quantitative and Qualitative Phases

Three points of integration occurred during this study. The first was when the quantitative and qualitative strands were connected by building both the qualitative sample and the interview protocol based on the quantitative results. The second was at the conclusion of the study, using a follow-up results joint display (Creswell, 2015). The joint display (see Appendix I) presented the quantitative and qualitative results side-by-side in columns and linked the two by showing how the qualitative results further explained the quantitative results (Creswell, 2015). The third was during the discussion of the integrated findings using a weaving approach with the sections organized using the CFQ-R domains (Fetters, Curry, & Creswell, 2013). The findings are discussed in the context of prior research and incorporate both quantitative and qualitative findings.

Validity of Mixed Methods Inferences

Inference quality is associated with design quality and interpretive rigor (Onwuegbuzie & Johnson, 2006). The use of the integrative model of quality included the following procedures: 1) design fidelity; 2) interpretive consistency; 3) theoretical consistency; and 4) integrative efficacy (Teddlie & Tashakkori, 2009).

Design fidelity was ensured because the researcher utilized the dissertation committee's feedback and guidance to ensure that procedures, including data collection procedures, were implemented with rigor. Secondly, mixed methods inferences were compared with the qualitative and quantitative findings to ensure the inferences and findings were consistent. Thirdly, findings were organized into themes that were in accordance with the conceptual framework and were then compared with the current state of knowledge in the area of HRQoL in CF to help provide theoretical consistency. Lastly, meta-inferences properly incorporated the inferences generated from the quantitative and qualitative results. By using these approaches, multiple validities legitimation was used to ensure that qualitative, quantitative, and mixed validity types resulted in the highest quality meta-inferences.

Ethical Issues

Recruitment, Retention, and Conduct of Research in Those with CF

Recruitment. When considering the number of potential participants available for recruitment, it is important to note that CF affects approximately 30,000 people in the United States (Ernst, Johnson, & Stark, 2011). This means that the CF community is fairly small. In addition, approximately half of the CF population has now reached adulthood (De Boeck et al., 2011). Further, due to the population being small, the same participants have been approached repeatedly to participate in various studies. With the enormous treatment burden of CF, participation in research can be seen as a low priority in this population (Withers, 2012). Recruitment barriers regarding the CF population include the setting most commonly being during a CF clinic visit. The pulmonary clinic was often busy and was not CF-specific. The clinic was located in a large room shared with other clinics. Privacy during recruitment was a potential issue. Lastly, undue influence and coercion could have been an issue because: 1) recruitment occurred in the clinic around the time of a scheduled appointment, and 2) one of the pulmonologists within the clinic was also a PI of the parent study for which initial recruitment occurred.

Retention. Research can be seen as unnecessary since it may add to the cumbersome treatment burden of CF and can lead to decreased retention rates (McDonagh & Bateman, 2012). Also, due to the longitudinal approach of the parent study, retention can be difficult. More specifically, due to the chronic nature of CF, the likelihood of participants being too sick to complete the study or dying during the study was increased, which could affect retention rates. Participants were called or sent e-mails periodically, according to their preference, to remind them to complete the questionnaire and help increase retention rates.

Other considerations while conducting research. Cross-contamination is also a huge risk that must be minimized in research. Bacterial respiratory infections may be associated with a higher mortality rate. These pathogens can live and grow on surfaces such as desks, chairs, or any other objects touched by the research participant (Zuckerman et al., 2009). Another difficulty arising in research of the CF population is that with all of the changes in lung function, HRQoL, treatment burden, etc., that occur as these participants age, no single person has the same changes (De Boeck et al., 2011). Cystic fibrosis is a multi-organ disease that presents differently in each person and has over 1,500 mutations. Some gene mutations are homozygous and some are heterozygous, increasing the variability in the clinical manifestations of CF. This combination can affect outcomes and make this population difficult to study (De Boeck et al., 2011).

How Ethical Issues Were Avoided

For ethical considerations, the American Psychological Association's ethical principles for conducting research were followed along with institutional policies on the protection of human subjects in research. Specific to the CF population, when interviews were done in person, the audio recorder and anything else used by the participant (pen, table, etc.) were cleaned with antibacterial wipes in between interviews to ensure that cross-contamination did not occur.

Veracity was achieved through the informed consent process. During the recruitment process, the participants were informed that they had complete freedom to decide whether to participate. Participants were given a copy of all informed consent materials and had the option to take 24 hours to read and digest the information before making a decision on whether to participate, per IRB guidelines (UAB Research, 2013). Giving the potential participant time to ask questions about the materials further ensured informed consent (UAB Research, 2013). The researcher informed participants that they were in control of the decision and could withdraw from the study at any time (McDonagh & Bateman, 2012). It was important that informed consent was obtained and confirmed throughout the study. After the quantitative strand, it was important to give the participants a chance to review the consent materials before giving consent to participate in the interviews.

Maintaining confidentiality when recruiting and collecting data could have been an issue. Due to recruitment occurring in clinics and healthcare settings, the researcher made sure the participant was given as much privacy as possible. While it is preferred and recommended that potential participants are approached in a private area, this was not feasible with the layout of the clinic. However, to mitigate this potential concern of lack of privacy, the researcher spoke in a hushed, quiet tone of voice when interacting with participants and ensured that distance from other patients and families was provided.

Confidentiality was maintained by keeping all audio recordings and paper files in a locked desk or password-protected computer in a locked office of a restricted research area. All necessary precautions were taken to ensure anonymity by removing identifiable data when appropriate and being sure that data storage methods abided by IRB requirements (Schonfeld, Brown, Amoura, & Gordon, 2011). All electronic files including patient information were stored on a secure drive on a password-protected computer. In addition, each file that contained information that could identify the participants was password protected as well.

Additionally, since a PI of the parent study, a pulmonologist, could be present in the clinic during recruitment, it was imperative that no undue influence or coercion occurred, and that the participant was aware that declining to participate in the study would in no way compromise his/her healthcare or clinic visit. Also, to minimize these risks, the participants were not recruited while seeing the healthcare provider and were not recruited by anyone associated with their clinic visit.

As part of the parent study, the research coordinator within the CF clinic forwarded clinic schedules of those who fit the inclusion criteria. It was common for researchers to screen patient information prior to recruitment to ensure that the people targeted were eligible for participation. Even though screening patient information was protected by the Health Insurance Portability and Accountability Act (HIPAA) preparatory research provision, the researcher made all efforts to keep patient information private (Schonfeld et al., 2011). The information was emailed to the password-protected email account of one of the researchers and was never printed or forwarded.

To ensure justice, all participants were treated equally and with respect. No discrimination based upon socioeconomic status, race, religion, or sexual orientation occurred. The specified age led to exclusion of children with CF. However, this exclusion was done upfront in order to capture the best data possible due to the gender gap becoming pronounced in adolescence and early adulthood. The IRB approval process helped ensure beneficence by assuring that the benefits of the research outweighed the risks to the participant. Even though this population is often sick, autonomy was respected and encouraged. All participants were assured that their information would be kept private and secure. Measures to do this included not allowing their names to be used on the taped interviews, de-identifying all interviews and referring to each participant only as a specified number, keeping all questionnaires in the survey software Qualtrics or in a locked desk within a restricted research area, and keeping and accessing all research-related items only on a password-protected, secure computer behind a locked door in the researcher’s office.

Ethical Issues Associated with Mixed Methods Design

Institutional Review Board approval was obtained for the quantitative strand. Because of the chosen sequential design, an amendment was submitted and approved before the qualitative phase could be conducted. Also specific to the mixed methods design, it was important for the researcher to address the different levels of sensitivity between the qualitative and quantitative strands (Ivankova, 2015). For instance, the interviews with select participants were more detailed and more personal than the questionnaires. For that reason, participants were asked not to state their name on the recording. Before beginning the interviews, an introduction was also read that informed the participants that they could stop the interview at any time if they did not wish to answer a question or wanted to stop. Also, due to the importance of having the questionnaires linked to the participants because of the sequential nature of the design, a number was assigned to each participant's questionnaire and then that information was only available on the secure drive of the researcher's computer. The participants were informed of these procedures and ensured that anonymity and confidentiality would be upheld. Lastly, participant burden must be balanced (Creswell, Klassen, Plano Clark, & Smith, 2011). Mixed methods can place a higher burden on those who are experiencing health issues, such as CF, when compared to collecting one form of data. However, collecting both quantitative and qualitative data has the potential to also offer unique benefits to the CF community (Creswell et al., 2011). Participant burden was minimized by collecting the quantitative and qualitative data at different times. In addition, payment and flexibility helped with respondent burden (Yoshikawa, Weisner, Kalil, & Way, 2008). In this study, the participants were compensated with a $30 Visa gift card for their participation in the quantitative phase, and then again for their participation in the qualitative phase. Flexibility was given by making the quantitative questionnaires available via an e-mailed link or by paper to complete at a time and place of participants' convenience. In addition, the option of a telephone interview was offered.

Chapter Summary

In order to most fully address the stated research questions, a sequential Quan → QUAL design was the best approach for design, data collection, and data analysis. The researcher answered the research questions by analyzing the self-reported HRQoL instrument, the CFQ-R (*N* = 123). The CFQ-R was scored using SPSS, according to guidelines provided by the developer of the instrument. The quantitative results from the CFQ-R informed the interview protocol for the qualitative phase. Thirty participants were purposively selected for the interviews. The interviews were semi-structured and were conducted once, face-to-face or over the phone (*n* = 30). Data were analyzed using thematic analysis. The quantitative and qualitative data were merged to form overall meta-inferences in order to better explain the gender differences in HRQoL through exploring gender-specific facilitators and barriers to HRQoL of adults with CF.

CHAPTER 4

RESULTS

Study Phase I: Quantitative

The purpose of this study was to better understand the gender differences in HRQoL of adults with cystic fibrosis (CF) through exploring gender-specific facilitators and barriers to HRQoL using a sequential Quan → QUAL mixed methods design. The goal of the quantitative strand of the study was to examine the gender differences in HRQoL by administering the CFQ-R to adults with CF ages 19 and older within a single CF center. This section presents results for the quantitative phase of this sequential Quan → QUAL mixed methods study.

The quantitative phase of this study was guided by the research question: What gender differences are present within the 12 domains of HRQoL included in the CFQ-R?

Sample Characteristics

The quantitative sample was comprised of 123 adults who completed the CFQ-R (see Table 1). The sample was comprised of 57 (46%) men and 66 (54%) women. Most participants were Caucasian and had an average age of 32 years (see Table 1). In terms of nutritional status, the average BMI was 23 and was similar between men and women. Half of the sample had a household income less than $40,000, and half had a household income of greater than $40,000; however, 15 participants did not disclose their household income. In addition, most participants were well educated, unemployed, and had some type of chronic lung infection. Of those who had a chronic lung infection, mucoid *P.*

aeruginosa was the most common type. Participants were equally divided between married and single.

The men and women within the sample did not differ in age, BMI, FEV_1, race/ethnicity, income, education level, depression and anxiety rates, presence of chronic lung infections, or type of lung infections. However, there was a significant difference in employment status. A greater percentage of women were unemployed compared to men (50% vs. 36.8%), while approximately half of the men (47.4%) were employed full time compared to 18.2% of women. In terms of student status, 16.7% of women were currently a student vs. 3.5% of men.

Table 1

Demographic Information (N=123)

Variable	**Total Sample (*N*= 123)**	**Men (*n*= 57)**	**Women (*n*=66)**	***p***	***e***
Age	31.89 (11.58)	31.04 (9.47)	32.63 (13.16)	0.44	0.14
BMI	23.51 (4.88)	23.57 (4.33)	23.46 (5.33)	0.89	0.02
FEV$_1$	60.97 (23.31)	61.07 (20.72)	60.88 (25.49)	0.96	0.01
Race/Ethnicity				0.83	0.02
Caucasian	115 (93.5%)	53 (93%)	62 (93.9)		
African American	8 (6.5%)	4 (7%)	4 (6%)		
Income				0.20	0.21
$20,000 or less	25 (20.3%)	11 (21%)	14 (25%)		
$20,000 to $40,000	25 (20.3%)	16 (31%)	9 (16%)		
$40,000 to $80,000	32 (26.0%)	16 (31%)	16 (29%)		
$80,000 and up	26 (21.1%)	9 (17%)	17 (30%)		
Data Not Available	15 (12.2%)	11 (73%)	4 (27%)		
Education				0.29	0.18
High school or less	29 (23.6%)	16 (28%)	13 (20%)		
Some College	47 (38.2%)	22 (39%)	25 (38%)		
College Graduate	34 (27.6%)	16 (28%)	18 (27%)		
Graduate Degree	13 (10.6%)	3 (5%)	10 (15%)		
Employment				<.01	0.34
Unemployed	54 (43.9%)	21 (36.8%)	33 (50%)		
Part-time	16 (13%)	7 (12.3%)	9 (13.6%)		
Full-time	39 (31.7%)	27 (47.4%)	12 (18.2%)		
Student	13 (10.6%)	2 (3.5%)	11 (16.7%)		
Data Not Available	1 (0.8%)		1 (0.8%)		
Marital Status				0.97	0.11
Married	54 (43.9%)	26 (45.6%)	28 (42.4%)		
Cohabiting	3 (2.4%)	1 (1.8%)	2 (3.0%)		
Separated	1 (0.8%)	0 (0%)	1 (1.5%)		
Divorced	8 (6.5%)	3 (5.3%)	5 (7.6%)		
Single	56 (45.5%)	27 (47.4%)	29 (43.9%)		
Data Not Available	1 (0.8%)		1 (0.8%)		
Depression				0.93	0.08
Yes	48 (39%)	22 (38.6%)	26 (39.4%)		
No	75 (61%)	35 (61.4%)	40 (60.6%)		
Anxiety				0.37	0.08
Yes	35 (28.5%)	14 (24.6%)	21 (31.8%)		
No	88 (71.5%)	43 (75.4%)	45 (68.2%)		
Infection				0.20	0.12
Yes	89 (72.4%)	44 (77.2%)	45 (68.2%)		
No	33 (26.8%)	12 (21.1%)	21 (31.8%)		
Data Not Available	1 (0.8%)	1 (0.8%)			
Infection Type				0.70	0.28
MRSA	9 (7.3%)	6 (10.5%)	3 (4.5%)		
MSSA	8 (6.5%)	3 (5.3%)	5 (7.6%)		
Pseudomonas: Mucoid	32 (26%)	13 (22.8%)	19 (28.8%)		
Pseudomonas: Non-mucoid	9 (7.3%)	5 (8.8%)	4 (6.1%)		
Burkholderia cepacia	1 (0.8%)	1 (1.8%)	0 (0%)		
Mycobacterium Species	3 (2.4%)	2 (3.5%)	1 (1.5%)		
MRSA and Mucoid	8 (6.5%)	4 (7%)	4 (6.1%)		
MRSA and Non-mucoid	7 (5.7%)	3 (5.3%)	4 (6.1%)		
MSSA and Mucoid	7 (5.7%)	5 (8.8%)	2 (3.0%)		
MSSA and Non-Mucoid	3 (2.4%)	2 (3.5%)	1 (1.5%)		
MRSA and Haemophilus	1 (0.8%)	0 (0%)	1 (1.5%)		
MSSA and Haemophilus	1 (0.8%)	0 (0%)	1 (1.5%)		
Data Not Available	1 (0.8%)	1 (0.8%)			

**p*-values in bold are indicative of significance at p<.05

***e* = effect size, Cohen's *d* and Cramer's *V* when appropriate

Results

The Shapiro-Wilk test for normality and Levene's test for homogeneity of variance were conducted for all quantitative variables (see Table 2). The normality test indicated non-normal distributions for age, BMI, physical functioning, role functioning, vitality, emotional functioning, social functioning, body image, eating difficulties, treatment burden, health perception, weight, respiratory functioning, and digestive symptoms ($p < 0.05$). FEV_1 was normally distributed ($p > 0.05$); however, Levene's test indicated that the assumption for homogeneity of variance was not met ($p = 0.03$). Therefore, non-parametric tests were needed for all quantitative variables.

Table 2

Normality and Homogeneity of Variance

Variable	Normality	Homogeneity of Variance
Age	**<0.01**	**0.02**
BMI	**0.01**	0.70
FEV_1	0.14	**0.03**
Physical Functioning	**<0.01**	**0.03**
Role Functioning	**<0.01**	0.46
Vitality	**0.02**	**0.01**
Emotional Functioning	**<0.01**	**0.03**
Social Functioning	**<0.01**	**<0.01**
Body Image	**<0.01**	0.46
Eating Difficulties	**<0.01**	0.97
Treatment Burden	**<0.01**	0.24
Health Perception	**<0.01**	**0.03**
Weight	**<0.01**	**0.06**
Respiratory Functioning	**<0.01**	**0.03**
Digestive Symptoms	**<0.01**	0.15

**p-values in bold are indicative of significance at p<.05*

Mean scores and standard deviations were reported for the overall sample and then split by gender for each of the domains of HRQoL (see Table 3). Overall, the HRQoL scores indicated that participants had the poorest quality of life, evidenced by lower mean scores, in the areas of vitality, treatment burden, and respiratory function, and the best quality of life in the areas of eating difficulties and digestive symptoms.

Mann-Whitney U tests were conducted to compare the HRQoL of men and women in each of the 12 domains of HRQoL. Men reported a poorer HRQoL, indicated by a lower mean score, in the areas of digestive symptoms, weight, and body image. Women had a lower mean score in the areas of physical functioning, role functioning, vitality, emotional functioning, social functioning, eating difficulties, treatment burden, health perception, and respiratory functioning. Significant differences ($p < 0.05$) between genders were present in the HRQoL domains of physical functioning ($p = 0.02$, $e = 0.41$), emotional functioning ($p = 0.02$, $e = 0.41$), social functioning ($p = 0.03$, $e = 0.38$), and weight ($p = 0.02$, $e = 0.43$). Cohen's *d* (*e*) indicated the magnitude of the differences between groups, and all domains that showed significant differences between men and women (physical functioning, emotional functioning, social functioning, and weight) illustrated a small to medium effect size (see Table 3).

Table 3

Differences of HRQoL Between Men and Women with CF

Variable	**Total Sample (*N*= 123)**	**Men (*n*= 57)**	**Women (*n*=66)**	***p***	***e***
Physical Functioning	59.61 (30.14)	66.16 (26.61)	53.95 (32.00)	**0.02**	0.41
Role Functioning	69.08 (25.00)	71.05 (23.63)	67.38 (26.20)	0.42	0.15
Vitality	51.49 (23.01)	52.63 (19.36)	50.51 (25.86)	0.60	0.09
Emotional Functioning	69.16 (22.30)	74.04 (19.22)	64.95 (24.00)	**0.02**	0.41
Social Functioning	61.83 (22.36)	66.37 (18.59)	57.91 (24.64)	**0.03**	0.38
Body Image	63.23 (31.91)	62.38 (33.58)	63.97 (30.63)	0.79	0.05
Eating Difficulties	83.92 (23.34)	84.02 (22.42)	83.84 (24.28)	0.97	0.01
Treatment Burden	52.03 (17.96)	53.80 (16.10)	50.51 (19.41)	0.30	0.18
Health Perception	59.44 (25.45)	63.35 (22.32)	56.06 (27.59)	0.11	0.29
Weight	66.12 (38.88)	57.31 (40.71)	73.74 (35.81)	**0.02**	0.43
Respiratory Functioning	58.99 (24.06)	60.04 (21.98)	58.08 (25.86)	0.65	0.08
Digestive Symptoms	71.99 (23.00)	71.54 (20.68)	72.39 (24.98)	0.84	0.04

**p-values in bold are indicative of significance at p<.05*
***e = effect size, Cohen's d*

Summary

In terms of the total sample (*N = 123*), participants reported the poorest HRQoL in the areas of vitality, treatment burden, and respiratory function, and rated their HRQoL as the best in the areas of eating difficulties and digestive symptoms. Men and women showed significant differences in HRQoL in the domains of physical functioning, emotional functioning, social functioning, and weight. Women reported a poorer HRQoL in the domains of physical functioning, emotional functioning, and social functioning while men reported a poorer HRQoL in the domain of weight.

Study Phase II: Qualitative

The qualitative research question was: What are the common gender-specific facilitators and barriers to HRQoL in adults with CF? The qualitative strand included semi-structured interviews with 15 men and 15 women. This section of the chapter will discuss the descriptive characteristics of the qualitative sample and then the thematic results by gender.

Description of Qualitative Sample

The qualitative sample included an equal number of men and women. Most participants were Caucasian and had an average age of 30 years (see Table 4). In terms of nutritional status, the average BMI was 23, which indicated a normal weight. When comparing the men and women within the sample, they did not differ in age, BMI, or FEV_1 (see Table 4). In terms of gender differences in HRQoL, significant differences between men and women occurred in the domains of vitality ($p = 0.02$) and weight ($p = 0.02$), with women reporting a better HRQoL in the domain of vitality, while men reported a poorer HRQoL in the domain of weight. In terms of the magnitude of the differences in HRQoL between genders, both vitality and weight exhibited a large effect size.

Table 4

Description of Qualitative Sample

Variable	**Total Sample (*N*= 30)**	**Men (*n*= 15)**	**Women (*n*=15)**	***p***	***e***
Age	29.77 (8.05)	31.27 (8.39)	28.27 (7.69)	0.32	0.37
BMI	23.12 (4.78)	22.73 (3.88)	23.52 (5.66)	0.66	0.16
FEV_1	65.80 (22.22)	63.67 (19.42)	67.93 (25.22)	0.61	0.19
Physical Functioning	72.92 (22.42)	74.44 (17.53)	71.38 (26.97)	0.72	0.13
Role Functioning	78.89 (20.61)	72.78 (22.60)	85.00 (17.02)	0.11	0.61
Vitality	62.77 (20.03)	54.44 (15.39)	71.11 (21.09)	**0.02**	0.90
Emotional Functioning	78.22 (17.93)	77.33 (15.70)	79.11 (20.46)	0.79	0.10
Social Functioning	73.15 (18.97)	77.04 (14.68)	69.26 (22.31)	0.27	0.41
Body Image	74.81 (28.28)	66.67 (33.86)	82.96 (19.18)	0.12	0.59
Eating Difficulties	89.63 (19.78)	85.93 (23.93)	93.33 (14.43)	0.32	0.37
Treatment Burden	59.26 (16.85)	54.07 (18.24)	64.44 (14.05)	0.93	0.64
Health Perception	65.93 (20.20)	62.22 (21.74)	69.63 (18.53)	0.32	0.37
Weight	68.89 (36.02)	53.33 (39.44)	84.44 (24.77)	**0.02**	0.94
Respiratory Functioning	67.96 (18.38)	65.56 (16.96)	70.37 (19.99)	0.48	0.26
Digestion	77.78 (22.60)	72.59 (18.72)	82.96 (25.50)	0.22	0.46

**p-values in bold are indicative of significance at p<.05*
***e = effect size, Cohen's d*

Qualitative Findings

The qualitative analysis resulted in five overarching themes and 14 subthemes. Their names and descriptions are included in Table 5.

Table 5

Themes and Corresponding Subthemes

Themes	Descriptions	Subthemes
1: Biological and Physiological Factors	Personal perception of individual characteristics	- Gender - Infection - Lung Transplant
2: External Factors	Personal perception of environmental factors that could affect HRQoL	- Exposure to Pathogens - Financial Stress - Holistic Approach to Healthcare - Support
3: Functional Status	Personal perception of how CF impacts daily functioning	- Physical Functioning - Role Functioning - Social Functioning
4: Perceptions of Preferences, Values, and Mental Health	Personal perception of personal preferences, values, and mental health	- Mental Health - Personal Preferences and Values
5: Perceived Symptom Status	How various symptoms associated with CF are perceived by participant	- Emotional or Psychological - Physical

Theme 1: Biological and Physiological Factors

Participants reported that certain biological and physiological factors including their gender, presence of a lung infection, and lung transplant status influenced how they perceived their HRQoL. Their perceptions of how each of these factors impacted HRQoL are illustrated below.

Gender. Seventeen participants felt that their gender in some way impacted their experience of CF. The two codes related to this subtheme that emerged from the interview data were CF being physically demanding as the reason for gender differences and gender differences associated with having CF.

CF being physically demanding as the reason for gender differences. Participants explained that being a man as opposed to a woman with CF was beneficial when it came to the physical strength required to deal with CF on a day-to-day basis. One man gave an example:

> I just thought about the war…why do we protect our women, why do we either want them in the airplanes or firing the guns at the back? Why do we not want them up there slinging knives and killing on our body, the stress, the sleeplessness?…When CF is at its worst…you can't sleep, you can't rest, you can't hardly breathe, your systems are shutting down. (PT 150)

Gender differences associated with having CF. Building on their questionnaire responses, participants had varying accounts of gender differences affecting HRQoL in relation to having CF. Both men and women expressed that fertility issues and wanting to be a parent affected their lives in various ways. One man stated, “I guess having children would be maybe the biggest difference. I think everyone wants to have a kid, but I would assume that women would want it more because of all that is involved with pregnancy and carrying a child” (PT 104). A woman echoed his observation: “It’s difficult to become pregnant or carry a child…you can't take a whole lot of antibiotics and your immune system being kinda low” (PT 536). One woman spoke of the emotional experience of trying to become a mom and said, “I’ve just always wanted to be a mom. That was my top priority. So, I think it was really scary, being this woman with this, you know, genetic condition” (PT 542).

In terms of aspects of CF that impact HRQoL more in men, participants spoke about feeling different from peers in terms of "bone structure and muscles" (PT 151). One man shared, "I guess guys like to be more...alpha male, more like fit… they want to have big muscles. You don't see many guys with CF that are just like ripped, from that aspect it would be different for guys" (PT 129).

Infection. Approximately half of the sample had some type of chronic infection. There was only one code included under the infection subtheme due to the widespread perception that lung functions corresponded with deteriorating health.

Deteriorating health due to infection. Both men and women expressed how lung infections negatively impacted their health in the areas of energy level, eating difficulties, weight, lung function, and emotional health. One man stated, "I don't feel very well and [don't] have a lot of energy and…it might be an indicator that I'm fighting an infection" (PT 109). Another man expressed that he was unable to eat due to the lung infection and subsequent treatment: "With this infection I lost 25 pounds and had to get a feeding tube" (PT 144). One woman spoke about the impact a lung infection had on her lung function: "I've had *Pseudomonas* flare-ups a few times, which my FEV is usually around 100, and so then it would drop to like 90, so I could tell a difference there" (PT 569). Lastly, one woman described her fears about having a chronic lung infection: "It's also very scary knowing that you have these, you know, bugs in your lungs that are just really dangerous…can cause so much damage" (PT 542).

Lung transplant. Three participants spoke about either having or waiting for a lung transplant. The corresponding code of lung transplant and its effect on HRQoL encompassed all patient experiences surrounding lung transplant.

Lung transplant and its effect on HRQoL. Both men and women expressed that receiving a lung transplant positively affected their HRQoL in that it decreased the amount of time that they had to spend doing CF-related treatments. One man stated, "It's easier now definitely 'cause a lot of medicines got stopped, so I don't have to do breathing treatments and stuff like that anymore, so it frees up a lot of time that I used to have to do that stuff" (PT 181). One woman echoed having a drastic change in time doing treatments: "So about eight hours a day I was doing treatments, and now that I had a transplant it, you know, takes maybe 15 minutes" (PT 522). Other positive effects associated with transplant were increased energy and lung function. One man explained, "Before transplant…I would get tired doing anything…if I walked to the bathroom I'd be give out [exhausted] and then possibly have to take a nap or something. That was before transplant, it's [energy] better now" (PT 181).

When comparing her lung function pre- and post-transplant one woman said, "I was on oxygen 24/7 and I just I couldn't do much 'cause my lung function was so bad, and I was just coughing, and you know it just was really hard" (PT 522). When talking about respiratory functioning after transplant she stated, "It's wonderful now, um... I can do anything now. There's no problems. I can walk, I can go up stairs, I can go up a hill without getting out of breath" (PT 522). In contrast, one man spoke about his joint pain being a negative side effect of his lung transplant:

> Before my transplant, we'll just say five years before, other than breathing, I didn't have any problems doing anything. I took a lot of steroids when I was tracking down [health was declining] and coming up to transplant, and ever since transplant, well, they've eat [damaged] my joints up so there's a lot of pain in my

> hips and knees. I've actually fractured my right hip since my transplant…I spent like six months on crutches…now it's a lot of joint pain. (PT 181)

Summary of Theme 1. The theme "Biological and Physiological Factors" included the subthemes of gender, infection, and transplant. In terms of gender differences in HRQoL, both men and women mentioned differences in fertility between men and women with CF as well as differing desires in terms of physical appearance. Men wished to be an "alpha male," while women were content with the slender appearance that often accompanies CF. In terms of infection, both men and women saw infection as a barrier to HRQoL due to the resultant decrease in lung function, and its negative impact on emotional health due to fear of the damage the infection would likely cause. Lastly, when discussing transplant, it was seen as both a facilitator and a barrier and was experienced similarly by men and women. While a lung transplant decreased the amount of time spent doing treatments and also increased energy level, steroids taken leading up to transplant and after transplant caused joint pain that was a barrier to HRQoL.

Theme 2: External Factors

Participants reported that external factors including the subthemes exposure to pathogens, financial stress, a holistic approach to healthcare, and support influenced how they perceived their HRQoL. Their perceptions of how each of these factors impacted HRQoL are illustrated below.

Exposure to pathogens. The subtheme of exposure to pathogens incorporated perceptions of how those with CF had to protect themselves as much as possible to avoid being exposed to illnesses carried by peers. This subtheme incorporated the code of being aware of surroundings to stay well.

Being aware of surroundings to stay well. Both men and women talked about how they have to be aware of their surroundings, take precautions, and explain the risks to peers in the hopes of avoiding exposure to pathogens. One man said, “It’s being cognizant of my surroundings and aware of people who are sick or if I’m out in public what I touch, keeping my hands clean” (PT 127). He also talked about educating others on the risks of pathogens to those who have CF when he stated, “You have to explain it to people and make sure they understand… like I can't be around people who are sick, and you have to make sure they understand” (PT 127). One woman also described her daily attempts to avoid exposure by explaining, “Living with CF it is different because…I have to do different things and have to stay away from people with cold and flu season coming in contact with them” (PT 522). In addition, one woman described her interactions with her son after he had been around other kids. She added, “I make sure I have my mask on and just be really careful about hand washing, and I make my son as soon as he comes home from school as soon as he walks in the door” (PT 522).

Financial stress. Financial stress was a subtheme brought up uniquely by men. The two corresponding codes included being stressed financially and insurance coverage affecting ability to work.

Being stressed financially. Two men described the stress that CF has caused them and their families financially related to hospital admissions and prescribed medications. One man shared his recurring stress whenever he was admitted to the hospital:

> Having CF and not feeling well is not fun, but to me the hardest part of it is financially and insurance. An admission can cost 50 to 70,000 dollars per admission…we've talked about how much medication can be, and so that can be a worry. To me that is the most stressful part of it. 'Cause it's expensive. (PT 131)

Another man spoke about how CF not only brought the stress of expenses but also rendered him unable to work full-time to help his wife pay for those additional expenses. He specifically described his stress related to acquiring insulin for his CF-related diabetes. "Where I have picked up a big expense in the past six months is with insulin to control my blood sugar. There is no help for that. I spent countless, countless days and phone calls looking for assistance here, there, and everywhere" (PT 169). He then described his stress of not being able to work as much as he wanted because of his CF: "Being unable to work what we consider full-time hours and full-time pay. And be able to match what my wife provides. And give us a little bit better comfort, cushion, from one bill, one month, one pay day to another" (PT 169).

Insurance coverage affecting ability to work. Two men also talked about how they were physically able to work but could not because being employed would cause them to lose their government-provided assistance related to health insurance coverage and other benefits. The loss of insurance coverage and benefits would leave them unable to pay for their needed medications, clinic visits, etc. One man explained how he was "caught" between insurance coverage and his ability to work: "I feel better and somebody might say, well, you could go back to work. The insurance that I have, because I am disabled, is paying for the medicine that is keeping me viable" (PT 150). Another man also expressed his difficulties with having to limit his hours at work. He noted, "In order to keep benefits I receive, I have an income limitation. That I…have to abide by" (PT 169).

Holistic approach to healthcare. The subtheme holistic approach to healthcare had five corresponding codes including benefitting from new therapies, having side effects from new therapies, placing importance on relationship with healthcare providers, taking medications to improve HRQoL, and treating CF holistically.

Benefitting from new therapies. Many of the participants said that their health was more stable because of the new medications, namely ivacaftor (Kalydeco) and ivacaftor/lumacaftor (Orkambi), that improve the chloride channel dysfunction associated with CF. Participants described how the new CF targeted therapies improved their lung function, weight, and diabetes control.

One man shared, "I feel like it [ivacaftor/lumacaftor (Orkambi)] has helped me stabilize my lung function…and my lung function has gone up a few points since I've started it. But mostly, I don't think I've been in the hospital in three or four years now" (PT 104). Another man also had the same experience and linked it to improvements in his HRQoL by saying, "Just general quality of life and I feel better, I get sick less, and my lung function went up about 10 percent" (PT 127). A woman also described the positive impact ivacaftor (Kalydeco) had on her HRQoL: "It was two months after I had been on Kalydeco, my lung function increased 20 percent…it's [Kalydeco] definitely a positive impact on my life" (PT 570).

Both men and women expressed feeling like their health is more stable because of the new medications. One man stated, "Orkambi sort of turned the clock back for me," and went on to add that taking it made him feel 10 years younger (PT 150). A woman credited one of the new drugs with keeping her stable in her 20s. She said, “Doctors have said, ‘You can see more of a decline in your twenties.’ I’m in my mid-twenties now and I’ve been lucky that it [FEV_1] stayed where it is. I think part of that could be attributed to Orkambi” (PT 569). Two women directly linked the drugs to decreased frequency of hospital admissions. One participant shared, “I haven't been in the hospital for two years because [of] that medicine” (PT 526). Another woman stated, “Before I started taking it, I was in the hospital once every six months, and I've just gone a year out of the hospital” (PT 529). A man depicted a similar experience and said that he felt like his health was kept stable leading up to his lung transplant because of Kalydeco. He stated:

> I started taking it [Kalydeco] before my transplant; I didn't get any worse, but I didn't get any better either. It [Kalydeco] just kept me leveled me off…because it was looking like I wasn't going to make it until transplant and I feel like the Kalydeco helped sustain me enough to get me to that point. (PT 181)

Two men spoke about how being on ivacaftor/lumacaftor (Orkambi) has allowed them to gain and maintain weight. One man observed, “The weight was obvious [side effect of Orkambi] and that’s helpful… [I’m] pretty much achieving my target [weight]” (PT 131). Furthermore, another man spoke of his experience: “I sustain my weight better. I don't feel like I am in survival mode all the time. I think just the fact that Orkambi has helped me retain more, it’s helped [keep] my body [from] just desperately wanting food all the time” (PT 133). Lastly, one woman stated that Orkambi allowed her to get off of insulin completely and added, “Now I’m completely off it [insulin]. And I’ve been off of it for a few years now” (PT 562).

Having side effects from new therapies. In contrast to the benefits that help improve their HRQoL, many participants also experienced negative side effects from the new therapies. Some of the side effects included shortness of breath or tightness in their chest, digestive issues, and a temporary flu-like illness. One man had to temporarily stop taking his medication because of the chest tightness: “I was talking to my doctors. I stopped it [ivacaftor/lumacaftor (Orkambi)] for a couple of weeks because I was having a significant amount of shortness of breath” (PT 109). Another man who did not stop taking ivacaftor/lumacaftor (Orkambi) expressed his frustration with the medication in the first few weeks: “After the first few doses, I experienced tightness in my chest like I had never experienced before. That first weekend I was on it [ivacaftor/lumacaftor (Orkambi)], I would have been fine to have thrown it [ivacaftor/lumacaftor (Orkambi)] out in the woods” (PT 169).

Furthermore, one participant discussed having to adjust other medications to compensate for digestive side effects associated with ivacaftor/lumacaftor (Orkambi): “I had some stomach issues (from Orkambi), some digestive issues which were remedied by doubling the dosage of my antacid” (PT 127). Another man added that he experienced both the flu-like illness and the digestive symptoms: “It was like fatigue, tired, my nose was running, my stomach was a wreck and I felt pretty weak...but after the first two weeks that all went away” (PT 129). A woman also described all of the expressed side effects when she said, “I experienced a week of almost like flu-like symptoms. Also, I had difficulty breathing. Also, I’ve been on a proton pump inhibitor medication [for acid reflux] that was kind of ineffective” (PT 569). Each participant experienced a different combination of side effects.

Placing importance on relationship with healthcare providers. Relationships with healthcare providers influenced participants' feelings about their experience with CF. Three participants expressed the positive impact healthcare providers have had on them. One man spoke about the importance of seeing the same providers to establish a rapport.

> I really am trying to get really close to my CF team. I enjoy seeing somewhat the same people. If they bring in a new person, I don't need to be just solely saw by that person because these are very personal things. You are digging into my soul, and I'm not gonna tell you how I am doing if I'm not gonna trust you to do something good with that information. (PT 150)

Two women characterized their healthcare providers as a positive aspect of having CF. One commented on "how nice and kind that the doctors and nurses that I have had interactions with [are]. The nurses, they just became like family… and the doctors. It's [CF] been a roller coaster but it's [CF] had good aspects too" (PT 535). Another woman explained using her care team as a resource: "It's important that you have a good relationship with your doctors and nurses because they understand. I just think using them as a resource is important in maintaining just overall quality of health" (PT 536). Conversely, one man expressed that he did not have a close relationship with his healthcare team and that his negative experience affected his mental health. He shared: "I can't wear myself out with [what] people think. I don't have energy for it. [People] being my doctors and nurses. It is a hate [for what care providers think] that causes probably more mental damage than anyone will ever know" (PT 133).

Taking medications to improve HRQoL. When asked about items or behaviors that help improve their HRQoL, many participants listed their prescribed medications first. One man observed that his medications “have made life much easier” (PT 173). Another man also listed medical technology and how far healthcare has come in his lifetime. He added, “Definitely the medications I would say are the number one thing [that improves HRQoL], the medications and the medical technology” (PT 127).

Treating CF holistically. One man felt it was important to add to his interview that there was a need for a holistic approach to healthcare:

> We [people who have CF as well as healthcare providers] have to treat CF holistically. I think we have to treat the wellness [by trying to] keeping you well. We obviously treat you when you are sick. I think that there’s an emotional [need]. Do we need to go see psychologists or be counseled? Yes, if we need it because I have and it helps. (PT 150)

Support. Sources of support for those with CF that helped improve their HRQoL included other people with CF, siblings who also had CF, friends, and family.

Finding support from others with CF. Six participants discussed receiving support from others with CF in various ways, including sharing experiences and opinions that those without CF would not understand. In speaking about how only those with CF truly understand the struggles associated with CF, one man said:

> I do think it is important to share people's experiences [with CF] because maybe how I handle one aspect of my life helps one person get through similar aspects of their life. One [girl with CF] from my high school, she has gone through a lung transplant so that is someone I will lean on. (PT 104)

In addition, another man felt that it was important to have others who understand the struggles of CF and added, “The reality of living with a chronic illness, it’s definitely helpful to…have social support” (PT 109). Another participant also discussed how talking with others who had CF made him feel less alone. He explained, “It’s a weird reassurance in life through knowing that other people are suffering” (PT 133).

In terms of using CF as a platform to help others, one man described helping others who were experiencing depression related to CF: “I'll always try to share with them [others who have CF] and, you know, let them know, hey man, all you got to do is just stay positive” (PT 137). A woman also said she used CF as an outlet to talk to parents of children who were newly diagnosed in order to give them hope. She explained:

> It's helpful for some families to look and see: oh, she's [the participant] had three kids and she's 32 and she's still walking around. I think I am helping more…encouraging other families. (PT 538)

Another woman echoed these sentiments about helping others with CF: “I have been able to talk to younger girls who have CF and [tell them] how they can deal with it [CF], especially with the social aspect and boyfriends” (PT 526).

Having a sibling with CF for support. Participants who had siblings with CF described their sibling’s support being helpful to them when they had a question, unique symptom, or just needed someone. One man shared, “Both of my siblings have CF…if I had to be honest, it’s probably a good thing ’cause [I can] get feedback [on] how other people are feeling or going through the same thing [that I am]” (PT 114). One woman received support from her brother: “My older brother has CF as well. So, if I have questions about something, like a weird symptom, I’ll just text him or call him” (PT 542).

Conversely, one woman expressed that it was difficult to relate to her sibling with CF by saying, “Hers [her sibling’s CF] is totally different than mine. She is six years younger than me and she has never been in the hospital. Hers [her sibling’s CF] is total opposite, but when something comes up…we'll talk about it” (PT 510). Interestingly, another woman felt that having a sibling with CF prevented her from having to interact with other people with CF by saying, “I don't really interact with ’em [others with CF]. I've got a sister and she has it [CF], so that's the only one [person who has CF] I really interact with” (PT 510).

Having a support system. Having a support system was reported as having a positive impact on HRQoL. Participants indicated parents, spouses, kids, and friends as their biggest sources of motivation to be compliant with their treatments and get through CF on a day-to-day basis. One man depicted his support system by saying, “The good aspect of it [CF] is [that] the family and friends you have…you are extremely close with because they are in it [CF journey] with you. I mean that’s a huge part at least for me to stay motivated to do my treatments every day” (PT 104). Also, participants attributed their health to their parents instilling compliance into their routine at a young age. One man added, “I [am] blessed with really good parents who taught me from a very young age that your health was one of the most important things in life” (PT 127). In addition, both men and women spoke about support and motivation from their spouses and children. One woman said, “I need someone like my husband is very much of an ‘okay-you-had-your-pity-party-let's-get-up-let's-do-something-about-it [personality]’” (PT 526). One man mentioned his daughter and added, “My wife is my biggest source of support. My daughter is my biggest source of...motivation” (PT 144). Another participant mentioned that taking care of his child motivated him to be compliant and that some of his friends with CF had similar experiences. He said:

> I’ve observed some other guys that have CF…once they had a child…their health improved because there was somebody else in their life that was totally reliant on them. It takes strength, energy, and help to do it all so [that] you can take better care of yourself. I think that really motivates me. I draw strength from all those people [wife and children]. (PT 150)

A woman also shared that her family supports her emotionally and helps her with her CF-related treatment regimen to decrease her treatment burden:

> I have a very strong support system; my husband, we've been together since we were like 14. My mom is a nurse and so she has really taught me the importance of caring for myself and making sure that I know about my disease…[and] also how to take care of myself. My dad would do anything for me. They actually still boil my nebulizers for my aerosols and they do that for me when I need it. Then my in-laws, they are always willing to do whatever I need. I could not ask for a better support system. (PT 536)

Summary of Theme 2. The theme of “External Factors” was made up of the following subthemes: exposure to pathogens, financial stress, holistic approach to healthcare, and support. Both men and women felt that they had to be cognizant of their environment to avoid exposure to harmful pathogens. Also, financial stress was a subtheme that was only mentioned by men. Their stress stemmed from the expenses related to their care, coupled with their inability to be the provider for their families. For the subtheme of holistic approach to healthcare, new therapies were seen by men and women as both a facilitator and a barrier due to experiencing both side effects and benefits. The side effect of weight gain was seen as a facilitator by men and as a barrier by women. Holistic care, encompassing physical and mental healthcare and good relationships with healthcare providers, had a positive impact on HRQoL. Lastly, support was seen as a facilitator by both men and women and came from various sources such as others with CF, siblings with CF, friends, family, spouses, and children. Support was believed to positively affect emotional health and provide motivation to adhere to treatment regimens and medications.

Theme 3: Functional Status

"Functional Status" was an overarching theme that included the subthemes of physical functioning, role functioning, and social functioning and helped illustrate how these various types of daily functioning were impacted by having CF.

Physical functioning. The subtheme of physical functioning comprised seven codes. These included being on oxygen affecting HRQoL, exercise to improve HRQoL, having physical limitations due to CF, inability to tolerate weather conditions, using available resources to improve physical functioning, using exercise to improve physical limitations due to CF, and using proper diet to improve physical functioning.

Being on oxygen affecting HRQoL. Two women who were on oxygen talked about the negative impact it had on their HRQoL. One woman explained, "Before the transplant it was really hard. I had to carry the oxygen tank on my back…I could barely walk 600 feet without taking a breath and stopping to huff and puff" (PT 522). In addition to the physical limitation, another woman depicted the negative impact oxygen had on her social life. She stated:

> Not being able to do what everybody else does… just simple things like going to school. I can't [go to school] because my body can't hold out. I can't walk very far without being out of breath or coughing really hard. (PT 565)

Exercise to improve HRQoL. Both men and women spoke about how they used exercise as a facilitator to improve their HRQoL. One man depicted the difference exercise made in his HRQoL by saying, "I'm not actually great at [exercising]. When I do, I can tell it [exercise] does help me feel better" (PT 109). A woman echoed his statement, adding how much it helped her lungs. She said, "I have slacked up on [exercising] and didn't really realize how it helped my breathing functions" (PT 535). Another woman explained how she forced herself to walk more by moving to a convenient location. She said that she was "fortunate to find an apartment where I can pretty much walk to campus and to walk anywhere I want to go. I can tell how my quality of life and my energy level has increased" (PT 569).

Having physical limitations due to CF. Instances where participants felt that they had physical limitations caused by CF included using stairs, the increase in physical limitations as they aged, when they were trying to work or have a social life, in instances surrounding a lung transplant, and lastly, when they were sick.

A man spoke about the difficulty of going up stairs: "I use the stairs from the second floor to the sixth floor. I [get] winded [breathless] going up that many steps and have to stop and rest" (PT 114). Another man mentioned that stairs were his main physical limitation by adding that stairs were his "bugaboo" right now (PT 144). Participants also felt that physical limitations increased as they got older. One man depicted his inability to play soccer anymore: "Running, I can't do really at all. I used to play soccer… when I got older [I] couldn't do that anymore. That can be pretty frustrating ’cause even jogging I have to stop and cough every 30 yards” (PT 131). Another man also mentioned that his physical functioning had “gotten a little worse over the years as I’ve gotten older” (PT 151).

The physical limitations of CF also negatively impacted participants in terms of their social lives with their friends and in their jobs. One man depicted a trip to the mall with his girlfriend: “There have been days we [he and his girlfriend] decided to go [shopping] and five minutes into the trip I'm more than ready to go home and sit down” (PT 173). Another man spoke about his inability to function physically in his job, which forced him to quit. He said, “It [physical functioning] is very limited. That’s one reason I quit working even though I was doing IT [information technology] work. I worked at a university and we [walked] from office building to office building” (PT 150).

Two women spoke about their inability to function physically due to being on oxygen leading up to transplant. One woman explained, “Before transplant I had to carry the oxygen tank on my back.... I could barely walk” (PT 522). Another woman echoed her experiences, adding, “I can’t do stairs,” and “Physical activities [are] very slim” (PT 565).

Two women also said that their physical functioning dropped when they were getting sick. One woman said, “Unless my lung functions drop…that as in one of my indicators…if I get out of breath, then I need to call [her doctors] and go in [for a hospital admission]” (PT 536). Another woman also noted that, “It’s just when I’m sick, I’m not able to do what I want to do” (PT 565).

Inability to tolerate weather conditions. Men and women both spoke about how extreme heat and cold made it more difficult to breathe when outside and how the weather affected their outside activities. One man spoke about not being able to go on a walk in hot weather. “Summer in Mississippi isn't the best time to walk, but when the weather gets better I try to do more walking” (PT 104). In addition, the weather conditions also impacted another man’s ability to walk long distances to his college classes: “Walking to class when it’s really hot…I can like really feel it [in his lungs]” (PT 129). A woman commented on the negative impact of hot, humid weather on her lungs and physical functioning: “My lungs were heavier and the air was really heavy, and I had a hard time breathing. [Then,] I had a hard time breathing in class and it’s...tiring and exhausting to try to walk on those days” (PT 529). Another woman spoke about how difficult it was for her to go outside in extreme heat by adding, “The couple [of] most hot, humid months of the year…I barely left the house. Usually, I’m a pretty active person. And I just would stay in the air conditioning because it [the air] gets so heavy. It’s just hard to breathe” (PT 542).

Using available resources to improve physical functioning. Specific resources identified to help improve physical functioning included disabilities services, working with an occupational therapist, and just allowing more time for moving at a slower pace. One man described his experience at a large convention, where he received a “sit in line sticker” for the benefit of not walking long distances and standing in “line for an hour to get into a certain event that might involve going outside and walking around the block” (PT 109). Another man went to an occupational therapist who helped him with breathing techniques. He added, “It has helped me just in my every day [life]. I don’t feel as tired using the breathing techniques" (PT 114). A woman shared that she preferred to simply "leave earlier to do something or take it [activities] a little slower" (PT 535).

Using exercise to improve physical limitations due to CF. Participants portrayed exercise as a major factor in keeping their physical limitations to a minimum. One man said that the gym was "the biggest thing" for him in terms of staying active (PT 151). One woman talked about how it took some time for her to believe that exercise would help her physical functioning. She explained that she thought working out was a "bunch of bologna." She then added that her healthcare providers "were telling me I need to exercise my lungs, but now that I've done that and been on Orkambi, I haven't been in the hospital for two years" (PT 526).

Using proper diet to improve physical functioning. Men also discussed how proper nutrition helped them stay active. One man said, "I know I need extra food to …getting enough energy and nutrition for weight lifting and stuff' (PT 104). Another man also said that it was important to have food and liquids on hand when he worked out to help him have the proper energy. He explained, "I always have some protein bars or something like that in case I am getting low blood sugar and low energy. And [I] make sure and stay hydrated or keep some salt or electrolyte supplements" (PT 109).

Role functioning. The subtheme of role functioning included the effects of CF on how participants functioned in their roles as friend, spouse, significant other, employee, etc. Codes within the subtheme of role functioning included being hospitalized affecting HRQoL, prescribed treatment regimen affecting role as a friend, and working or job affecting HRQoL.

Being hospitalized affecting HRQoL. Many participants characterized hospitalization as a barrier to HRQoL. Reasons included missing out on work, missing family, and hospitalization having a negative effect on their emotional state. One man talked about being depressed when he had to be away. “It’s depressing when I know I have to go be in the hospital. Not because [I have to] be in the hospital, it is just having to be away from family” (PT 114). Another man talked about how he missed important moments with his daughter: “My little girl is 16 months old, so [when] you’re in the hospital for two weeks you miss milestones” (PT 114).

One woman depicted the negative impact hospitalization had on emotional state: “It's an emotional thing when you are sick in the hospital, and when you're doing medicine and not getting better. You can have emotional outbursts” (PT 510). Another woman described her experience with depression when she was hospitalized and added that she “went through a huge depression phase when I was hospitalized back-to-back” (PT 548). She reflected, “I was in college and kind of excluded from my group of friends, because I was in a sorority. I had to leave that and I was trying to student teach because I’m into education. And I couldn’t really student teach” (PT 548). Another woman talked about the consequences hospitalization had on her ability to work, saying, “I'm a school teacher so trying to prepare and think…okay [the] next two weeks…what's going to happen with my students if I have to be admitted” (PT 536).

Prescribed treatment regimen affecting role as a friend. Participants felt that their treatment regimen rendered them unable to fulfill their role as a friend at times. One woman felt that CF made her unable to be a good friend to others:

> I feel like friendship-wise, I am not the best friend that I could be. Partly because I am not always involved because I do have to spend a lot of my time committed to doing my daily treatments. And, because I do those at night, I’m not really out [with friends] all the time. (PT 548)

A man echoed her feelings when he described participating in his friends’ weddings: “Doing it [treatments] in the evening…I'm at the age where everyone is getting married. It [making time for treatments] interferes with weddings [or] other social events” (PT 104).

Working or job affecting HRQoL. Many participants felt like having a job improved their quality of life and gave them purpose. One man explained, “Having a job is a big thing. I do get a little purpose and also something to do” (PT 104). Another man said that having a job made him feel normal: “I enjoy going to work and being productive and feeling like I'm somewhat a normal person…as much as I can be” (PT 169). A woman also mentioned her job when asked what helped improve her HRQoL: “Well, I have a job that I like. I have my dream job” (PT 554).

Social functioning. This subtheme depicts how having CF impacts participants’ ability to function in social settings. Codes within this subtheme included having CF affecting social life and/or work, difficulty traveling due to CF, digestive symptoms affecting social life, getting negative reactions from others about CF, and seeing negative comments on social media.

Having CF affecting social life and/or work. Participants shared that they were self-conscious about certain aspects of having CF and how that was a barrier to their ability to function in social settings. One man said, “When you are younger, like high school, college, you don’t want to pull out a pill bottle and take it in a large setting of people” (PT 104). Another man talked about being embarrassed in social settings at times: “The worst part is coughing all the time. At restaurants, people think I'm choking…some of it is people out of concern, and others are concerned about themselves and think that I’m out sick and could be infecting them” (PT 131).

Another woman described being self-conscious about taking medications in front of friends and shared, “Things like birthday parties…I would be hesitant to take my enzymes. One time I didn’t [take enzymes] and ate birthday cake, and I was sick as a dog for a day” (PT 569). Two participants also expressed being caught between doing their treatments and doing the things they felt they needed to do in order to have a social life. One man said:

> I would say [the hardest part about CF is] getting all your treatments in and doing what you have to do to live a successful life. Because in college you need to be involved in all this stuff to build your resume. At the same time, you have to fit in your treatments and your medicines. (PT 129)

One woman called having treatments and a social life “a catch 22” because she wouldn’t feel well enough to do anything if she did not do her treatments (PT 529). Another woman explained that at times she had to choose between her social life and her medications, adding, “I catch myself sometime at night—I wish I could go do this with my friends right now. But, I have to stop and realize: Oh, I have to stop and take my medicine before I go” (PT 570).

Difficulty traveling due to CF. Participants described difficulty traveling that stemmed from having to take their medications and equipment needed to do their CF-related treatments. One man noted:

> I used to love traveling, but now I just I really don't look forward to it because of all the stuff I have to prepare and take. Plus, if I'm flying, I have to get out all the machines and medications to get through airport security. (PT 104)

Another man explained that it was hard for him to plan to travel internationally with his wife and children: "It is hard for me to commit to future plans because my kids and wife, they want to go. [But] it takes a lot of effort to load up everything I need to stay well and transport it to another location" (PT 150). Another woman spoke about not being able to pack as much as she wanted because of her equipment:

> You have to take two shirts, two pants, and two suitcases full of medication that has to be refrigerated. If you're on Cayston [a particular inhaled antibiotic], you have to take a bottle sanitizer to sanitize it every day. It's best not to travel when you're on Cayston. (PT 554)

Digestive symptoms affecting social life. Both men and women expressed how restrictive digestive symptoms that accompany CF can be, whether they caused them to not eat on dates or just stay home and not go out at all. One man spoke about his dating experiences:

> If I was going to go out with a girl, I wouldn't eat, because I never knew how that food would act on my stomach. Wherever we went, I would get like a hamburger and eat half of it and make it look like [I] ate earlier, 'cause if I ate a bunch of food, I would have diarrhea at some point in the next few hours. (PT 150)

Others would stay at home when they were experiencing digestive symptoms. One man explained, “If it's one of the worse days, I usually don't want to do anything ’cause the pain can get intense at times. If there's anything I needed to do or had planned to do, it's usually cancelled or put off [delayed]” (PT 181). A woman mirrored his experience and added, “It can cause me to feel tied to the bathroom on days I'm not feeling well. It's kind of restrictive” (PT 538).

Getting negative reactions from others about CF. Two forms of negative reactions were mentioned, separation and being labeled. One man spoke about older adults separating themselves from him because he had CF:

> As a kid, a lot of older adults would be a little bit stand-offish. I had a counseling session because it really bothered me…especially from grandparents and the pastor. The counselor said that it’s like…if you have an animal that gets sick and you're going to have to put it down, there’s something within our human nature that begins to separate. I experienced that [emotional separation] a lot as a child. (PT 150)

A woman had a similar experience with her friends. She added, “Sometimes people leave…when they realize there's this [CF], they just leave. That's definitely difficult on a social and emotional level” (PT 529). Another woman experienced how CF affected her dating life when her boyfriend’s mom had a hard time accepting her in fear that her son would get hurt. She said:

“His mom looked at me and she said, ‘So you're the girl with CF, right?’ I was like, ‘Well, no, actually my name is [participant name].’ She was like, ‘Oh yeah, but you have CF, and I read some things about it, and do you know that you can die from that?'" (PT 526).

Lastly, one man felt labeled with CF by the mother of another student, who began asking other parents about CF. He stated, "The next thing I know, instead of, he's a good basketball player, baseball player, anything like that, it was oh, he's got cystic fibrosis. That was the first thing they brought up" (PT 174).

Seeing negative comments on social media. Multiple participants felt that social media had a negative effect on their HRQoL. One woman said, "If you're depressed, your health can go down...I feel like it's a fine balance with social media if you find the right page, because there's a page out there that's not good for CF patients" (PT 526). Another woman had a similar perception of social media:

> You're looking at what's going to inevitably happen to you. Some people on there are working to get a transplant or [have] end-stage lung disease, and there's a part of me that's like, oh, that will be me in 10 years or however long, which can be depressing. (PT 529)

Another woman ultimately decided not to look at social media due to negativity. She explained, "I deleted all my CF stuff off Facebook because a lot of people were very negative. I got tired of seeing everybody's negativity towards it [CF]" (PT 547).

Summary of Theme 3. The theme "Functional Status" comprised three subthemes: physical functioning, role functioning, and social functioning. In terms of physical functioning, being on oxygen was seen as a barrier to HRQoL, while exercise was described as a facilitator. In addition, decreased physical functioning affected participants' jobs and social life. In terms of facilitators to improve HRQoL, men more commonly mentioned seeking available resources, while women expressed going out of their way to not feel "different" or like they had a disability.

In terms of role functioning, being hospitalized was seen as a barrier to fulfilling roles as a friend, parent, professional, etc., by both men and women. Being a parent and having a job were both seen as facilitators by men and women because they felt that both roles gave them motivation and purpose. Coughing, taking enzymes, and prescribed treatment regimen were all expressed as barriers to going to social events. Also, difficulty traveling was seen as a barrier because of the amount of medication and equipment that had to be packed. Digestive symptoms were also a barrier in social situations such as dates and birthday parties. Lastly, women were the only ones to bring up negative comments on social media as being a barrier to HRQoL due to effect on mental health.

Theme 4: Perceptions of Preferences, Values, and Mental Health

"Perceptions of Preferences, Values, and Mental Health" was an overarching theme that included the subthemes of mental health and personal preferences and values. This theme illustrated how mental health and personal perceptions affected the participants' HRQoL.

Mental health. The subtheme of mental health included seven codes. These codes included feeling isolated from others with CF, having a destructive mentality, having a negative perspective, having a positive perspective, portraying the burden of CF, striving to have a normal life with CF, and uncertainty of the future.

Feeling isolated from others with CF. Participants shared how they wished they could interact more with others who had CF and how the cross-contamination issue was conveyed to them at such a young age that many other people with CF refused to interact them. One man described, “They [care providers] beat it [potential for cross-contamination] into us to stay away from each other. As long I don't cough in your face and shake your hand, can we not just sit here and there and talk…sad” (PT 150). He later went on to add that CF “can be a very lonely disease” (PT 150). Others shared that their parents kept them from others with CF. One man said, “She [mom] didn't want me being around them [others with CF] and looking at them and saying, you know, that may be what happens to me later on in life” (PT 174). A woman had a similar experience with her parents. She stated, “I was shielded when I was little because my parents never wanted me to interact with other people with CF” (PT 548). Despite the past, one woman wished she could interact more with others who have CF. She added, “Building relationships with people who do have CF…I wish I could talk to those people face-to-face and spend time with them” (PT 536).

Having a destructive mentality. Two men explained how they had a destructive mentality and that it was a barrier to their HRQoL. One man described how he would ignore getting sick to avoid missing events he had scheduled. He said, “There are times where I've been so angry that like I've physically told myself I wasn't sick just so I could do stuff. And then, I'm in the hospital.” (PT 133). Both men discussed having a fatalistic view that negatively impacted them mentally. One man expressed survivor’s guilt and added, “Now you are going hate yourself because you lived and your friends died. I don't like hating myself at all” (PT 133). Another man spoke about his fatalistic mentality when looking at the future. “You'd hear someone…well, that happens later in life or 10 years down the road. I [thought], well, that’s not gone [going to] be me, so what do I care? That’s very destructive…your emotions and your mentality” (PT 150).

Having a negative perspective. One man discussed his negative perspective and how his mentality affected his actions. He recounted interactions with coworkers: “I say weird and insensitive things and don't apologize for it. There’s one thing CF teaches you…it’s amusing watching people get offended when their life isn't in jeopardy” (PT 133). He went on to explain how his mentality caused him to separate himself from others. “I am a horribly segmented person…I don't mix relationships with family, or school, or at work. I keep all these separate” (PT 133).

Having a positive perspective. Many participants described how having a positive mentality empowered them to push forward and had a positive impact on their HRQoL. One man talked about how his perspective helped him: “Just thinking about how good you have it [life] rather than how bad you have it [life]…just a different perspective and attitude makes me feel better” (PT 114). Another man spoke about how he put having CF into a positive perspective in order to have a positive influence on others:

> It’s positive for me because even though I'm sick, there's two trains of thought. You can look at it like this [CF] is something that is going to kill you, or you can look at it like it’s [CF] something that can make you keep going. I want to live life to the fullest and hopefully be some sort of source of hope for other people. (PT 114)

Additionally, a man described how a positive outlook influenced all other aspects of his life, adding, “In my 28 years, I believe…what you think about predominantly determines how you feel…how happy or sad you are, your general positivity or negativity, and outlook on life” (PT 131). Another man had a similar thought, commenting that “life is just a matter of perspective” and “the number one thing that has an effect on my quality of life is what I choose to believe and how I choose to think" (PT 131). A woman mirrored how important a positive perspective was by sharing, "I feel like having a positive attitude and not going into CF with a negative attitude really helps [improve HRQoL]" (PT 526).

Also, participants used their positive perspective on various aspects of CF to empower them. One woman said, "The severity of the challenges and overcoming them—they're empowering. I try to look more on the positive side of living with CF" (PT 569). Another woman said, "I think it [CF] gives me determination to do more things. Since I do have lung disease, I want to see myself go far, I want to be very successful, and say that I didn't let CF get in my way" (PT 570).

Portraying the burden of CF. Participants portrayed the constant burden of CF and how each addition to their treatment routine increases the burden. One man stated, "When new stuff comes around with CF, sometimes it's kind of a blow [difficult] to deal with" (PT 173). Another man illustrated the cumulative burden of CF with an analogy:

> The backpack [CF], you never take it off. Now, the brick is what you have to do [treatment burden] with CF. You put one brick [in the backpack] for having to take all the medicine, you put in a brick for the lung infection which drives up the blood sugar…you put another brick [in the backpack]. Eventually, you reach a point where it's no longer a backpack, but it's an entire load of bricks on your back. That's CF, and eventually that [CF] will just drive you into the ground. (PT 150)

A woman also talked about the daily burden and how it was heavier some days than others. She said, “Some days you’re sitting in a chair, on oxygen, just trying to get through the day” (PT 565).

Striving to have a normal life with CF. Many people described how striving to live a “normal” life helped improve their HRQoL. One man added how he “wanted to strive to have as normal a life with CF as possible” (PT 150). A woman felt that being “normal” contributed to a positive HRQoL when she said, “Normal stuff makes me feel good and have a good quality of life” (PT 554). In contrast, participants also spoke about how they did not like when people did not treat them normally. One participant noted, “I don’t want people to know that I have CF just because I don’t want them to treat me differently” (PT 565).

Uncertainty of the future. Participants shared how the uncertainty of their health and lifespan took an emotional toll on them. One man said, *“*Uncertainty…once you get one specific infection in your lung, your lung function will decrease rapidly. Not knowing when that could happen…probably the biggest emotional toll [is] just uncertainty of how to plan for the future” (PT 104). A woman also discussed how uncertainty impacted her: “Just the not knowing when I am going to get sick…worrying because you have your ups and downs [with health]. Not seeing improvement, sometimes that’s the hardest” (PT 510). One man remarked that he also had uncertainty about his lifespan and how that may impact his family. He stated, “Most people don’t sit there and think, wow, I hope I outlive my parents so they don’t go through losing their child” (PT 109). One man wanted to prepare for the time when his health got worse. He added, “I worry about the future and try to plan and make preparations for the inevitable time when my health is not as good as it is right now” (PT 127).

Personal preferences and values. The subtheme of personal preferences and values depicted how characteristics of a person shape how they view their HRQoL. This subtheme included 12 codes including being disciplined to be active, being disciplined to complete all prescribed therapies, being open with others about CF, coping with spirituality or religion, finding hope in new research or therapies, hoping to have or having a family despite CF, improving diet, making treatment time a positive time, not being disciplined to complete prescribed therapies in early adulthood, not letting CF define them as a person, realizing the impact of reproductive issues associated with CF, and viewing CF as a blessing.

Being disciplined to be active. Participants said that being disciplined to stay active helped their health and their HRQoL. One man explained:

> It’s [being active] a basic daily thing that I have to do. Period…like keeping track of stuff, checking how I’m breathing, knowing how, when, and if it [CF] is affecting certain things. I work on computers, so I'll do jumping jacks after an hour and a half of being on the computer. (PT 133)

Another man added that even when he was hospitalized he remained disciplined to get in some type of physical activity. He shared, “Even in the hospital, I was walking at least 4 miles per day” (PT 131).

Being disciplined to complete all prescribed therapies. Participants attributed their discipline to complete their treatment regimen to wanting to maintain their health. One man described why maintaining health was so important: “CF is an accumulative disease. The less you do, less of that corrective [treatment regimen] you do, the worse things get. That’s where discipline comes in. CF is not a good disease to have if you are lazy” (PT 150). A woman shared her outlook on why she was disciplined to complete her treatments: “I’m to the point where every little bit of my health that I have is precious and I don’t want to jeopardize that over just not wanting to do my stuff [treatment regimen]” (PT 565). Another woman talked about how she dealt with times when she was non-compliant. “I think just having that self-awareness and checking in with yourself to make sure that you’re doing the best things you can for yourself, which with CF means doing your treatments every day” (PT 569).

Being open with others about CF. Telling others about having CF was portrayed as being a facilitator to a positive HRQoL. One man described how telling others about CF helped him cope with having CF: “Being open about that [CF] and not trying to hide that part of my life from my friends and loved ones is important, and I think has been a positive coping mechanism” (PT 109). Another man felt that being open helped promote acceptance and understanding when dealing with colleagues. He explained when he first told his coworkers about CF, “I was like, ‘You [co-workers] are gonna hear me cough. I'm not sick, I just cough a lot and here’s why [CF].’ I said, ‘I want everybody to know so that when I do cough, I'm fine. No problem’” (PT 137). One man also described how he learned to be more open so that his friends would give him grace. He said, “I left high school and moved away, trying to move away from CF…where nobody knew I had it. They treated me like I didn't have it, but then when I didn't feel good, people didn't give you any grace” (PT 150). A woman spoke about coming to terms with being more open in order to receive the grace she needed. “I don’t want people to give me any kind of special treatment because of it [CF]. And coming to terms with: well, it's not special treatment. It's just what you need to do the best that you can" (PT 569). Another woman also spoke about not wanting to feel different by saying that she did not want "people to look at it [CF] as a disability" (PT 536).

Coping with spirituality or religion. Spirituality and religion were portrayed as promoting a positive mindset while also giving participants peace. One man noted, "I am involved in my church, I am a youth pastor. All of that [church activities] keeps me positive" (PT 114). Another man also described the positive change that religion/spirituality made in his mindset: "When my mindset changed from a me-centered to what I would call a more Godly worldview...then, I was like, well, it's hard to love others if you feel bad because you're not taking care of yourself" (PT 150). One woman talked about how her faith in God gave her peace: "I think just the reality that I may not live as long as a normal person. It has always been tough for me emotionally. But, my faith in God has gotten stronger so that [length of life] has become less of a concern for me" (PT 151). Another woman also shared about how her faith helped her find peace and hope. She said, "I've had quite a few friends with CF that have just given up [on life] or didn't believe in God. That's [God] where I get my strength. When I'm having my bad days, I just pray" (PT 542).

Finding hope in new research or therapies. Participants also found hope in recent treatment developments. One woman stated, "I'm very hopeful for all of the drugs and treatments that are coming out and being developed. It's amazing. My mom always told me, growing up, that a cure [for CF] was probably going to be found within my lifetime" (PT 542). Another woman echoed her account by also speaking about how she has more hope now than she had in the past and added, “Just knowing that there is so much, you know, research and stuff that’s been done. There are a lot more treatments [for CF] out there. There’s a lot more hope than there once was” (PT 569).

Hoping to have or having a family despite CF. One man recounted his journey with his wife in conceiving his children through in vitro fertilization and how it gave them hope. He continued, “Hope to have a family, not just for the guys...there is one lady [with CF], she’s in her 30s, and they had their baby through a surrogate mom” (PT 150). One woman described how she knew growing up that getting pregnant would be difficult. “Growing up, thinking that I wasn’t even going to be a mom because they told me: ‘You have very slim chance of getting pregnant.’ And then, we got pregnant on the first month we tried, which was amazing” (PT 542). Also, a woman who was not yet a mother spoke about her dream of having a family in the future and how that dream motivated her to stay healthy: “I stay healthy because…I want to have a family, you know, the dream life of just having a family, a husband” (PT 570).

Improving diet. Participants identified improving diet as a facilitator to both improve HRQoL and also maintain it by avoiding other CF-related complications. One woman spoke of changing her diet to improve her digestive symptoms. She said, “Eating healthy is another huge thing for me. I have a sensitive stomach, so just being mindful of what I’m eating” (PT 569). Two men noted that they improved their diet because of the risks surrounding diabetes. One man stated, “My diet is a little better… I went on what they call a keto diet, and I have seen improvements in my blood sugar” (PT 150). Another man who had not yet developed CF-related diabetes changed his diet in hopes of avoiding it: “Most every [person with] CF has a tendency to develop diabetes. I'm not diabetic, but I try and keep that [tendency to develop diabetes] in mind with what I'm eating and drinking" (PT 131).

Making treatment time a positive time. Making the time spent doing treatments into positive or productive time was a facilitator to HRQoL. One man said:

> I always try to make [treatment time] efficient. I'll either do something fun, watch TV, or play video games…or I'll work on something for school or for work so that I'm not just sitting there doing nothing [during the treatment]. (PT 109)

A woman also felt making treatment time into a positive time improved her HRQoL, noting, "I try to find something productive to do during that [treatment] time [that] I may not have a chance to do the rest of the day. That's kind of helped" (PT 569).

Not being disciplined to complete prescribed therapies in early adulthood. Participants described going through a non-compliant phase as a young adult but outgrowing it once they realized the consequences non-compliance had on their health. One man said, "Even in college, I was not as good about taking the enzymes, which is not good to your stomach and that [digestive symptoms] can be very inconvenient" (PT 104). Another man also mentioned being non-compliant in college and said, "But that didn't work out well because [his health] did get worse skipping stuff" (PT 150). A woman mentioned a similar experience of quickly realizing the impact non-compliance had on her health, recalling, "Back when I was young, I went through a rebellious stage. I decided that I wasn't going to do them [treatments] because I felt they weren't helping me. I found out really quick that they do [help]" (PT 565).

Not letting CF define them as a person. Participants mentioned that CF was a part of them, but that they did not let it stop them from achieving their goals. One woman described her relationship with CF, saying, “I mean, I'm not CF, CF is just a part of me” (PT 510). Another woman echoed her statement: “It [CF] is a part of me, like a huge part of me. But it’s not who I am” (PT 542). Another woman explained how she did not let CF stop her. “I graduated college. I’m checking all these things off my list. I’ve had it [CF] the whole time I’ve accomplished all these things. It [CF] hasn’t slowed me down yet” (PT 542). Another woman viewed CF as an “eye-opener” and went on to say, “I want to see myself go far. I want to be very successful and say that I didn’t let CF get in my way” (PT 570).

Realizing the impact of reproductive issues associated with CF. Many experiences were discussed regarding the impact of reproductive issues, including finding out about potential infertility, struggles with infertility, and the impact of issues associated with pregnancy in the post-partum period. One man described how he felt hopeless after finding out that most men with CF were sterile and said, “I had the who's going to want to be with a guy that can't have children [mindset]…then it [the impact of sterility] got heavy” (PT 150). A woman also shared how she had always wanted to be a mom. She stated, “I’ve just always wanted to be a mom. That was like my top priority. So, it was really scary, being this woman with this genetic condition” (PT 542).

Prior to exploring options and ability to conceive, one man spoke about how it was a difficult time for him and his wife. “I haven't got tested to see where I'm at [with fertility] or what I can do [to conceive] or anything like that, so...me and my wife…right now, she wants one [a child] and I also do want a child of my own” (PT 174). Another man also spoke about the unknown state of his fertility: “Sometimes I think about what if I can't after we go through everything [fertility treatments]. I don't want to let her [his wife] down, but then again I know that it [fertility] is beyond my control" (PT 181). Conversely, one man described finding out that he would not be able to have children: "I officially found out that…me having children…that's not an option. That was difficult to deal with" (PT 173). Women also spoke about their journeys with infertility. One woman in the midst of her journey said:

> Lately me and my husband have had to walk through infertility…we've been trying to get pregnant for three years. You want to be a mother so bad, and then you have this one thing [CF] that's in your way. I'm strong minded. I'm like okay…I've been able to overcome all this stuff, and I still don't have a baby. (PT 526)

Two women who had already had children talked about their fertility difficulties and how it negatively affected them. One woman said:

> I also had a big problem getting pregnant the first time because of the extra cervical mucus and everything from my CF. That was a big struggle, just wanting to be a mother and not being able to be. It took me almost three years to have my first child with intervention [fertility treatments]. It was difficult to conceive, so emotionally that was really hard until we were able to conceive our first daughter. (PT 538)

After having children, one woman observed the toll her pregnancy had taken on her body: "I would say each of my pregnancies have kind of taken a little bit more [life] out of me. Now that I'm older and have three children, I'm starting to struggle a little bit more" (PT 538).

Viewing CF as a blessing. Most participants chose to view CF and its many challenges as a blessing and in a positive light. One woman summarized her struggles by saying, “In many ways I'm blessed because even though it [CF] has an ugly side, I've lost a sister, I've lost friends…it's [CF] not cancer. It's [CF] very treatable” (PT 169). One man discussed how he considered himself blessed and how that positively impacted how he lived his life, commenting, “I've seen plenty of CF patients who have died much younger than I am, so I take that as a blessing that I am still around. That encourages me to live life to the fullest and take nothing for granted” (PT 127). A woman also described how the challenges of CF have positively impacted her life: “Living with CF has kind of been a blessing too, just because it’s [CF] presented challenges that I’ve overcome and it’s made me a more resilient person” (PT 569).

Summary of Theme 4. The theme of perceptions of preferences, values and mental health had two subthemes: mental health and personal preferences and values. Feeling isolated from others who have CF because of the potential for cross-contamination, having a negative perspective and a destructive mentality were all mentioned as barriers to HRQoL in the area of mental health. Having a destructive mentality was reported as a barrier only by men. In addition, having a positive perspective was both a facilitator and a barrier identified by both men and women. Lastly, both men and women depicted the burden of CF and the uncertainty of the future as barriers to HRQoL.

Having the discipline to stay active and complete all prescribed treatments were seen as facilitators to HRQoL by men and women. In addition, being open with others about having CF and being spiritual and/or religious were also seen as facilitators to a better HRQoL. Furthermore, many participants had hope in new therapies for CF and to have a family. Some participants chose to improve their diet to facilitate a better HRQoL related to digestive symptoms and managing glucose levels. Making treatment time into a positive time and viewing CF as a blessing were also seen as facilitators by both men and women.

Theme 5: Perceived Symptom Status

The last theme, "Perceived Symptom Status," had two subthemes, which were emotional or psychological and physical. These subthemes helped illustrate how participants perceived both their emotional or psychological and physical symptoms associated with CF.

Emotional or psychological. This subtheme had six associated codes: experiencing anxiety and/or depression, implementing strategies to treat anxiety, having low energy linked to mentality, having mechanisms to improve mental or emotional health, playing video games having a negative impact on emotional status, and reading to improve emotional state.

Experiencing anxiety and/or depression. Participants reported anxiety surrounding clinic visits or getting sick, infection, and panic attacks. Bouts of depression were related to wanting to give up on life with CF or getting sick. In terms of clinic visits, one woman said, "I get anxiety going to the doctor. I never know what my pulmonary function tests are, so I can have a little anxiety" (PT 510). A man also shared that he had anxiety when he felt like he was getting sick. "I do sometimes have trouble with anxiety over what could go wrong [with his health] now…or a particular symptom that I am noticing that signals that there is something bad [pertaining to his health] going on" (PT

109). Similarly, another man experienced anxiety over getting a chronic lung infection and its impact on his life, “[With] this infection, I've got a lot of anxiety. I got a two-year-old daughter. I don't want to leave her…too early” (PT 144). One man talked about anxiety and panic attacks associated with moving away from home and said:

> As long as I was in my parents' house, it was the safe house. I was in college and one [panic attack] hit me, you feel like you are going to die. It was a 30-minute drive home. Made it in 20, and I got home and it [panic attack] stopped. I was fine. I was like, this is crazy, I am going nuts. (PT 150)

In terms of depression, one man described how, at times, he doesn’t want to fight CF anymore but uses his family to get through it:

> There’s times where, I think…I don't know if I can go on...and I just want to give up, but I have a family that motivates me, so I keep going. It’s easy to get down [depressed] having CF. (PT 151)

A woman described depression surrounding a hospitalization and stated, “I went through a huge depression phase when I was hospitalized back-to-back” (PT 548).

Implementing strategies to treat anxiety. Counseling, medication, meditation, and journaling were mentioned as facilitators to overcome anxiety. One man recounted an anxiety-inducing experience: “I had just suffered some post-traumatic stuff from becoming diabetic and was given way too much insulin. I had this long stretch of low blood sugars” (PT 150). When asked about what helped him overcome his anxiety, another man said, “I've done a little counseling, and I take medication” (PT 181). One woman used meditation and music to overcome her anxiety. “I just try to think and hold deep breaths. Hopefully, everything will be fine. I've had anxiety and like freaked out, and I just put my earphones in and music and blast the music, and it [music] gets you through" (PT 510). Another woman also mentioned meditation as well as journaling. She shared, "I do a lot of like journaling when I'm feeling anxious or depressed. I really believe in journaling…and clearing my mind with meditating and yoga" (PT 569).

Having low energy linked to mentality. Participants talked about how the link between physical and mental energy could be both a facilitator and a barrier to HRQoL. One man said, "Energy makes energy. If you get up groggy, you stay groggy that day. I think a lot of it [low energy] is mental" (PT 150). A woman spoke about having to balance her mental energy and how she often felt better mentally before she did physically:

> When I am sick I don't have much of either [mental or physical energy], but kind of in that recovery process…I may have a lot more mental energy, so I feel like: Oh, I'm ready to go…but physically I'm not to that point yet. You have to be mindful of that and balance mental and physical energy. (PT 569)

Having mechanisms to improve mental or emotional health. In order to improve and maintain emotional health, participants mentioned activities such as yoga, theatre, watching television, and outdoor activities such as walking or riding a motorcycle. One man listed multiple activities he found helpful:

> I have done a little bit of yoga...I'm involved with a cappella groups, so I have always enjoyed being involved with music and also theatre. I think [theatre] has been a good emotional benefit. (PT 109)

Two other participants preferred being outside to calm or improve their emotions. One man said, "I walk a lot, I spend time outdoors. I find that calming" (PT 144). Lastly, one woman preferred being outside and going on a motorcycle ride with her husband. "Sometimes my husband and I get up and take a motorcycle ride. Get away from things" (PT 535).

Playing video games having a negative impact on emotional status. Two men talked about how they felt that playing video games had a negative impact on HRQoL, both in terms of mental health and physical activity. One man discussed his experience: "I was kinda encouraged to occupy my time with TV and video games, and that was the era that I grew up in. If you are struggling emotionally, I think it makes it worse because it's a false reality, especially video games" (PT 150). Another man talked about the sedentary lifestyle that video games promote. "I don't sit down and play video games like...I don't wanna say my generation, but like children these days, and the ones that I've grown up with have all these games and sit down and play and all this" (PT 174).

Reading to improve emotional state. When asked about anything that helps improve their emotional functioning, multiple participants mentioned that they liked to read. One woman stated, "I do like to read" (PT 510). A man, when asked this question, responded with, "I do a lot of reading" (PT 131). Lastly, another man provided his reasoning as to why the felt that reading worked for him: "I really encourage reading. I think that that allows your mind to expand and broaden" (PT 150).

Physical. How participants perceived their physical symptom status was depicted using 20 corresponding codes, which were: 1) feeling like lack of sleep correlated with getting sick, 2) feeling like there is a connection between lung function and appetite, 3) feeling positive about weight, 4) eating frequent meals to increase caloric intake for weight, 5) getting a feeding tube to gain weight, 6) not having an appetite associated with

CF, 7) using shakes to increase caloric intake for poor appetite, 8) taking medications to improve appetite, 9) having weight issues associated with CF, 10) having CF-related digestive symptoms, 11) implementing strategies to improve digestive symptoms, 12) having a connection between respiratory function and HRQoL, 13) implementing strategies to improve respiratory function, 14) having a low energy or endurance level, 15) implementing strategies to improve energy, 16) having a negative body image, 17) having a positive body image, 18) using exercise to improve weight or body image issues, 19) following prescribed treatment regimen affecting HRQoL, and 20) implementing strategies to decrease treatment burden.

Feeling like lack of sleep correlated with getting sick. Sleep was viewed as a facilitator to a better HRQoL. Many participants felt like if they did not get enough sleep, they were more prone to get sick. One man said, “I think I am certainly more prone to get sick when I get less sleep” (PT 127). Another man felt similarly and stated, “If I don't get my sleep, I get sick, like clockwork (PT 129). Conversely, another participant also felt that when she was getting sick, she did not sleep well and that her sleep was an indicator of getting sick: “Whenever it’s getting time for an exacerbation, I don’t sleep as well” (PT 565). A man shared her feelings and added, “Obviously, if you get sick, that is going to affect your sleeping habits” (PT 104). Another woman expressed that sleep was vital to her overall health and quality of life by noting, “Sleep is very, very important to me, as far as staying well, staying energized” (PT 569).

Feeling like there is a connection between lung function and appetite. Some participants felt that they had a poor appetite when they were sick and that losing their appetite was an indicator of a pulmonary exacerbation. One woman shared that she used her appetite as an indicator of when she was getting sick. “I can sometimes tell when I'm getting sick, I don't eat as much” (PT 510). Another woman had a similar point of view and observed, “I realize that when my appetite is not good, that's when we know I need to go in the hospital” (PT 526). Others did not speak of their appetite being an indicator for when they were getting sick, but did say their appetite decreased when sick. One man stated, “When I am sick, I don't want to eat. If my lungs are picking on me [do not feel well], I shut down. I don't wanna eat. When my lung function is good, everything else is good” (PT 150). A woman also spoke about how being sick impacted her appetite: “I just was not hungry because I was coughing all the time” (PT 522).

Feeling positive about weight. Both men and women spoke about how the weight issues associated with CF could be seen as a positive aspect of the disease because it allowed them to be able to eat as much as they wanted. Women were happy with being skinny. One man spoke about how he liked to be able to eat more, saying, “I guess I am able to eat a lot more junk than most people and not have to worry about putting on too many pounds. That could be a positive” (PT 104). Conversely, a woman discussed how she put her weight into a positive perspective by saying:

> It’s [weight] a whopping 120 [lbs] and I’m proud of it. But other people are like: That’s just skin and bones. It depends on how you look at it. If you look at [it] from a normal person that don’t have any issues, then yeah, it’s skin and bones. But in CF people, it’s a good thing. (PT 565)

Eating frequent meals to increase caloric intake for weight. To combat issues with low weight, participants talked about eating frequent meals to increase their caloric intake. One woman explained how her parents helped her: “My parents were very persistent in me consuming an ungodly number of calories when I was growing. My mom said when I was little they wanted me to consume four to five thousand calories a day" (PT 569). Another woman spoke about increasing her caloric intake at the present time to increase her weight. "[I am] eating a lot of high calorie meals. Right now, I am getting about 3,000 calories a day" (PT 526).

Getting a feeding tube to gain weight. A feeding tube was used for many participants when other methods did not result in weight gain. Participants talked about getting a feeding tube in the past, in the future, and before transplant. One man spoke about the positive impact a feeding tube had on his weight: "I lost 25 pounds and had to get a feeding tube, and that has probably literally saved my life" (PT 144). A woman also discussed the positive impact the feeding tube had in providing stability in her weight: "I'm skinnier than normal people, but with the feeding tube, it [the feeding tube] gives me a lot more stability in my weight" (PT 565). Another man was in the process of planning to get a feeding tube because of weight loss after other methods to gain weight failed. He said, "I've tried everything under the sun to try to put on weight…to the point now, that me and my doctors are discussing me getting a G-tube. Other than that, it seems that it's [weight gain] not going to happen for me" (PT 173). Lastly, both men and women spoke about a feeding tube being a facilitator preceding lung transplant. One man said, "Before my transplant, I had to get a feeling tube. I guess that helped quite a bit because I did it [received tube feedings] at night when I slept. I was getting extra protein and calories at a time that I [normally] wouldn't" (PT 181). A woman described how a feeding tube helping her gain weight before transplant. "I had a horrible appetite, then got a feeding tube put in February. It [feeding tube] helped me gain weight so that I could meet the weight that they wanted me to before [getting a lung] transplant" (PT 522).

Not having an appetite associated with CF. Participants had varying experiences with appetite. One man rated his appetite as being poor: "I just try to force myself to eat at least half of what I normally would just to get some calories" (PT 104). Another man had a similar experience, remarking, "There are days where I have to force myself to eat because I don't feel hungry" (PT 173). One woman noted how one of the newly developed drugs impacted her appetite and said, "Before Orkambi, I was hungry a lot more. I was eating a lot less right after I started Orkambi. I'm hungry, and I have an appetite, but it is more like a normal person's appetite" (PT 529).

Using shakes to increase caloric intake for poor appetite. Participants talked about using milkshakes to ingest calories when their appetite was poor. One man said, "If I know I'm not really eating, I'll try to drink an Ensure or something like that to keep getting my calorie intake" (PT 129). Others talked about drinking shakes to also gain muscle through increasing protein intake. One woman explained, "Right now I'm doing a lot of Muscle Milk, which I hate, but I'm choking it down twice a day" (PT 526). Another woman offered similar reasoning, stating, "I have recently started drinking Carnation breakfast supplements…just trying to increase protein [in my] diet so I can try to build more muscle and gain more weight" (PT 570).

Taking medications to improve appetite. Medications were also mentioned as being used to improve appetite, but participants did not feel that the medications greatly improved their appetite. One man spoke about the connection between his appetite and how he felt:

> I do have Periactin [appetite stimulant medication]. If I'm eating well, I usually don't take it, which I know is terrible. Then, when I'm not eating I usually start back on it and it kind of helps correct the appetite, but a lot of that [appetite] is tied to how I feel. (PT 104)

Another man also discussed how he did not feel that his appetite stimulants helped him: “Appetite stimulants…and…different kinds of shakes, and nothing really works” (PT 181).

Having weight issues associated with CF. When asked about weight pertaining to HRQoL, participants struggled with being underweight, being overweight, and trying to adjust between needing to gain weight and just maintaining weight. Both men and women spoke about being underweight. One man discussed accepting it, and said, “I'm like 110 pounds right now, and I wish I could gain more [weight], but I've worried myself to death so many times that I just…I'm okay with it” (PT 133). Women had similar experiences, and one shared her battle of going between being underweight and a healthy weight:

> I am at a healthy weight, but there's times…that I'll get pretty low, to 110, and that's an unhealthy weight. I've always been borderline of…you are good now but can't lose two pounds…That [weight] is the hardest part of CF for me. (PT 526)

Conversely, other participants spoke about needing to lose weight. One woman said:

> I am pretty healthy. I would rather lose weight than gain weight, which I know is opposite than most CFs [people with CF]” (PT 536). Another woman discussed having to adjust her eating habits according to her weight and added, “I think it was kind of an adjustment to realize, like: Okay, I can eat like regular people. I

> don’t need to be having my third serving of this. So kind of figuring out that balance. (PT 569)

Having CF-related digestive symptoms. Digestive symptoms were portrayed as being restrictive and a barrier to HRQoL. One man said, “The constant battle of keeping your stomach from hurting and having diarrhea is exhausting” (PT 133). Another man spoke about how digestive symptoms negatively impacted his work day and stated:

> [Digestive symptoms] do take time out of work. Like, if I'm supposed to be out on a job or doing a route and I can't because I got to go to the bathroom. I don't work somewhere with a bathroom. I am always outside, I'm a meter reader. (PT 174)

Other participants talked about digestive symptoms causing them to have to stay home. One man shared, “I normally don't go anywhere because my stomach stays tore up [upset]” (PT 150). Another man also discussed staying home due to digestive symptoms. He elaborated, “When it flares up [digestive symptoms], there's stomach pain and you really don't feel like doing anything. I've spent many days laying on the couch with a heating pad” (PT 181). Women had similar experiences. One woman talked about digestive symptoms being “restrictive” and reflected, “Sometimes it can cause me to definitely not feel well or feel tied to the bathroom on days I'm not feeling well” (PT 538).

Implementing strategies to improve digestive symptoms. Facilitators to improve the digestive symptom portion of HRQoL included interventions for acid reflux, such as a probiotic on a daily basis, taking enzymes correctly, Miralax, stool softeners, and kombucha. One man illustrated his battle with acid reflux and what he did to improve it, noting that he had to “limit certain really acidic foods late at night…and spicy food. I have elevated the head of my bed, maybe 3 or 4 inches" (PT 109). Other participants mentioned taking a probiotic to improve digestive symptoms. One man said, "I take Culturelle if I'm on like antibiotics to help my stomach" (PT 129). One woman also talked about taking a probiotic in conjunction with a healthy diet. She said, "I try to take probiotics…I don't take them religiously like I probably should. But…also just trying to eat kind of healthy" (PT 569).

One man shared his experience when he did not take his enzymes correctly. "If I don't take my enzymes, I'll have stomach cramps and diarrhea" (PT 109). In addition, a woman mentioned taking Miralax and stool softeners to help with her digestive symptoms: "I take Miralax once a day with my coffee, and I take stool softeners twice a day" (PT 522). Lastly, one man found that drinking a fermented tea greatly improved his digestive symptoms. He stated, "Something called kombucha, it's fermented tea, and that has been a really big help [to improve digestive symptoms]" (PT 150).

Having a connection between respiratory function and HRQoL. Higher respiratory function was a facilitator to a better HRQoL, while lower respiratory function was a barrier to HRQoL. One man depicted this relationship by saying, "Yes, the lower it [respiratory function] is, the worse it [HRQoL] gets" (PT 150). A woman stated, "Well, if it [FEV_1] is at baseline or good, then I'm great and just live normal, everyday life. If it [FEV_1] is down, then I'm not able to do as much as I had wanted" (PT 562). Others talked about the impact that a decrease in lung function had on their HRQoL. One man said:

> If I compare to what I used to be, I would say it [FEV_1] is kind of poor. It [FEV_1] affects me in some of activities I can do, because if it [FEV_1] keeps on its current arc [decreasing pattern], it could be far more impactful [on HRQoL]. (PT 131)

Another man also spoke of how decreasing respiratory function can negatively impact activities of daily living. He stated, “My respiratory function has decreased over the years. And it’s really been the biggest thing, I think, on my quality of life…that gradual decreasing of lung function. Even though it’s slow, it [FEV_1] is still beginning to really affect...just simple tasks of the day” (PT 151). Additionally, a woman who had a lower lung function spoke about its impact on her HRQoL: “Well, I’m functioning at about 25 percent FEV-wise. So, it has taken a big toll on my quality of life” (PT 565).

Implementing strategies to improve respiratory function. Participants mentioned their treatments, exercise, and incentive spirometers as facilitators to help improve their respiratory function. One man said, “I try to do all my treatments and…I try to do everything every day. Now I am using an Aerobika [device used for positive expiratory pressure therapy]” (PT 114). Other participants talked about increasing the number of their treatments if they felt like they were getting sick. One man said, “I've increased the vest, and increased all the chest therapies” (PT 144). Others mentioned exercise in conjunction with their treatments. One woman explained, “Lately, I try to work out three to five times a week. When I do that [exercise],…I feel like that always helps me” (PT 548). A man also talked about exercise along with the use of an incentive spirometer: “I've got one of those incentive spirometers to help build my lungs up. And I try to walk and stuff to keep them [lungs] healthy” (PT 181).

Having a low energy or endurance level. Participants talked about how having a low energy level was a barrier to their HRQoL due to not being able to do all of the activities of daily living that they wanted. One man explained, “It is very inconvenient for your everyday life…physically, not always having a lot of energy to do things that maybe you once would have done” (PT 104). A woman also talked about how having a low energy level negatively impacted her daily activities. “Sometimes I just don’t have the energy or the strength. I may not be able to go and play softball some days if I don’t feel like it. Or, if my niece comes over, she’ll be wanting to play. And sometimes, I just don’t have the energy to do it [play]” (PT 562). In addition, others discussed that when they were able to do their activities of daily living, they were tired for long periods of time afterwards. One man said, “I try to play tennis now, and I can get extremely exhausted afterwards. Usually, [I’m] pretty much exhausted the next day as well” (PT 104). A woman reported a similar experience: “Just this past week, I’ve been helping decorate, and a full day of decorating puts me on the couch for about two days” (PT 565).

Implementing strategies to improve energy. Strategies that participants mentioned helped improve their energy level included exercise and taking time for themselves. One woman described how a few days of not exercising negatively impacted her HRQoL: “Staying active keeps my stamina and energy level up. If I spend a day or two less active, I can tell I lost a little bit of energy and stamina” (PT 169). Lastly, another woman spoke about how she had to take time for herself when needed to keep her energy up. She stated:

> I get a lot of energy too, just having some time, both to myself when I need it…but also having time with friends and going out and being social. Being by

> myself is more restoring that energy. Whereas, going out and being with friends is more energizing. So, I think it's holistic as far as all those sources I get my energy from. (PT 569)

Having a negative body image. Men and women reported having a negative body image for different reasons. Men tended to mention not wanting to be skinny and that the scars associated with CF bothered them, while women were more bothered with bloating associated with having CF and wanted to be skinny. One man talked about not wanting to be skinny from an early age. "I was kind of a tall lanky skinny kid. I didn't have a good view of myself" (PT 150). Another man also talked about the "skinniness" and added, "When I look at myself, I look like I'm a toothpick. I'm skinny and there's nothing I can do about it" (PT 174). Another man also desired to be more muscular and stated, "I haven't been able to grow like a normal, healthy male would as far as bone structure and muscles" (PT 151). One man mentioned body image when asked how he felt CF was different for men with CF as opposed to women. He shared, "Guys like to be the alpha male and more [physically] fit. They [men] want to have to big muscles. You don't see many guys with CF that are just like ripped [very muscular]" (PT 129). Lastly, one man spoke about how his scars associated with CF and being skinny affected his body image: "I've had so many surgeries. It's left a lot of scars on my stomach. I've always been pretty skinny…and so I've always had a negative view of my body pretty much my whole life" (PT 151).

Women described how they were self-conscious about the bloating associated with CF. One woman talked about her body image due to bloating after having a lung transplant: "[Body image is] yucky now because I gained all this weight from prednisone [steroid prescribed post-transplant]. I have stick legs and a round belly" (PT 522). Another woman posited that the bloating impacted the body image of women more than men with CF. She said, "Bloating, I think that affects women more" (PT 536). Another woman discussed an experience that began when she was young that negatively impacted her body image: "I've always had bloating since the age of 14. I've always gotten asked in public: Oh, are you pregnant? And: When are you due? And so that's probably my sensitive spot that's always made me very self-conscious about my body" (PT 542). In terms of wanting to be skinny, one woman talked about how Orkambi has negatively impacted her body image. "After I started taking Orkambi, I gained 10 pounds, so my image of myself isn't what I am used to. I am not generally happy with what I see in the mirror" (PT 529).

Having a positive body image. When both men and women mentioned having a positive body image, they often still mentioned some of the complaints of those who had a negative body image, such as wanting to gain muscle, being skinny, and having scars. One man mentioned that even though he was satisfied, he wanted to gain muscle mass and said, "I feel like I'm normal with how I look and how I see myself. The only other small complaint that I would have is [that] I would like to try to get into a workout routine and have muscle definition" (PT 173). When talking about being skinny, one woman talked about being happy with that: "I'm about what a normal person would look like. Maybe a little skinnier, but…most folks wouldn't know [I have CF] just by looking at me" (PT 562). Another woman talked about having a positive body image despite her doctors advising her to gain weight and added: "My doctors always say, 'You're too thin, you need to put on some weight.' And, you know, I am pretty thin. But I don't think that is a negative. My mom was always thin when she was my age" (PT 570). Another woman spoke about her scars being a positive influence on her body image and added, "I'm proud of how I am. I'm proud of all the scars and all that because that just shows the stuff that I've been through, and I'm stronger now" (PT 565).

Using exercise to improve weight or body image issues. Both men and women talked about using exercise to improve their body image. One man stated, "I have started trying to exercise more and actually do some strength training" (PT 109). Another man also incorporated strength training and reported, "I started a weight lifting program, and I started running, and that really brought me down to a more ideal body weight" (PT 150). A woman also added exercise to help gain muscle. She said, "I work out five days a week to kinda build muscle mass instead of body fat" (PT 526).

Following prescribed treatment regimen affecting HRQoL. Participants talked about how treatment burden could be a barrier to HRQoL. One man discussed the inconvenience of the CF treatment regimen: "One of the hard parts is doing numerous medications. More specifically, the breathing treatments, which can take well over an hour to do, and that's just very inconvenient for everyday life" (PT 104). Another man compared himself to his peers to depict how his treatment regimen impacted his life. He said: "It [treatment regimen] takes a lot of time every day. If I'm going to get up and get somewhere, it takes me longer than it would take most of my peers" (PT 109). Another man echoed the burden of time and stated, "The time burden is probably the thing that I notice most" (PT 109). Another man talked about how it greatly impacted his HRQoL because it was taking him longer to finish college:

> I'm not graduating on time because I've had to drop a class because I've been in the hospital for two weeks, and I knew there was just no way I could catch up. That’s probably where it decreases the quality of life, because you have to put more effort into it to get the same result [as peers]. (PT 129)

A woman also illustrated the difficulties of the treatment burden while being a college student: “When I’m stressed with work and school, because I’m a full-time student, sometimes I put my therapies, like my nebulizing treatments and chest therapy, on the back burner” (PT 548). Other participants felt differently and saw their treatment regimen as a facilitator to HRQoL. One man said, “For me it’s simple, it [treatment regimen] just helps my quality of life on an everyday basis. And so, for me, it’s quality of life” (PT 151).

Implementing strategies to decrease treatment burden. Having a pill container, incorporating others into treatment time, setting alarms, doing treatments on the go, and having a schedule were all named as facilitators to improve HRQoL in the area of treatment burden. One man talked about how his pill organizer helped him:

> It helps to organize my medications into a weekly pill box because even though that takes like 20 minutes once a week, it ends up being faster than staring at the cupboard every morning [thinking], which of these seven bottles do I need? (PT 109)

Another man talked about incorporating others into his treatment time so that it did not negatively impact his HRQoL. He said, “Trying to incorporate my friends and family when I am doing treatments so that I don’t necessarily have to wait until they leave to go ahead and do my treatments” (PT 109). Other participants talked about alarms and how they helped them remember treatments. One man added, “I do set alarms in my phone to remind me when I need to make sure and do my medications” (PT 173). Others talked about using various devices to be able to do treatments on the go to decrease the treatment burden. One woman reported using “Airflux or something. Similar to a flutter. But, it can basically be going instead of the vest therapy when I’m on the go” (PT 547). A man spoke of using a flutter and said, “I'll take Pulmozyme and like Tobra and be like, alright, we are doing Pulmozyme and Tobra in the car. I carry a flutter valve around with me all the time” (PT 133). Lastly, many participants mentioned that having a schedule was vital so that they could plan around their treatments. One man shared, “It’s a lot of putting myself on a schedule and making sure that I keep to it [the schedule]” (PT 173). A woman echoed his statement and added, “I have a schedule…just having a daily routine really helps” (PT 570).

Summary of Theme 5. The overarching theme of “Perceived Symptom Status” included two subthemes, emotional or psychological and physical perceived symptoms. Within the subtheme of emotional or psychological, many participants spoke about experiencing anxiety and/or depression. Anxiety and/or depression stemmed from clinic visits, being hospitalized, and declining health. Facilitators that participants identified to overcome anxiety and depression included meditation, yoga, counseling, and journaling.

Participants depicted two relationships in the subtheme of perceived physical symptom status, a relationship between lack of sleep and getting sick and a relationship between lung function and appetite. Facilitators to improve and/or maintain respiratory function included completing treatments, exercising, and using incentive spirometers. Participants identified viewing their weight as positive as a facilitator to HRQoL. Next, low energy was seen as a barrier to HRQoL because many participants shared that it interfered with completion of their normal day-to-day activities and spending time with others. Facilitators identified to improve energy level were exercise, resting when needed, and just taking time for themselves. Additionally, negative body image was seen as a barrier to HRQoL. Men and women portrayed their body image differently. Men viewed being skinny in a negative light and wished to have more muscle mass, while women liked being thin and were very self-conscious about bloating that they experienced as part of their digestive symptoms. Facilitators identified to improve digestive symptoms included interventions for acid reflux, probiotics, taking enzymes correctly, Miralax, stool softeners, and kombucha. Lastly, facilitators that participants identified as decreasing treatment burden included weekly pill containers, setting alarms for treatments, being on a set schedule, and being able to do their treatments "on the go."

CHAPTER 5

DISCUSSION

A sequential Quan → QUAL mixed methods study was conducted in order to better understand the gender differences in HRQoL of adults with cystic fibrosis (CF) through exploring gender-specific facilitators and barriers to HRQoL. The goal of the quantitative phase was to examine the gender differences in HRQoL by administering the CFQ-R to adults with CF ages 19 and older. To achieve this goal, 123 adults with CF completed the CFQ-R. Based on the results of the CFQ-R, a sample was chosen to be as representative as possible of varying HRQoL within the CFQ-R domains that indicated a statistically significant difference between men and women. The selection of the qualitative sample was limited by the parent study's inclusion criteria. However, both genders were equally represented in the qualitative sample. The goal of the qualitative phase was to build upon the results of the questionnaire to better understand the gender-specific facilitators and barriers to HRQoL through individual interviews with 15 men and 15 women.

Summary of Major Findings

Quantitative Results

Analysis from the CFQ-R was used to answer the following research question: What gender differences are present in adults with CF within the 12 domains of HRQoL as measured by the CFQ-R? Data analysis revealed that the overall sample reported the poorest HRQoL in the areas of vitality, treatment burden, and respiratory functioning;

however, when looking at the mean HRQoL score in each of the 12 domains split by gender, men reported a lower mean score in the three domains of digestive symptoms, body image, and weight, while women reported a lower mean score in the domains of physical functioning, role functioning, vitality, emotional functioning, social functioning, eating difficulties, treatment burden, health perception, and respiratory functioning. Significant differences between genders were present in the HRQoL domains of emotional functioning, social functioning, physical functioning, and weight.

Qualitative Results

Five overarching themes emerged that helped further explain the HRQoL of the overall sample as well as better explain any gender-specific barriers and facilitators to HRQoL that could contribute to the significant gender differences found in the quantitative phase. The five themes were: 1) “Biological and Physiological Factors”; 2) “External Factors”; 3) “Functional Status”; 4) “Perceptions of Preferences, Values, and Mental Health,” and 5) “Perceived Symptom Status.” These themes answered the qualitative research question: What are the common gender-specific facilitators and barriers to HRQoL in adults with CF? Men and women had various explanations for their HRQoL scores. In terms of gender-specific facilitators and barriers to HRQoL, when asked specifically about gender differences, men identified their physical strength as a facilitator because of the nature of CF as a chronic, progressive disease that becomes more difficult to manage over time. Men mentioned using available resources such as disability services and “sitting in line passes,” to avoid having to stand in line for long periods, as a facilitator to improve physical functioning. Women did not mention utilizing resources and instead described avoiding resources such as school elevators because they did not want to be viewed as different or disabled by their peers. In addition, infertility and difficulties conceiving a child were identified as a barrier by both men and women. Furthermore, multiple women listed having a child as their top priority and identified themselves as “meant to be a mother.” Body image was also brought up as a barrier to HRQoL by both men and women, but their reasons and experiences were different. Men had body image issues because they wanted to have more muscle mass, while women had body image issues due to CF-related bloating and viewed being “skinny” or “thin” due to disease as a positive aspect of their body image. Each gender revealed a barrier that the other did not mention. Men brought up financial stress and how they did not like not being able to be the “provider” of the family and take financial stress off their significant other. They also mentioned being unable to work due to income limitations set by insurance companies in order to receive government-funded benefits such as disability compensation and prescription and healthcare coverage. Women brought up the negative mental impact that social media could have when they saw others’ negativity towards CF or saw others with CF nearing the end of life.

Integration of Quantitative and Qualitative Results

The mixed methods research question for this study was: How do quantitative questionnaire results and qualitative interviews jointly explain the gender differences in HRQoL by identifying gender-specific facilitators and barriers to HRQoL of adults with CF? In order to better understand the gender differences in HRQoL found in the quantitative strand, individual interviews were conducted to obtain a more comprehensive understanding of gender-specific facilitators and barriers to HRQoL.

Due to the sequential Quan → QUAL study design, the results of the quantitative strand were first analyzed so that HRQoL scores and demographic characteristics could be reviewed to answer the quantitative research question of: What gender differences are present in adults with CF within the 12 domains of HRQoL as measured by the CFQ-R? Subsequently, individual interviews were completed to answer the qualitative research question of: What are the common gender-specific facilitators and barriers to HRQoL in adults with CF? Obtaining the different data in this sequential order allowed the interview data to more comprehensively explain the results of the questionnaire responses.

Joint Display to Show Integrated Findings

The integrated quantitative and qualitative findings are presented in a joint display, in which each domain of the CFQ-R that was analyzed quantitatively was depicted with summaries from each of the five themes that emerged from the inductive thematic analysis of the qualitative data (see Appendix I). The integrated findings were grouped by each domain of the CFQ-R. In addition, the integrated findings will also be discussed in conjunction with previous research on HRQoL.

Physical Functioning

In the physical functioning domain of HRQoL, the quantitative results showed a statistically significant difference in physical functioning between genders, with women reporting a poorer HRQoL. In conjunction with these study findings, men have previously self-reported their physical functioning as higher than that of women (Borawska-Kowalczyk & Sands, 2015; Hebestreit et al., 2014; Patterson et al., 2008; Simon et al., 2011; Stofa et al., 2016). Facilitators to physical functioning noted by men that could have contributed to the statistically significant gender difference included men having more physical strength and being more open to utilizing available resources such as disability services or occupational therapists. Barriers reported by women that could contribute to their poorer HRQoL in this domain included women not wanting to be labeled as having a disability and preferring more private interventions, such as taking physical activities more slowly. In support of this finding, a qualitative study conducted by Berge and colleagues (2007) also found that women were more concerned with feeling different from peers. However, findings unique to the current study include men's perception of their physical strength and willingness to utilize available resources as potential reasons for the gender differences in self-reported physical functioning.

Role Functioning

The quantitative analysis showed no statistically significant difference in the role functioning of men and women. However, men reported a better mean score, which indicates a higher HRQoL in the area of role functioning. Nevertheless, the facilitators and barriers to HRQoL mentioned by men and women were similar. Barriers to role functioning included being hospitalized, reproductive implications of CF that interfered with their ability to be a parent, missed work or school days due to CF, and the CF treatment routine's effect on their roles. The overarching facilitator was having a support system.

Being hospitalized was a barrier that interfered with participants functioning in their many roles. These included missing out on precious moments with their children, missing their families due to traveling long distances to be hospitalized, and absence from school and/or work. In terms of reproductive implications of CF, both men and women listed the struggles of becoming a parent as a barrier. However, men mentioned struggles related to being told they were unable to have children, letting their spouse down if they were unable to conceive a biological child, and worry about being unable to find a significant other who would desire to be with them knowing the possibility that they would be unable to conceive.

When discussing absence from school or work due to CF, both men and women indicated this was a significant barrier because it caused them to get behind and, in some cases, even resulted in dropped classes, which delayed graduation. For work, both men and women stated that having a job empowered them and gave them purpose. This finding was consistent with what is known about role functioning, in that participants who worked reported higher scores in the domain of role functioning (Abbott et al., 2009; Havermans et al., 2009). In addition, working also improved the psychosocial health of those with CF (Havermans et al., 2009). Lastly, CF treatments often were a barrier to their role as a friend as it caused them to be late, or even cancel, social functions, and even for the social events they attended, they frequently departed early in order to ensure compliance with their CF treatment regimen. Likewise, hesitancy to make future plans due to the social restrictions of CF has been reported (Hegarty et al., 2009). Additionally, being a student or having a job could lead to those with CF feeling as if they have less time to complete their prescribed treatments (Havermans et al., 2008).

The overarching facilitator to role functioning was support. Those with CF expressed needing support when they did not feel well or needed to complete prescribed treatments and still fulfill roles as a spouse, parent, etc. These study findings are consistent with literature implicating that social support has a positive impact on overall

HRQoL and could potentially have more impact on HRQoL when compared to clinical variables (Besier et al., 2009; Dębska and Mazurek, 2015).

Although inconsistent with the quantitative findings that men reported a better HRQoL in the domain of role functioning, barriers unique to men included wanting to assume traditional male roles and be the provider of the household. Insurance was depicted as a barrier to being able to work, because men felt that they had to choose between having a job and keeping their insurance benefits due to government-funded insurance companies placing a limit on the amount of income a person may earn while receiving such benefits. In conjunction with these results, Chevreul and colleagues (2016) found that CF had a significant impact internationally on not only the HRQoL of those who have CF, but also the HRQoL of their caregivers. Also, the costs related to hospitalizations and prescription drugs were associated with the subsequent decrease in HRQoL (Chevreul et al., 2016).

Vitality

The quantitative results showed no significant difference in vitality between men and women. In fact, the mean score of men was only one point higher, indicating men had a slightly better HRQoL than women in the area of vitality. In conjunction with the quantitative results, there were no significant differences in the facilitators and barriers to HRQoL that men and women mentioned.

The qualitative results for the domain of vitality or energy indicated the following barriers: having more mental energy than physical energy, tiring easily when doing activity for short periods of time, energy decreasing with age, spontaneous days with no energy with unknown cause, and low energy being linked to getting sick. When talking about having more mental than physical energy, both men and women spoke about mentally feeling like they were well or “ready to go” but physically could not do it. They also talked about needing to find balance between the two in order to stay healthy. Secondly, energy decreasing with age was mentioned in conjunction with stamina. Participants talked about not having the energy that they once did and also tiring more quickly doing something that they could do much more easily a few years prior. They also talked about “hitting a wall” and not being able to go any further much faster than in the past. In addition, multiple participants discussed having days when they just had no energy and could determine no cause for it. In support of participant reports, longitudinal research has shown that there is a steady decrease in all HRQoL domains over a 10-year follow-up period, including the domain of vitality (Abbott et al., 2015; Uchmanowicz et al., 2014; van Horck et al., 2017).

Lastly, participants talked about low energy being linked to getting sick. Oftentimes, their first indicator of needing antibiotics was sleeping a lot or just feeling sluggish. In terms of facilitators to the energy domain of HRQoL, participants mentioned sleep, positive perspective, support from family to push them thorough, exercise, and nutrition. Sleep was mentioned as being “very important” and “vital” to having energy. Supporting participant accounts, those in previous studies who reported poor sleep quality were shown to report poorer HRQoL in the domain of vitality (Bouka et al., 2012; Forte et al., 2015).

In addition, participants mentioned the need to get out and do things while they were still able and that they used that and a positive perspective as motivation to keep going. Support from family was also a vital facilitator. Both men and women mentioned days when they were struggling and how they had someone who would help them push through when they felt like they could not. Exercise was also mentioned as allowing participants to keep their energy level up. Also, exercising consistently was needed in order to keep their energy level up despite feeling like they had no “reserve energy.” Taking time for themselves to do something enjoyable was important to a few participants in order to build their energy back up. Lastly, proper nutrition and vitamins were paired together to improve energy. Many participants mentioned that when they weren’t able to consume proper nutrition, their energy level was low and they could tell a drastic difference on those days.

Emotional Functioning

The quantitative results evidenced a significant difference in the emotional functioning domain of HRQoL when comparing men and women. Qualitative data analysis complemented these findings due to the facilitators and barriers being reported as different for men and women. In addition, from the CF-patient registry data that were reported as part of the demographics, while neither was statistically significant, both anxiety and depression were higher in women when compared to men (31.8% vs. 24.6% and 39.4% vs. 38.6%, respectively). There was a larger difference between the rates of anxiety between men and women when compared to depression.

In terms of the qualitative results, barriers perceived by both men and women included uncertainty, declining health, and infection. In addition, facilitators shared between genders were spirituality/religion, positive perspective, and support.

Spirituality/religion. Men and women had similar reasoning when explaining why their spirituality and/or religion was a facilitator to their mental and emotional health. Specific benefits that were discussed included providing hope and being able to hand their illness over to a higher power. When they handed their illness over to a higher power, they expressed that worries and fears associated with CF were "less of a concern." In addition, participants spoke about gaining strength and motivation to get through tough times related to CF by relying on their spirituality/religion. The fear of death also held less weight. Participants said that "they would be fine either way" and that "God had a plan." These findings corroborate previous research showing that spirituality was a positive coping strategy and, in turn, provided those with CF with hope and a sense of peace (Mc Hugh et al., 2016).

Positive perspective. Both men and women expressed that having a positive perspective was vital to avoid dwelling on the negative aspects of CF. They spoke about it being beneficial to look at CF in the light of a disease that they could "fight," compared to other illnesses. Also, participants felt like the perspective that one chose to have determined how positive or negative one was as well as one's outlook on life. They also mentioned that a positive perspective made them "feel better" overall and that they chose to view CF as making them emotionally "resilient." Findings were consistent with the literature, in that optimism, similar to the code in this study labeled "positive perspective," has been shown to be a protective factor for emotional functioning (Oliver et al., 2014). In addition, religious coping is positively associated with social aspects of HRQoL and has been linked to positive HRQoL outcomes (McHugh et al., 2016). Across studies, coping is a significant factor in predicting social and emotional HRQoL (Abbott et al., 2008; Casier et al., 201l; Mc Hugh et al., 2016). Positive coping mechanisms, such as optimism and acceptance, positively affect how a person copes with CF (Abbott et al., 2008). Oliver and colleagues (2014) found that optimism is protective against the emotional functioning domain, particularly in those with elevated levels of stigma and distress and even more so anxiety.

Support. Support was portrayed as a facilitator to emotional functioning because participants leaned on members of their support system when they were “feeling down” or having a “pity party,” and their source of support was able to make them feel better. They also felt like their support system “picked up the slack” when they were having a bad day so that they did not feel guilty or overwhelmed. One distinction was that women tended to need physical support such as help with “setting up for treatments” or “cleaning nebulizers,” whereas men mentioned treatments autonomously and looked to their support system for emotional support only. In conjunction with findings by Besier et al. (2009), social support was more important for women in relation to having CF. Women have also been shown to need more support from friends, family, and healthcare providers in order to deal with the depressive symptoms related to CF (Berge et al., 2007). Conversely, males more easily incorporated CF into their identity as a part of them for which they took full responsibility (Berge et al., 2007).

Striving to have a normal life. Despite mentioning that it is not easy, participants mentioned that striving to have a normal life made them “feel good.” The emotional differences came into play when women reported avoiding using available resources, such as the elevator, and avoiding telling others who needed to know about them having CF in an attempt to feel more “normal” and not be labeled as having a "disability." This finding corroborates previous research that showed "feeling different" negatively impacted emotional functioning (Hegarty et al., 2009).

Barriers portrayed by men and women. Barriers shared between genders included uncertainty, declining health, and infection. These barriers were closely related. Uncertainty was depicted as being correlated with declining health by both men and women and impacting emotional health due to "being hard not to dwell on" and "worry" about. Women said that seeing where others who have CF are listed for transplant or are recently deceased negatively impacts their mental health, causing them to "worry" and be "scared." In addition, uncertainty was also linked to both declining health and infection when participants spoke about uncertainty, worry, and anxiety related to either having or contracting an infection in the future with detrimental effects on their health. Those who had lung infections spoke about the infection "coming in waves" and the uncertainty of the damage caused by infection. Similar to these findings, patients with elevated symptoms of depression and anxiety reported a poorer HRQoL across all 12 CFQ-R domains (Olveira et al., 2016). Higher HRQoL was associated with lower depressive symptoms on all domains of the CFQ-R (Riekert et al., 2007).

Facilitators and barriers specific to men. Facilitators specific to men were distraction, hope in advancements, counseling, and being outdoors. In terms of anxiety, men spoke about using things such as TV or sports to distract them from anxiety until they could calm down. In addition, men spoke about how hope in new treatments and therapies helped them get through times of anxiety or depression. Lastly, men spoke about how they had been encouraged to play video games while doing treatments but that it could have a negative impact on their mental health because so many games are centered around negative concepts such as killing.

Facilitators and barriers specific to women. There was only one facilitator specific to women, and it was journaling to help get through hard times. Barriers specific to women included anxiety related to taking medications in front of others, and anxiety surrounding pulmonary function testing. Settings that had provoked anxiety included taking enzymes at school and parties and were related to being in large crowds. The anxiety surrounding pulmonary function testing was related to not knowing whether they would be admitted into the hospital and have to make arrangements for work, family, etc.

Social Functioning

Quantitative analysis showed that there was a significant difference between the social functioning of men and women. The interviews revealed that facilitators that helped improve social functioning for both men and women included lung transplant, being open with others about CF, and support. Lung transplant was viewed as a facilitator to social functioning due to the decrease in time that was required for CF-related treatments. This decrease freed up time for socialization and allowed participants to do things like take their kids to school, go to the gym, and walk around with ease.

Being open with others about CF was a facilitator as well because those around participants on a regular basis could help if needed. Participants talked about their bosses' knowing about their CF being a facilitator because when they became sick or needed time off to rest, their bosses were understanding. In addition, openness promoted acceptance and understanding in social settings when participants needed to cough or take enzymes; others were also less likely to think participants were contagious. Lastly, when plans with friends, families, bosses, etc., had to be cancelled due to a CF-related event, grace was more likely to be given.

Support was also a facilitator for the social functioning of both men and women. Additionally, support was interrelated with being open about having CF because the openness allowed family and friends to be supportive through events such as difficult clinic appointments, hospitalizations, etc. Also, being open with friends about CF allowed them to be "supportive in their own way."

Barriers included hospitalization, difficulty traveling, digestive symptoms, negative reactions from others, having to decline social invitations, and treatment burden. Being hospitalized was identified as a barrier to social functioning due to participants having to "stop their lives" for the 10-14 days that they are in the hospital while life stays "very busy." In addition, participants felt "excluded" from their friends and social lives while in the hospital, which had a negative effect on emotional functioning. Literature supports the findings in that those who are hospitalized have been shown to report a poorer HRQoL in the area of social functioning when compared to those with CF who are not hospitalized (Hegarty et al., 2009). Difficulty traveling was portrayed as a barrier due to the amount of preparation and the amount of medications and equipment that had to be packed and taken on the trip. Participants explained that it was "overwhelming," and some chose not to fly due to the hassle of carrying their equipment through security. Digestive symptoms were a barrier to social functioning due to interfering with social events such as dates, birthday parties, etc. Participants explained that they would not eat if they did not have their enzymes, and that when they were experiencing digestive symptoms, they felt "restricted." In addition, negative reactions from others about CF impeded friendships because participants felt that some friends could not “empathize.” Also, older adults tended to be “standoffish” towards participants when they were younger due to CF being a terminal illness and began separating themselves from the participants. Romantic relationships were also impacted due to parents being skeptical about their child dating someone with CF. Having to decline social invitations was perceived as being closely correlated with treatment burden due to treatments causing participants to be late or cancel social outings altogether if they were not feeling well. This result corroborates previous findings that those with CF have been hesitant to make plans for the future due to the social restrictions of the illness, including academic and vocational restrictions (Hegarty et al., 2009).

No gender-specific barriers to social functioning were discussed. However, facilitators that were specific to men included being open with others about CF and incorporating others into treatment time. Men tended to be more open with others about CF, while women only mentioned CF in a social setting to those “who need to know” and often would not tell teachers, coaches, etc. until they had to due to illness. In addition, women spoke about not wanting to be perceived by peers as having a disability or being different. Similarly, women have been shown to be more self-conscious and pay more attention to how peers perceive them and their CF-related symptoms such as coughing or taking enzymes (Patterson et al., 2008). Men also spoke about incorporating others into treatment time so that it could be a more positive experience and also not interfere as much with hanging out with friends. For women, social media was viewed as a platform to talk with others who have CF, discuss their experiences, and also help others who may be younger or those who have newly diagnosed children with CF. Interestingly, previous research supports the need to further explore these gender-specific facilitators because although self-reported HRQoL is stable over time, psychosocial health is not, indicating that social support and social functioning may have a higher impact than any single clinical variable (Bradley et al., 2013; Dębska & Mazurek, 2015; Dill et al., 2013).

Body Image

Quantitative results in the domain of body image showed that, while statistically significant differences were not present between genders, women did have a slightly higher mean score, indicating a better HRQoL in this domain. Barriers to having a positive body image were different in men and women. Men were unhappy with their body because they felt the need to be the “alpha male,” have muscle mass, and not have a short stature. In addition, scars from CF-related surgeries made them self-conscious and, as a result, not walk around without a shirt. Women tended to not be bothered by being “skinny” or “skinnier than their friends.” However, bloating associated with the digestive symptoms of CF negatively influenced their body image. Women were found, in prior research, to be more likely to report coughing and feeling bloated (Sawicki et al., 2008). Also, weight gain from Orkambi and prednisone was mentioned by women as having a negative impact on their body image.

In terms of facilitators, both genders mentioned exercise, but men more often mentioned strength training to build muscle mass. Unique to men, they mentioned increasing protein and calorie intake in an attempt to gain muscle mass. Conversely, women reported avoiding their body image and said they simply “ignore it and pretend it is not there.” In conjunction with the findings of this study, women tend to report that they desire a thin figure, whereas men tend to want a more muscular body (Simon et al., 2011). In addition, women tend to desire to be thinner despite being advised differently by their healthcare providers (Simon et al., 2011).

Eating Difficulties

Quantitative analysis showed no statistically significant differences in eating difficulties between men and women. However, men had a slightly higher mean score than women, indicating that men had a slightly better HRQoL. The qualitative results revealed similar facilitators and barriers to eating difficulties between men and women. The barrier to eating that was reported by both men and women was a decreasing lung function or feeling like their lungs were “sick.” Many explained that when their lungs were getting “sick,” it was a chain reaction that also caused them not to have an appetite and not be able to eat like they normally would. Others also said that having difficulty eating was a sign that they needed to be hospitalized or get antibiotics. In terms of facilitators to help overcome eating difficulties, many participants spoke about different types of milkshakes and also taking appetite stimulants. Milkshakes were used to get as many calories in as possible when they did not want to eat and included protein shakes, Scandishakes, and homemade milkshakes. In addition, participants spoke about using appetite stimulants, but they also reported not taking them consistently and not feeling like they worked.

Weight

The quantitative results suggested the presence of a relationship between gender and weight ($p = 0.02$). In addition, women had a mean score on the CFQ-R that was 16 points higher than that of men, indicating that women had a higher HRQoL in the domain of weight. The qualitative results elaborated on the quantitative results and provided insight into why the perception of weight was different between men and women. In terms of barriers, none were discussed other than just “not being able to gain weight” due to CF. However, both men and women talked about feeding tubes being their biggest facilitator to gaining weight, adding that getting extra calories while sleeping allowed them to “stabilize” their weight, and also make the weight they needed to in order to get a lung transplant. In looking further into the participants’ perception of their weight, women were happy with being “thin,” and many talked about how even though their doctors wanted them to gain weight, they didn’t want to because they were happy with their weight. Conversely, men desired to be more muscular and saw the thin and often small stature that came along with having CF as undesirable.

Nutritional status is measured by height, weight, and BMI across published studies. Decreased nutritional status, or lower BMI, is associated with more frequent hospitalizations, increased likelihood of being infected with *P. aeruginosa*, decreased lung function, and lower scores on the HRQoL measurement tools in the areas of treatment burden, body image, and weight (Bodnar et al., 2014; Borawska-Kowalczyk & Sands et al., 2015; Dill et al., 2013; Forte et al., 2015; Havermans et al., 2009; Rozov et al., 2010; Salek et al., 2012; Shoff et al., 2013).

Treatment Burden

Quantitative results showed that there was no significant difference in the perception of treatment burden between men and women. The mean scores of the CFQ-R revealed that, while women reported a poorer HRQoL in this domain, it was slight, with the difference of only three points. The qualitative results showed that men and women had similar barriers and facilitators surrounding treatment burden. The two overarching barriers were time and needing access to the equipment when the treatment was due. In terms of time, having to travel for care, working full-time, getting less sleep due to treatments, and dealing with insurance were all barriers that made time management difficult. Many participants often felt stressed and like they had to pick between personal and professional life and getting treatments done. They also discussed how they felt like something often got "left off." Forming a schedule was the only facilitator that mitigated the treatment burden. Many also mentioned as part of their schedule they had pill containers and alarms that reminded them when to do treatments and cut down on the time it took to get their medications together on a daily basis.

Supporting research shows that there is an interrelationship between increasing age, decreasing lung function, increasing frequency of pulmonary exacerbations, and increasing treatment burden (Dębska & Mazurek, 2015; van Horck et al., 2017). Women report a higher treatment burden, in addition to a higher respiratory and psychological symptom burden (Groeneveld et al., 2012; Sawicki et al., 2008). It is also important to consider that a person's perceived treatment burden depends in part on how they view it within the context of their other life responsibilities (Sawicki, Sellers, & Robinson, 2009).

Health Perceptions

When looking at the overall health perception of men and women statistically, there was no significant difference between men and women. However, men did report a better overall health perception than women. In terms of the qualitative results, for overall health perceptions, the participant's matter of perspective was both a facilitator and a barrier for both genders. Perspective was described as the way the person chose to view CF and that it could be either positive or negative. This was portrayed as "what you choose to think" and "what you believe" determines how you feel and how you choose to approach and deal with having CF. Perspective was also described as the factor that had "the most effect" on quality of life overall. Also, participants discussed that even though CF has bad points or "an ugly side," one could still choose to have a positive "overall outlook" on life. Previous research on various coping strategies yielded similar results and noted that optimistic acceptance (positive perceptions) and behavioral avoidance (negative perceptions) were significant predictors of how a person coped with having CF (Abbott et al., 2008). Having a more positive perspective was found to be associated with better self-reporting of HRQoL (Abbott et al., 2008). These studies show how perception of overall health could influence HRQoL.

Respiratory Functioning

There was also no significant difference in the self-report of the respiratory functioning domain of HRQoL between men and women. Men did report a slightly better HRQoL in the respiratory functioning domain in the mean scores on the CFQ-R. The qualitative results revealed that participants felt that there was a direct connection between their respiratory function and their overall HRQoL. Many participants directly mentioned that "the lower it [respiratory function] gets, the worse it [HRQoL] gets." In addition, age was also linked to respiratory function and overall HRQoL, because participants talked about how the older they have gotten, the more their respiratory function values have declined, and that the more "shortness of breath" they had, the worse their HRQoL. They also mentioned that when they woke up in the morning and were congested or their lungs did not "feel good," that "it wasn't going to be the best day." Also, many noted that when it was difficult to breathe, it was difficult to do anything else and that it was very difficult to work through. Participants also talked about their respiratory function fluctuations in that when their respiratory function values were "normal" for them, they were great and had a good day, and when they were "down," then they weren't able to do much at all. Lastly, those who had a lower respiratory function, i.e., 25%, talked about how that took the biggest "toll on their quality of life." In this way, respiratory function values were both the facilitator and the barrier for both genders in the respiratory functioning domain of the CFQ-R.

Lung function, measured though FEV_1, has been widely assessed in the literature as an indicator of HRQoL scores. Poor lung health, illustrated by more frequent pulmonary exacerbations, lower FEV_1, and infections with *P. aeruginosa*, has also been associated with having higher levels of anxiety and depression (Olveira et al., 2016). The literature is consistent in reporting that any of these indicators of poor lung health are associated with a lower HRQoL score (Abbott et al., 2015; Ashish et al., 2012; Bodnar et al., 2014; Borawska-Kowalczyk & Sands, 2015; Bradley et al., 2013; Cohen et al., 2011; Dębska & Mazurek; Dill et al., 2013; Forte et al., 2015; Havermans et al., 2008; Havermans et al., 2009; Kir et al., 2015; Moço et al., 2015). Furthermore, as FEV_1 declines or number of pulmonary exacerbations increase, depressive symptoms increase (Olveira et al., 2016; Riekert et al., 2007).

In terms of lung infections, people with CF and who are infected with *P. aeruginosa* consistently have a worsened HRQoL in the domains of physical functioning, respiratory symptoms, treatment burden, role function, health perception, and emotional functioning (Ashish et al., 2012; Bodnar et al., 2014; Kir et al., 2015).

Digestive Symptoms

There was also no significant difference in the report of digestive symptoms between men and women. Similarly, the mean scores in this domain of the CFQ-R showed a three-point difference in the mean scores, with women reporting a better HRQoL. Other than the facilitators and barriers related to the social implications of digestive symptoms that were previously discussed, the main facilitator and barrier to digestive symptoms was digestive enzymes. In terms of identifying a facilitator, participants noted that when they took their digestive enzymes as prescribed, they did not have any digestive symptoms. In fact, they said that if they did not have their enzymes, they would not eat anything in public such as at school, with their friends, or on dates because they knew that their digestive symptoms would “flare up.” Consistent with participant accounts, pancreatic enzyme use has been shown to explain approximately 50% of variance in digestive symptoms (Quittner et al., 2010).

Implications

This section illustrates how this study could inform future research, clinical practice, and policy.

Future Research

Findings from this study suggested that there are significant gender differences in HRQoL in the domains of emotional functioning, social functioning, physical functioning, and weight. Previous research has indicated that coping styles influence emotional and social functioning. Since this study did not examine associations between coping styles and emotional and social functioning, future research may examine the associations in this sample.

Physical functioning and weight were significantly different between genders, with men desiring to gain weight and muscle mass, and women desiring to stay thin. Due to the disease process, people who have CF are often thinner than those without CF. For men, gaining muscle mass is ideal and beneficial to their health. For women, the desire to stay thin contradicts the nutritional recommendations of healthcare providers to have patients gain weight and achieve optimal BMIs. It is critical for people with CF to maintain good nutritional status in order to optimize overall health. Future research should examine methods to improve weight perception in women with CF to reduce negative health consequences of poor nutritional status.

Gender-specific facilitators and barriers to HRQoL domains identified in this study lay the foundation for future educational interventions that focus on improving HRQoL in CF patients. In light of the study findings, it is now apparent that a generic, "one-size-fits-all" educational intervention would not be appropriate for individuals with CF. Instead, men- and women-specific interventions should be developed and tested to explore their potential for improving HRQoL.

Clinical Practice

This study illustrated the impact of the relationship with healthcare providers on people with CF. Having consistent healthcare providers led to development of trust and continuity of care provision. Findings from this study suggest that seeing the same healthcare provider made participants feel more comfortable with disclosing sensitive information and that their problems were more adequately addressed.

Currently, the CFQ-R is not used routinely in clinical practice to assess HRQoL. Addressing HRQoL in clinic visits would allow for identification of problem areas that may differ between men and women. By using the CFQ-R routinely in clinical practice, healthcare providers would be able to: 1) identify problems in specific HRQoL domains; and 2) identify a change in HRQoL over time, which would allow prompt investigation of causes and implementation of measures for improvement. Finally, findings from this study support the usefulness of CFQ-R in routine clinical practice to guide healthcare provider decision-making (Dill et al., 2013).

Policy

This study yielded several policy implications, including revisions of guidelines for depression and anxiety screening, which could subsequently lead to the development of medical and psychosocial treatment programs for individuals with CF to improve their HRQoL (Havermans et al., 2008). Current guidelines suggest screening for depression and anxiety annually (CFF, 2018); however, frequent assessments during routine clinic visits that occur usually every three to four months may be more appropriate. More frequent assessment of psychosocial health is needed because psychosocial health fluctuates in the CF population over time while physical HRQoL domains, such as respiratory function, generally remain stable. Therefore, adequate assessment of psychosocial health is imperative to improving outcomes of those with CF (Dill et al., 2013).

Limitations

1. The quantitative strand was restricted to using data collected as part of the parent study.
2. Convenience sampling was used for the quantitative phase, which has a high risk for sampling bias and limits representativeness.

3. The demographic variables drawn from the CF Registry Patient Portal were restricted to what was entered by the participant’s clinician.
4. The qualitative sample for this study had to be chosen from the subsample of participants who met the parent study’s inclusion criteria. However, the researcher did screen eligible participants’ CFQ-R scores to make the subsample as representative as possible.
5. All interviews were not able to be conducted in person due to participants having to travel long distances for clinic visits and some not having a clinic appointment within the data collection period.
6. All data were collected from a single CF center.

Strengths

First, the researcher was well trained to conduct this study due to multiple research training courses, being a research assistant involved in all aspects of a mixed methods study, and prior work with the adult CF population. In addition to the research training courses, the researcher also took coursework that included two classes on mixed methods research. For the quantitative phase of the study, the researcher used the instrument that is considered to be the gold standard HRQoL instrument for the CF population (Henry et al., 2003). The instrument is disease-specific, has been validated in over 30 languages, and is widely used in the CF population (Quittner et al., 2012). For the qualitative phase of the study, credibility and trustworthiness were ensured through rich, thick description, peer review by the dissertation committee, and inter-coder agreement (Creswell, 2015). Rich, thick descriptions were obtained through in-depth interviews and note-taking. Peer review was conducted by the dissertation committee to help ensure that the study was as rigorous as possible. Lastly, inter-coder agreement to ensure reliability was conducted with a research assistant who is also a member of the research team. In addition, two members of the dissertation committee oversaw the qualitative data analysis process.

In order to ensure validity of the meta-inferences drawn from this study, the integrative model of quality was used (Onwuegbuzie & Johnson, 2006). As part of this model, the researcher utilized her dissertation committee to help ensure design fidelity. Additionally, interpretative consistency was achieved by comparing the meta-inferences drawn from the study to the qualitative and quantitative findings to ensure findings were consistent. Theoretical consistency was ensured due to the study being guided by a conceptual framework and findings being compared with the current state of the science. Lastly, integrative efficacy was used to help properly incorporate the inferences gathered from the quantitative and qualitative strands of the study. Lastly, the integration of the quantitative and qualitative findings was also illustrated in a joint display. All of these strategies and strengths resulted in the study's high quality meta-inferences.

Conclusion

This study is the first mixed methods study to offer insight into gender-specific barriers and facilitators to HRQoL in adults with CF. Findings from the study can be used to inform research, clinical practice, and policy development. Future research and interventions based on this innovative study could potentially lead to mitigation of barriers and overall improvement of HRQoL for people with CF.

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APPENDIX A

PRISMA DIAGRAM

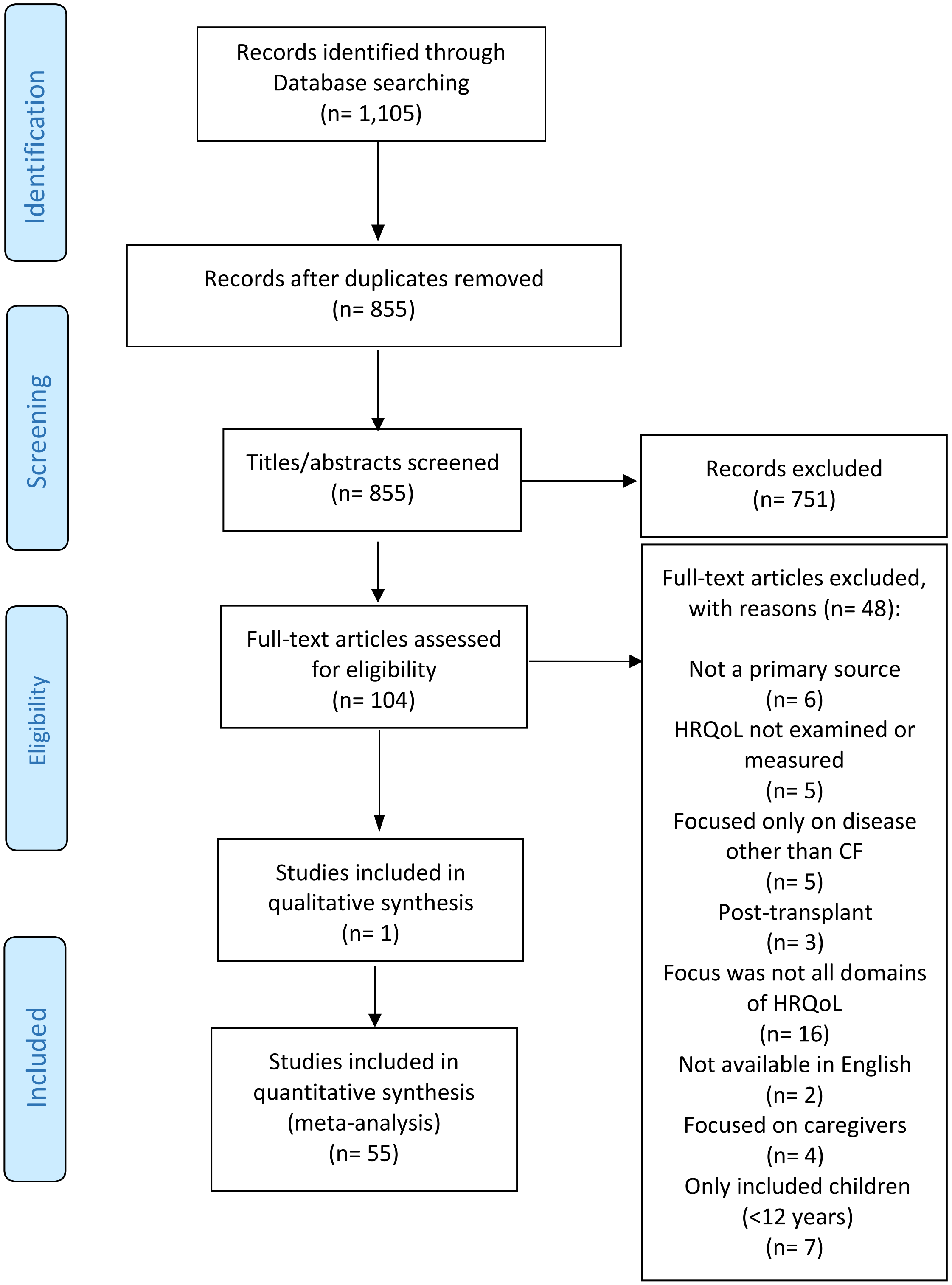


Figure A1. PRISMA Diagram

APPENDIX B

CONCEPTUAL AND OPERATIONAL DEFINITIONS OF COMPONENTS OF HRQOL

Table B1

Conceptual and Operational Definitions of Components of HRQoL

Domain	Conceptual Definition	Operational Definition
Physical Functioning	Limitations in physical activity related to CF.	CFQ-R; CFQoL
Body Image	How people with CF feel that the disease has made them look and feel different from peers.	CFQ-R; CFQoL
Social Functioning	How CF and associated treatments have affected socialization.	CFQ-R; CFQoL
Health Perceptions	How people with CF feel about health status in terms of whether they feel healthy.	CFQ-R
Respiratory Symptoms/Chest Symptoms	How often respiratory symptoms such as coughing are present.	CFQ-R; CFQoL
Treatment Burden/Treatment Issues	To what extent the prescribed treatment regimen makes life more difficult.	CFQ-R; CFQoL
Emotional Functioning	To what extent the participant felt worried or upset about CF.	CFQ-R; CFQoL
Role Functioning	How CF interferes with school, work, etc.	CFQ-R
Vitality/Energy	How energetic people are able to be despite having CF.	CFQ-R
Eating Difficulties	How difficult CF makes it for them to be able to eat.	CFQ-R
Digestive Symptoms	Presence of abdominal pain associated with CF.	CFQ-R
Weight	Issues gaining weight.	CFQ-R
Career Concerns	How CF interferes with career.	CFQoL
Interpersonal Relationships	How CF affects relationships with others.	CFQoL
Future Concerns	Concerns for the future because of CF.	CFQoL

Note. This table presents conceptual and operational definitions of the domains for health-related quality of life included in the Cystic Fibrosis Questionnaire Revised (CFQ-R) and the Cystic Fibrosis Quality of Life Questionnaire (CFQoL) (Gee, Abbott, Conway, Etherington, & Webb, 2000; Quittner et al., 2012).

APPENDIX C

CONCEPTUAL FRAMEWORK

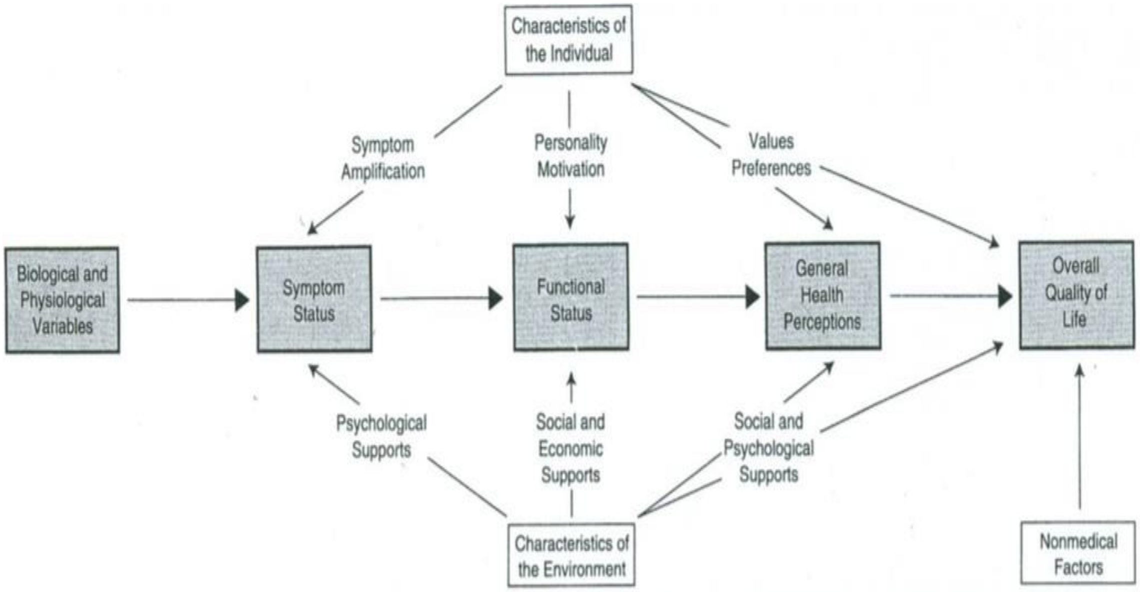


Figure C1. Wilson and Cleary's (1995) relationships among measures of patient outcome in health-related quality of life conceptual model.

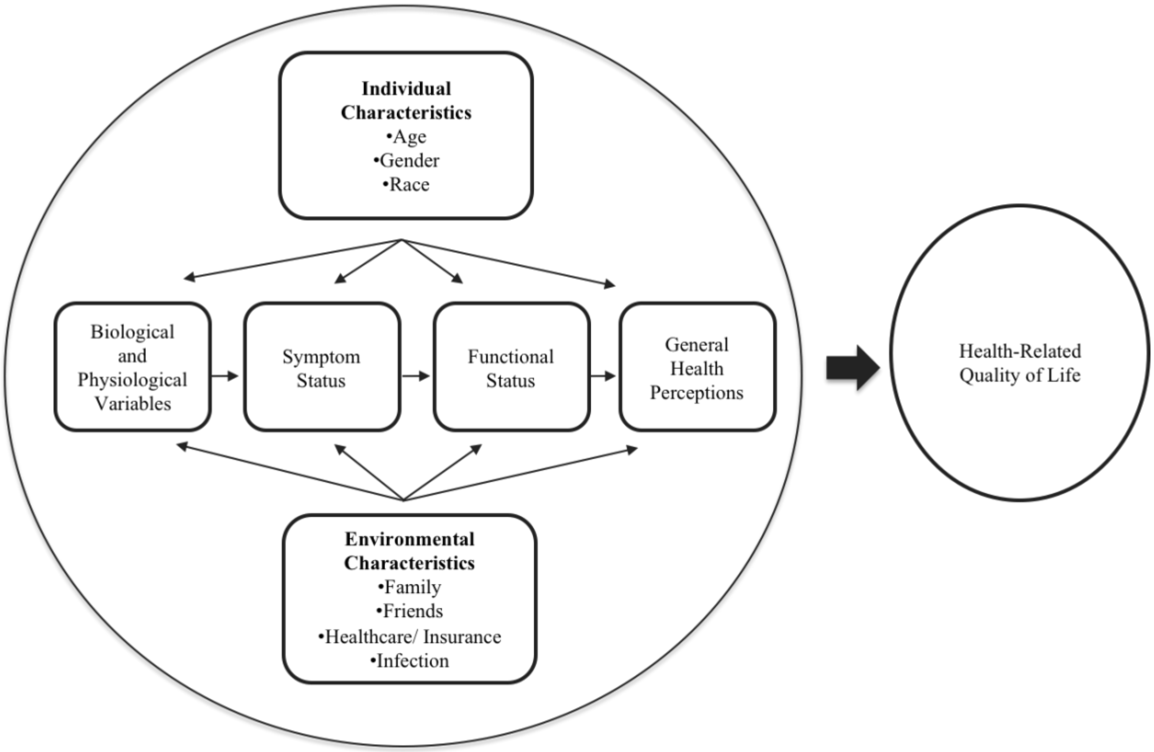


Figure C2. Adapted model of health-related quality of life in those with CF based on literature review.

APPENDIX D

MEASUREMENT TABLE

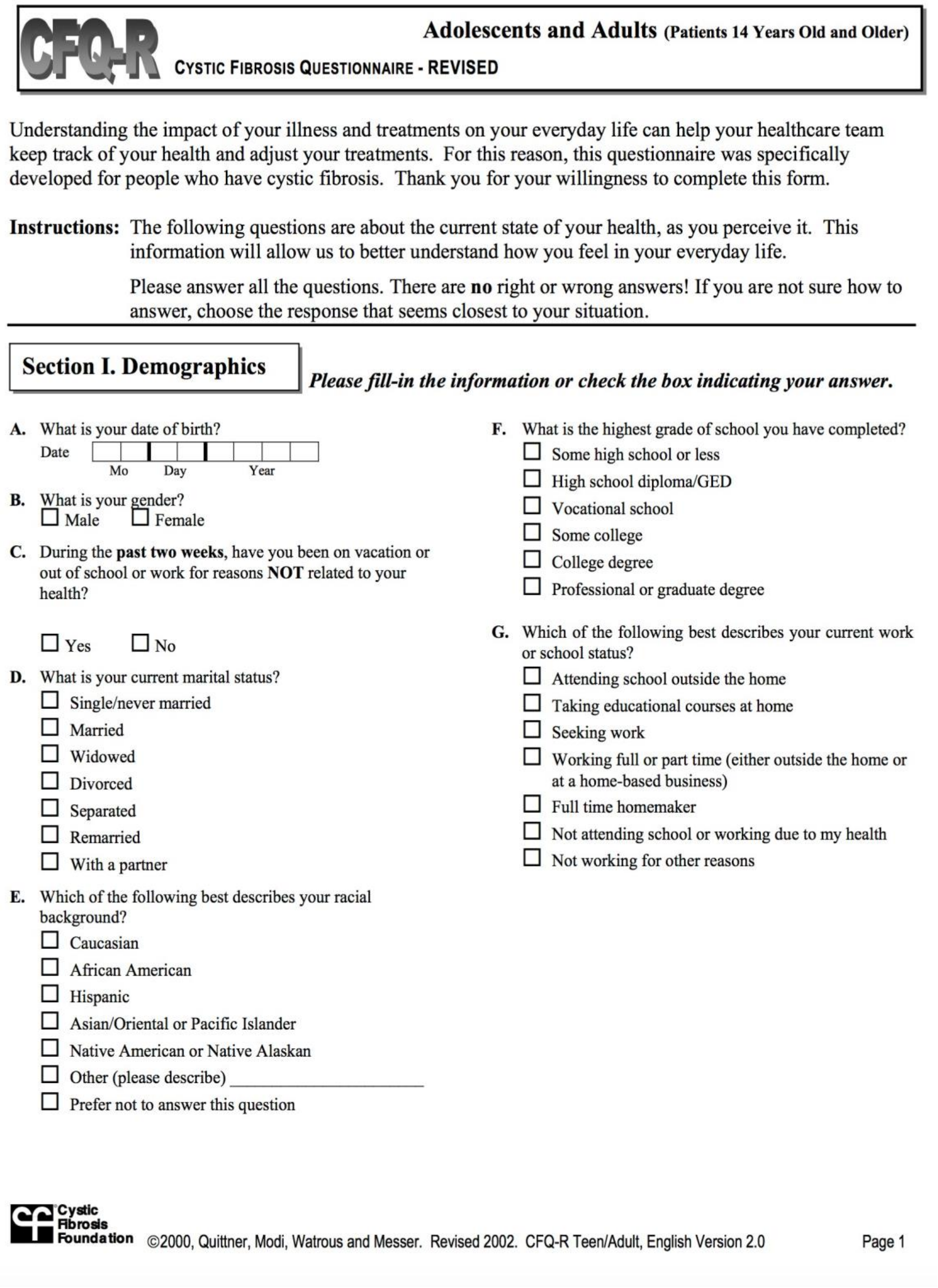
Table D1

Measurement Table

Concept	**Definitions**	**Measurement**	**Validity/Reliability**	**Time of Measurement**
				Baseline
Health-related quality of life	Encompasses physical, social, psychological, and functional aspects of daily living and how CF impacts each one	CFQ-R	Cronbach’s alpha = 0.88	**X**

APPENDIX E

INSTRUMENTS AND SCORING GUIDELINES



CFQ-R

Adolescents and Adults (Patients 14 Years Old and Older)

CYSTIC FIBROSIS QUESTIONNAIRE - REVISED

Understanding the impact of your illness and treatments on your everyday life can help your healthcare team keep track of your health and adjust your treatments. For this reason, this questionnaire was specifically developed for people who have cystic fibrosis. Thank you for your willingness to complete this form.

Instructions: The following questions are about the current state of your health, as you perceive it. This information will allow us to better understand how you feel in your everyday life.

Please answer all the questions. There are **no** right or wrong answers! If you are not sure how to answer, choose the response that seems closest to your situation.

Section I. Demographics

Please fill-in the information or check the box indicating your answer.

A. What is your date of birth?

Date ☐☐ ☐☐ ☐☐☐☐
Mo Day Year

B. What is your gender?

☐ Male ☐ Female

C. During the **past two weeks**, have you been on vacation or out of school or work for reasons **NOT** related to your health?

☐ Yes ☐ No

D. What is your current marital status?

☐ Single/never married
☐ Married
☐ Widowed
☐ Divorced
☐ Separated
☐ Remarried
☐ With a partner

E. Which of the following best describes your racial background?

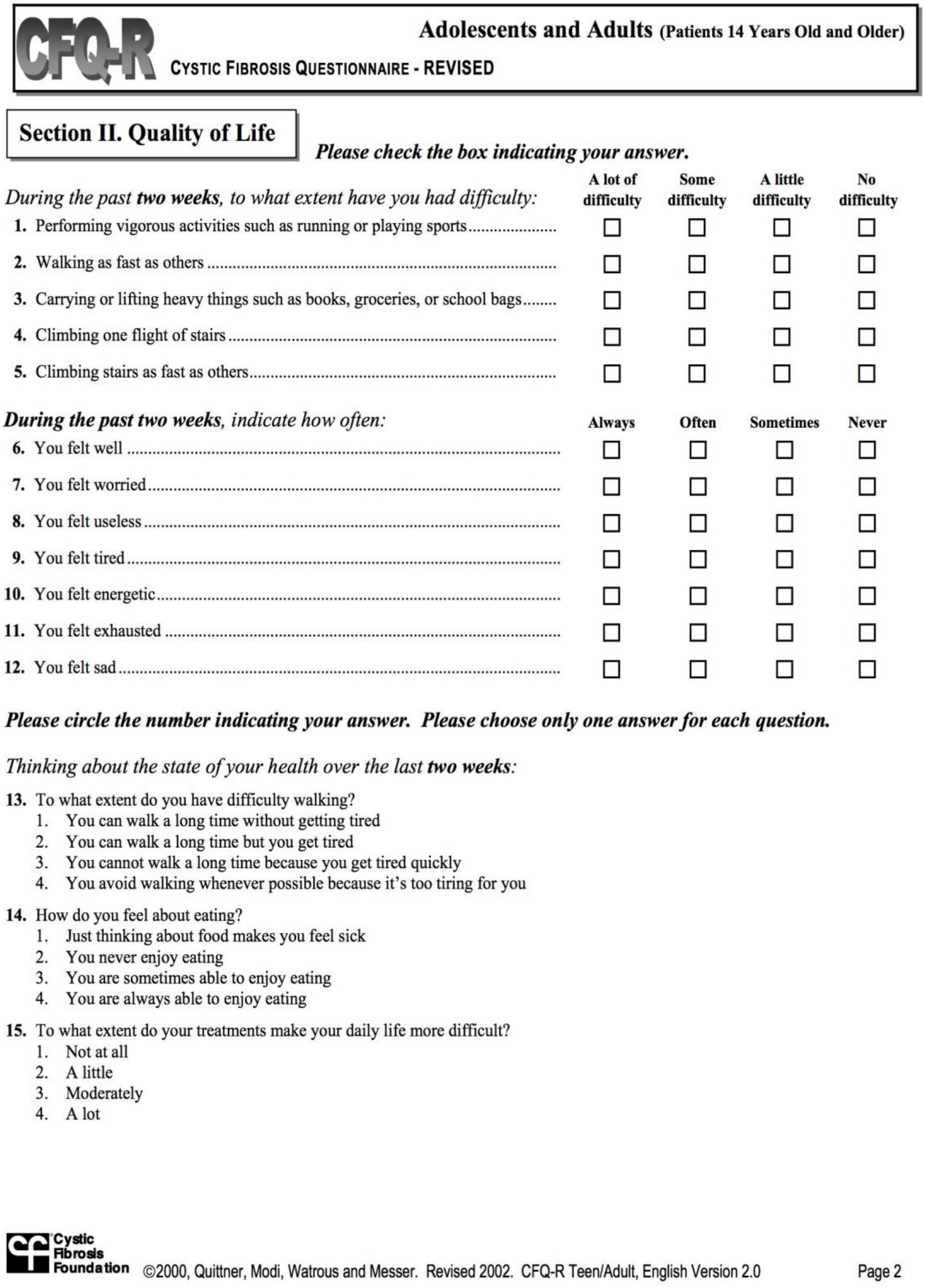
☐ Caucasian
☐ African American
☐ Hispanic
☐ Asian/Oriental or Pacific Islander
☐ Native American or Native Alaskan
☐ Other (please describe) ______________________
☐ Prefer not to answer this question

F. What is the highest grade of school you have completed?

☐ Some high school or less
☐ High school diploma/GED
☐ Vocational school
☐ Some college
☐ College degree
☐ Professional or graduate degree

G. Which of the following best describes your current work or school status?

☐ Attending school outside the home
☐ Taking educational courses at home
☐ Seeking work
☐ Working full or part time (either outside the home or at a home-based business)
☐ Full time homemaker
☐ Not attending school or working due to my health
☐ Not working for other reasons



CFQ-R **Adolescents and Adults** (Patients 14 Years Old and Older)

CYSTIC FIBROSIS QUESTIONNAIRE - REVISED

Section II. Quality of Life

Please check the box indicating your answer.

*During the past **two weeks**, to what extent have you had difficulty:*	A lot of difficulty	Some difficulty	A little difficulty	No difficulty
1. Performing vigorous activities such as running or playing sports	☐	☐	☐	☐
2. Walking as fast as others	☐	☐	☐	☐
3. Carrying or lifting heavy things such as books, groceries, or school bags	☐	☐	☐	☐
4. Climbing one flight of stairs	☐	☐	☐	☐
5. Climbing stairs as fast as others	☐	☐	☐	☐

***During the past two weeks**, indicate how often:*	Always	Often	Sometimes	Never
6. You felt well	☐	☐	☐	☐
7. You felt worried	☐	☐	☐	☐
8. You felt useless	☐	☐	☐	☐
9. You felt tired	☐	☐	☐	☐
10. You felt energetic	☐	☐	☐	☐
11. You felt exhausted	☐	☐	☐	☐
12. You felt sad	☐	☐	☐	☐

Please circle the number indicating your answer. Please choose only one answer for each question.

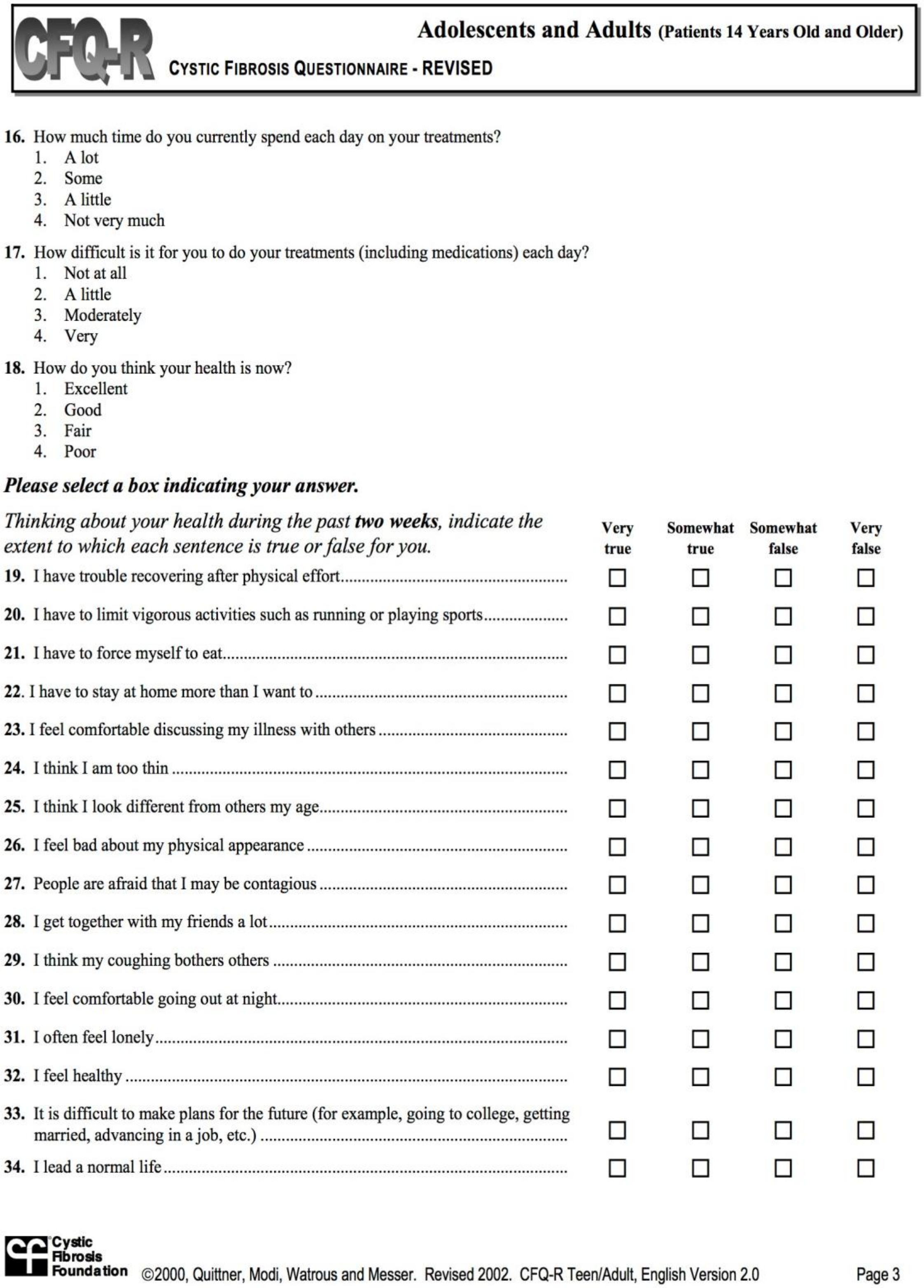
*Thinking about the state of your health over the last **two weeks**:*

13. To what extent do you have difficulty walking?
1. You can walk a long time without getting tired
2. You can walk a long time but you get tired
3. You cannot walk a long time because you get tired quickly
4. You avoid walking whenever possible because it's too tiring for you

14. How do you feel about eating?
1. Just thinking about food makes you feel sick
2. You never enjoy eating
3. You are sometimes able to enjoy eating
4. You are always able to enjoy eating

15. To what extent do your treatments make your daily life more difficult?
1. Not at all
2. A little
3. Moderately
4. A lot

Cystic Fibrosis Foundation



CFQ-R

Adolescents and Adults **(Patients 14 Years Old and Older)**

CYSTIC FIBROSIS QUESTIONNAIRE - REVISED

16. How much time do you currently spend each day on your treatments?
1. A lot
2. Some
3. A little
4. Not very much

17. How difficult is it for you to do your treatments (including medications) each day?
1. Not at all
2. A little
3. Moderately
4. Very

18. How do you think your health is now?
1. Excellent
2. Good
3. Fair
4. Poor

Please select a box indicating your answer.

Thinking about your health during the past ***two weeks****, indicate the extent to which each sentence is true or false for you.*	**Very true**	**Somewhat true**	**Somewhat false**	**Very false**
19. I have trouble recovering after physical effort	☐	☐	☐	☐
20. I have to limit vigorous activities such as running or playing sports	☐	☐	☐	☐
21. I have to force myself to eat	☐	☐	☐	☐
22. I have to stay at home more than I want to	☐	☐	☐	☐
23. I feel comfortable discussing my illness with others	☐	☐	☐	☐
24. I think I am too thin	☐	☐	☐	☐
25. I think I look different from others my age	☐	☐	☐	☐
26. I feel bad about my physical appearance	☐	☐	☐	☐
27. People are afraid that I may be contagious	☐	☐	☐	☐
28. I get together with my friends a lot	☐	☐	☐	☐
29. I think my coughing bothers others	☐	☐	☐	☐
30. I feel comfortable going out at night	☐	☐	☐	☐
31. I often feel lonely	☐	☐	☐	☐
32. I feel healthy	☐	☐	☐	☐
33. It is difficult to make plans for the future (for example, going to college, getting married, advancing in a job, etc.)	☐	☐	☐	☐
34. I lead a normal life	☐	☐	☐	☐

Cystic Fibrosis Foundation

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Page 3

CFQ-R **Adolescents and Adults** **(Patients 14 Years Old and Older)**
CYSTIC FIBROSIS QUESTIONNAIRE - REVISED

Section III. School, Work, or Daily Activities

Questions 35 through 38 are about school, work, or other daily tasks.

35. To what extent did you have trouble keeping up with your schoolwork, professional work, or other daily activities during the past **two weeks**?

1. You have had no trouble keeping up
2. You have managed to keep up but it's been difficult
3. You have been behind
4. You have not been able to do these activities at all

36. How often were you absent from school, work, or unable to complete daily activities during the last two weeks because of your illness or treatments?

☐ Always ☐ Often ☐ Sometimes ☐ Never

37. How often does CF get in the way of meeting your school, work, or personal goals

☐ Always ☐ Often ☐ Sometimes ☐ Never

38. How often does CF interfere with getting out of the house to run errands such as shopping or going to the bank?

☐ Always ☐ Often ☐ Sometimes ☐ Never

Section IV. Symptom Difficulties

Please select a box indicating your answer.

Indicate how you have been feeling during the past ***two weeks.***	**A great deal**	**Somewhat**	**A little**	**Not at all**
39. Have you had trouble gaining weight?	☐	☐	☐	☐
40. Have you been congested?	☐	☐	☐	☐
41. Have you been coughing during the day?	☐	☐	☐	☐
42. Have you had to cough up mucus?	☐	☐	☐	☐ **Go to Question 44**

43. Has your mucus been mostly: ☐ Clear ☐ Clear to yellow ☐ Yellowish-green ☐ Green with traces of blood ☐ Don't know

How often during the past ***two weeks:***	**Always**	**Often**	**Sometimes**	**Never**
44. Have you been wheezing?	☐	☐	☐	☐
45. Have you had trouble breathing?	☐	☐	☐	☐
46. Have you woken up during the night because you were coughing?	☐	☐	☐	☐
47. Have you had problems with gas?	☐	☐	☐	☐
48. Have you had diarrhea?	☐	☐	☐	☐
49. Have you had abdominal pain?	☐	☐	☐	☐
50. Have you had eating problems?	☐	☐	☐	☐

Please be sure you have answered all the questions.

THANK YOU FOR YOUR COOPERATION!

Cystic Fibrosis Foundation

General Scoring Instructions

For ease of interpretation, the questions on the CFQ-R are labeled according to the number on the questionnaire and the domain they are designed to measure. The domain label precedes the question number. For example the first question on the questionnaire is designed to measure a physical symptom and its label is “Phys1.” The complete labeling for each version of the CFQ-R is presented under the section entitled “Question Labels”.

The following scoring codes were written to be used with CFQ-R data that was entered into a database/spreadsheet where each question is a unique variable. The variable names should match the question labels listed in the “Question Labels” section. Values for each question range from 1 to 4. For questions with responses listed horizontally (left to right) the left resonse category should be assigned a value of 1, the second category should be assigned a 2, the third a 3, and the rightmost category should be a ssigned a 4.

Here is an example.

1. Performing vigorous activities such as running or playing sports……. **1** **2** **3** **4**

For questions that are listed vertically (top to bottom), the top category should be assigned a value of 1, the next a 2, the third a 3, and the bottom category a 4.

Here is an example.

13. To what extent do you have difficulty walking?	Scoring Values
1. You can walk a long time without getting tired	(**1**)
2. You can walk a long time but you get tired	(**2**)
3. You cannot walk a long time because you get tired quickley	(**3**)
4. You avoid walking whenever possible because it’s too tiring for you	(**4**)

It is important that you assign the values according to these rules for each question. Some of the questions will be phrased in a positive direction (like Question 13 listed above) and the values may seem inappropriate. The scoring codes reverse the ordering for these positively phrased questions. **Do not reverse the coding when you are entering the scores into your database/spreadsheet**. We have found it to be more accurate to let the scoring proceedures address the reverse coding.

Please note that question 43 (resp43) on the Teen/Adult version and question 37 (resp37) on the Parent version have one extra category (don’t know) we typically assign a value of 5 to that category. This question is not included in the scoring of the respiratory scale.

Question Labels

CFQ-R Teen/Adult Version

Question 1 = phys1
Question 2 = phys2
Question 3 = phys3
Question 4 = phys4
Question 5 = phys5
Question 6 = vital6
Question 7 = emot7
Question 8 = emot8
Question 9 = vital9
Question 10 = vital10
Question 11 = vital11
Question 12 = emot12
Question 13 = phys13
Question 14 = eat14
Question 15 = treat15
Question 16 = treat16
Question 17 = treat17
Question 18 = health18
Question 19 = phys19
Question 20 = phys20
Question 21 = eat21
Question 22 = social22
Question 23 = social23
Question 24 = body24
Question 25 = body25
Question 26 = body26
Question 27 = social27
Question 28 = social28
Question 29 = social29
Question 30 = social30
Question 31 = emot31
Question 32 = health32
Question 33 = emot33
Question 34 = health34
Question 35 = role35
Question 36 = role36
Question 37 = role37
Question 38 = role38
Question 39 = weight39
Question 40 = resp40
Question 41 = resp41
Question 42 = resp42
Question 43 = resp43
Question 44 = resp44
Question 45 = resp45
Question 46 = resp46
Question 47 = digest47
Question 48 = digest48
Question 49 = digest49
Question 50 = eat50

CFQ-R Parent Version

Question 1 = phys1
Question 2 = phys2
Question 3 = phys3
Question 4 = phys4
Question 5 = phys5
Question 6 = emot6
Question 7 = emot7
Question 8 = vital8
Question 9 = vital9
Question 10 = vital10
Question 11 = vital11
Question 12 = vital12
Question 13 = school13
Question 14 = phys14
Question 15 = phys15
Question 16 = phys16
Question 17 = eat17
Question 18 = treat18
Question 19 = body19
Question 20 = body20
Question 21 = body21
Question 22 = health22
Question 23 = emot23
Question 24 = health24
Question 25 = emot25
Question 26 = emot26
Question 27 = school27
Question 28 = school28
Question 29 = school29
Question 30 = treat30
Question 31 = treat31
Question 32 = health32
Question 33 = weight33
Question 34 = resp34
Question 35 = resp35
Question 36 = resp36
Question 37 = resp37
Question 38 = resp38
Question 39 = resp39
Question 40 = resp40
Question 41 = digest41
Question 42 = digest42
Question 43 = digest43
Question 44 = eat44

CFQ-R Child Version

Question 1 = phys1
Question 2 = phys2
Question 3 = phys3
Question 4 = phys4
Question 5 = phys5
Question 6 = phys6
Question 7 = emot7
Question 8 = emot8
Question 9 = emot9
Question 10 = emot10
Question 11 = emot11
Question 12 = emot12
Question 13 = emot13
Question 14 = emot14
Question 15 = eat15
Question 16 = treat16
Question 17 = eat17
Question 18 = treat18
Question 19 = eat19
Question 20 = social20
Question 21 = social21
Question 22 = social22
Question 23 = social23
Question 24 = social24
Question 25 = social25
Question 26 = social26
Question 27 = body27
Question 28 = body28
Question 29 = body29
Question 30 = treat30
Question 31 = resp31
Question 32 = resp32
Question 33 = resp33
Question 34 = resp34
Question 35 = digest35

SPSS Program Codes for Scoring the CFQ-R Teen/Adult Version

```
*Recoding Some Items.

recode vital6 vital10 phys13 treat15 treat17 health18 social23 social28 social30 health32
health34 resp43 role35 (1=4) (2=3) (3=2) (4=1).

 *Calculating Scores.

compute physical = (mean.4 (phys1, phys2, phys3, phys4, phys5, phys13, phys19, phys20)-
1)/3*100.
compute role = (mean.2 (role35, role36, role37, role38)-1)/3*100.
compute vitality = (mean.2 (vital6, vital9, vital10, vital11)-1)/3*100.
compute emotion = (mean.2 (emot7, emot8, emot12, emot31, emot33)-1)/3*100.
compute social = (mean.3 (social22, social23, social27, social28, social29, social30)-1)/3*100.
compute body = (mean.2(body24, body25, body26)-1)/3*100.
compute eat = (mean.1(eat14, eat21, eat50)-1)/3*100.
compute treat = (mean.1 (treat15, treat16, treat17)-1)/3*100.
compute health = (mean.1 (health18, health32, health34)-1)/3*100.
compute weight = (mean.0 (weight39)-1)/3*100.
compute respirat = (mean.3 (resp40, resp41, resp42, resp44, resp45, resp46)-1)/3*100.
compute digest = (mean.1(digest47, digest48, digest49)-1)/3*100.
Execute.
```

SPSS Program Codes for Scoring the CFQ-R Parent Version

```
*Recoding Some Items.

recode emot6 vital10 vital12 phys15 treat31 health22 health24 health32 school28 resp37 (1=4)
(2=3) (3=2) (4=1).

 *Calculating Scores.

compute physical = (mean.4 (phys1, phys2, phys3, phys4, phys5, phys14, phys15, phys16)-
1)/3*100.
compute emotion = (mean.2 (emot6, emot7, emot23, emot25, emot26)-1)/3*100.
compute vitality = (mean.2 (vital8, vital9, vital10, vital11, vital12)-1)/3*100.
compute school = (mean.2 (school13, school27, school28, school29)-1)/3*100.
compute eat = (mean.1 (eat17, eat44)-1)/3*100.
compute body = (mean.1 (body19, body20, body21)-1)/3*100.
compute treat = (mean.1 (treat18, treat30, treat31)-1)/3*100.
compute health = (mean.1 (health22, health24, health32)-1)/3*100.
compute respirat = (mean.3 (resp34, resp35, resp36, resp38, resp39, resp40)-1)/3*100.
compute digest = (mean.1 (digest41, digest42, digest43)-1)/3*100.
compute weight = (mean.0 (weight33)-1)/3*100.

Execute.
```

SPSS Program Codes for Scoring the CFQ-R Child Version

```
*Recoding Some Items.

recode phys1 phys2 phys3 phys4 phys5 emot14 treat18 eat19 social20 social22 social24
social26 (1=4) (2=3) (3=2) (4=1).

 *Calculating Scores.

compute physical = (mean.3 (phys1, phys2, phys3, phys4, phys5, phys6)-1)/3*100.
compute emotion = (mean.4 (emot7, emot8, emot9, emot10, emot11, emot12, emot13, emot14)-
1)/3*100.
compute social = (mean.3 (social20, social21, social22, social23, social24, social25, social26)-
1)/3*100.
compute eat = (mean.1 (eat15, eat17, eat19)-1)/3*100.
compute body = (mean.1 (body27, body28, body29)-1)/3*100.
compute treat = (mean.1 (treat16, treat18, treat30)-1)/3*100.
compute respirat = (mean.2 (resp31, resp32, resp33, resp34)-1)/3*100.
compute digest = (mean.0 (digest35)-1)/3*100.

Execute.
```

Interview Guide

Thank you for taking the time to talk with me today. Everything we say will be recorded unless you request otherwise during the interview. The purpose of our study is to help us learn how people cope with having CF and how different styles of coping contribute to health and well-being. The interview is meant to build upon the surveys that you completed. First, I want to ask about your medications and how often you take them. Second, I will ask questions about your quality of life related to living with cystic fibrosis. I will be audio-taping and taking notes during the interview. Audio recordings will be transcribed word for word and reviewed by the researchers involved with this study. A number will be used to identify you during the interview instead of your name in order to protect your identity. You may end the interview at any time or ask to skip questions that you do not want to answer. You will still receive your compensation for your participation.

Quality of Life Questions:

1. **What is/are the hardest part(s) about living with cystic fibrosis?**

2. **Share a typical day with me.**

    - ➢ What aspects of your life help improve your quality of life?
        - o i.e. support from friends or family
    - ➢ What aspects of your life make you less satisfied with your quality of life?
        - o i.e. difficulty incorporating your CF treatments into your daily life

3. **What does living with CF mean to you?**
    - ➢ i.e. How would you describe it to me?

4. **In looking at how your view yourself:**

    Physical Aspects

    - ➢ How do you view your body image?
        - o How has CF affected your body image?
        - o What strategies have you used use to help or improve your body image?
    - ➢ How do you view your weight? i.e. healthy weight, low weight etc.
        - o What strategies have you used use to help or improve your weight?
    - ➢ How, if at all, have the digestive symptoms (stomach pain, bloating, gas etc.) of CF affected your quality of life?
        - o What strategies have you used to help or improve your digestive symptoms?
    - ➢ How does having cystic fibrosis affect your ability to function physically? i.e. physical activity, walking or climbing steps, etc.
        - o What strategies have you used use to help or improve your physical function?

- ➢ How has CF affected your appetite?
  - o What strategies have you used use to help or improve your appetite?
- ➢ How would you describe your respiratory function and its effect on your quality of life?
  - o What strategies have you used use to help or improve your respiratory function?

Social/Role Functioning

- ➢ How are your roles (student, wife/husband, mother/father, friend etc.) affected by CF?
  - o What strategies have you used use to help or improve your role function?
- ➢ How does CF affect your energy level? Provide an example.
  - o What strategies have you used use to help or improve your energy level?

Emotional Functioning

- ➢ What emotional (worries, fears) and social aspects (ability to socialize with family or friends) of your life have been affected by CF?
  - o What strategies have you used to help or improve your emotional state and ability to socialize?

Treatments

- ➢ How does your CF-related treatment routine affect your day-to-day life?
  - o What strategies have you used use to help your quality of life related to your treatment routine?

Gender

- ➢ How, if at all, does being a man (or woman) affect your quality of life?

5. **Is there anything you would like to add about things that have affected your quality of life in a positive or negative way that we did not discuss in the interview?**

Thank you so much for taking the time out of your day to participate in the interview.

APPENDIX F

VARIABLES INCLUDED IN THE STUDY WITH EMPIRICAL INDICATORS

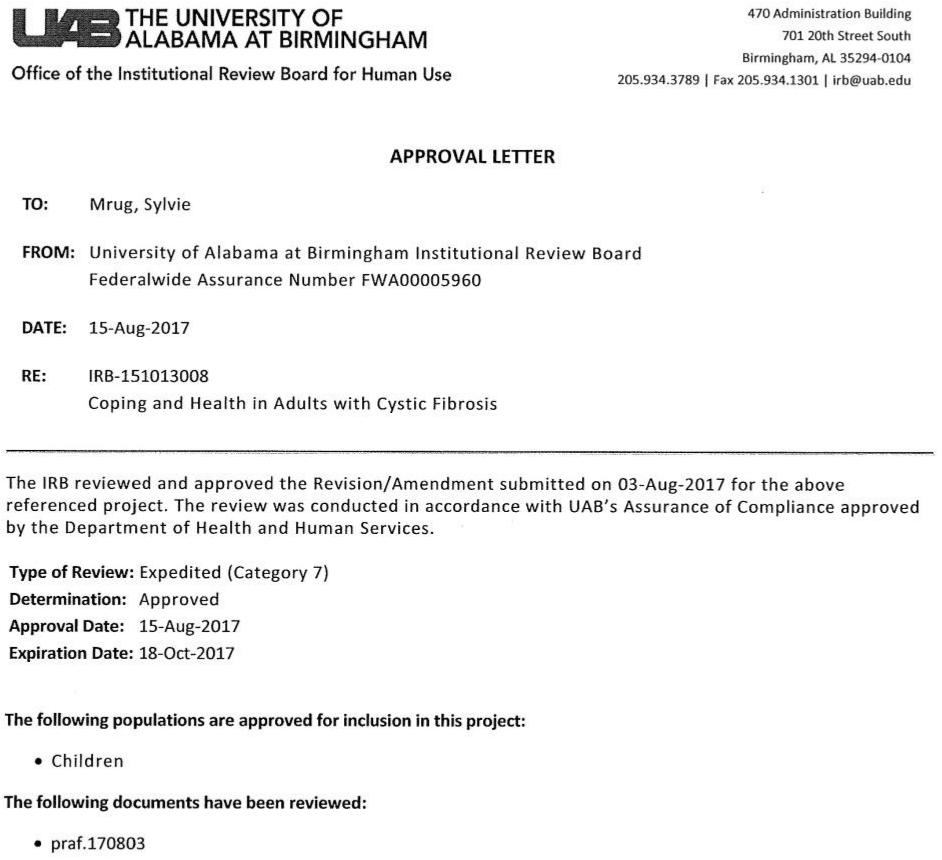
Table F1

Variables Measured with Definitions and Empirical Indicators

Variable	Conceptual Definition	Empirical Indicator	Conceptual Model
Physical Functioning	Limitations in physical activity related to CF.	CFQ-R domain	Functional Status
Body Image	How people who have CF feel that the disease has made them look and feel different from peers.	CFQ-R domain	General health perceptions
Social Functioning	How CF and associated treatments have affected socialization.	CFQ-R domain	Functional status
Health Perceptions	How people with CF feel about health status in terms of whether they feel healthy.	CFQ-R domain	General health perceptions
Respiratory Symptoms	How often respiratory symptoms such as coughing are present.	CFQ-R domain	Symptom status
Treatment Burden	To what extent the prescribed treatment regimen makes life more difficult.	CFQ-R domain	General health perceptions
Emotional Functioning	To what extent the participant felt worried or upset about CF.	CFQ-R domain	Functional status
Role Functioning	How CF interferes with school, work etc.	CFQ-R domain	Functional status
Vitality/Energy	How energetic people are able to be despite having CF.	CFQ-R domain	Symptom status
Eating Difficulties	How difficult CF makes it for them to be able to eat.	CFQ-R domain	Symptom status
Weight	Issues gaining weight.	CFQ-R domain	Symptom status
P. aeruginosa and Burkholderia cepacia status (+/-)	Environmental pathogens that cause decreased lung function in those with CF.	Cystic Fibrosis Foundation Patient Registry	Environmental characteristics
Lung Function	Forced expiratory volume in 1 second (FEV1).	Cystic Fibrosis Foundation Patient Registry	Biological and physiological variables
Demographics	Age, gender, dating/marital status, employment status, etc.	Demographics form	Individual characteristics

APPENDIX G

INSTITUTIONAL REVIEW BOARD MATERIALS



THE UNIVERSITY OF
ALABAMA AT BIRMINGHAM
Office of the Institutional Review Board for Human Use

470 Administration Building
701 20th Street South
Birmingham, AL 35294-0104
205.934.3789 | Fax 205.934.1301 | irb@uab.edu

APPROVAL LETTER

TO: Mrug, Sylvie

FROM: University of Alabama at Birmingham Institutional Review Board
Federalwide Assurance Number FWA00005960

DATE: 15-Aug-2017

RE: IRB-151013008
Coping and Health in Adults with Cystic Fibrosis

The IRB reviewed and approved the Revision/Amendment submitted on 03-Aug-2017 for the above referenced project. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services.

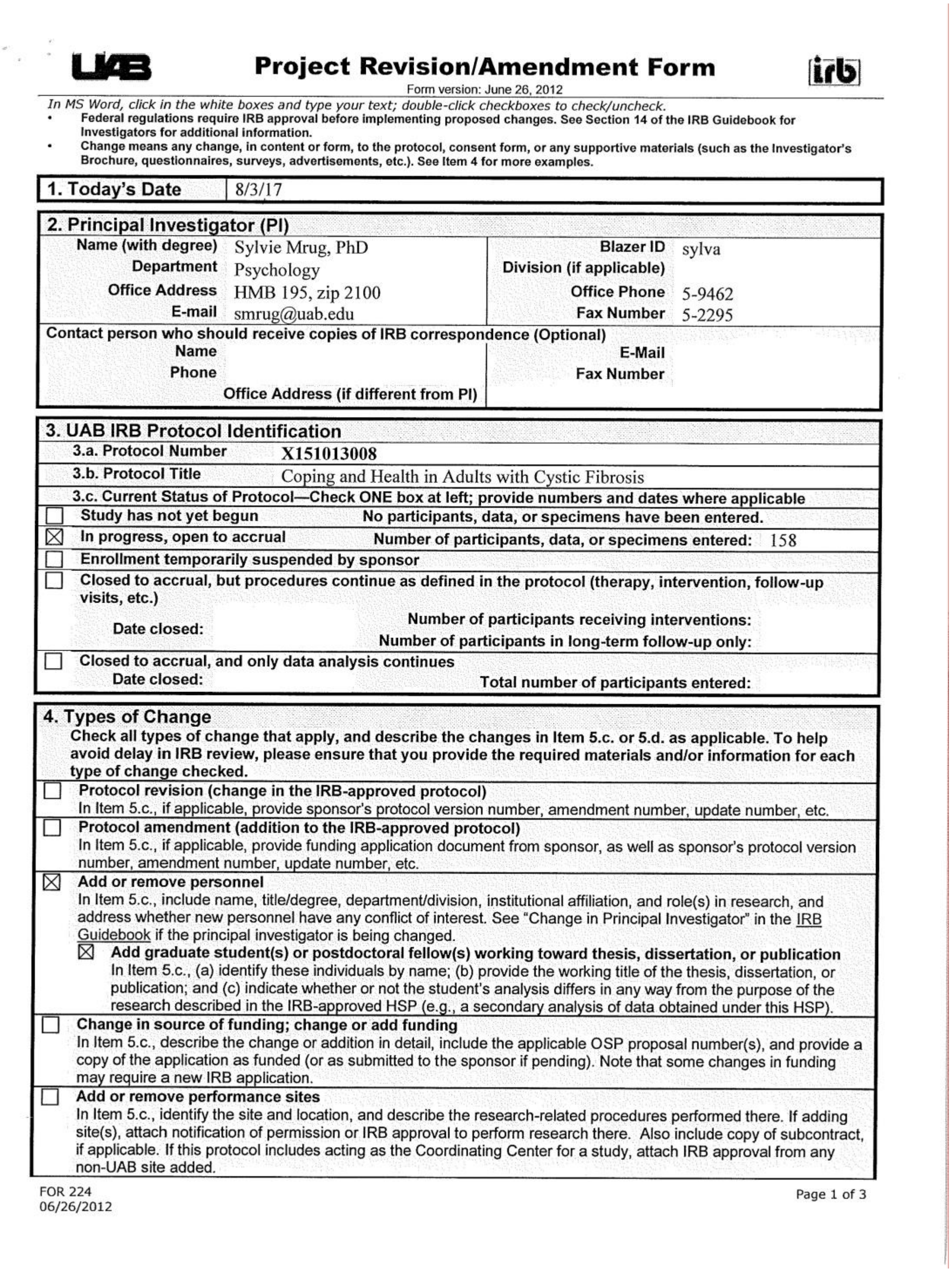
Type of Review: Expedited (Category 7)
Determination: Approved
Approval Date: 15-Aug-2017
Expiration Date: 18-Oct-2017

The following populations are approved for inclusion in this project:

- Children

The following documents have been reviewed:

- praf.170803



UAB

Project Revision/Amendment Form

irb

Form version: June 26, 2012

In MS Word, click in the white boxes and type your text; double-click checkboxes to check/uncheck.

- **Federal regulations require IRB approval before implementing proposed changes. See Section 14 of the IRB Guidebook for Investigators for additional information.**
- **Change means any change, in content or form, to the protocol, consent form, or any supportive materials (such as the Investigator's Brochure, questionnaires, surveys, advertisements, etc.). See Item 4 for more examples.**

1. Today's Date	8/3/17

2. Principal Investigator (PI)

Name (with degree)	Sylvie Mrug, PhD	**Blazer ID**	sylva
Department	Psychology	**Division (if applicable)**	
Office Address	HMB 195, zip 2100	**Office Phone**	5-9462
E-mail	smrug@uab.edu	**Fax Number**	5-2295

Contact person who should receive copies of IRB correspondence (Optional)

Name		**E-Mail**	
Phone		**Fax Number**	
Office Address (if different from PI)			

3. UAB IRB Protocol Identification

3.a. Protocol Number	**X151013008**
3.b. Protocol Title	Coping and Health in Adults with Cystic Fibrosis

3.c. Current Status of Protocol—Check ONE box at left; provide numbers and dates where applicable

☐ **Study has not yet begun** — **No participants, data, or specimens have been entered.**

☒ **In progress, open to accrual** — **Number of participants, data, or specimens entered:** 158

☐ **Enrollment temporarily suspended by sponsor**

☐ **Closed to accrual, but procedures continue as defined in the protocol (therapy, intervention, follow-up visits, etc.)**

Date closed:

Number of participants receiving interventions:

Number of participants in long-term follow-up only:

☐ **Closed to accrual, and only data analysis continues**

Date closed:

Total number of participants entered:

4. Types of Change

Check all types of change that apply, and describe the changes in Item 5.c. or 5.d. as applicable. To help avoid delay in IRB review, please ensure that you provide the required materials and/or information for each type of change checked.

☐ **Protocol revision (change in the IRB-approved protocol)**
In Item 5.c., if applicable, provide sponsor's protocol version number, amendment number, update number, etc.

☐ **Protocol amendment (addition to the IRB-approved protocol)**
In Item 5.c., if applicable, provide funding application document from sponsor, as well as sponsor's protocol version number, amendment number, update number, etc.

☒ **Add or remove personnel**
In Item 5.c., include name, title/degree, department/division, institutional affiliation, and role(s) in research, and address whether new personnel have any conflict of interest. See "Change in Principal Investigator" in the IRB Guidebook if the principal investigator is being changed.

- ☒ **Add graduate student(s) or postdoctoral fellow(s) working toward thesis, dissertation, or publication**
  In Item 5.c., (a) identify these individuals by name; (b) provide the working title of the thesis, dissertation, or publication; and (c) indicate whether or not the student's analysis differs in any way from the purpose of the research described in the IRB-approved HSP (e.g., a secondary analysis of data obtained under this HSP).

☐ **Change in source of funding; change or add funding**
In Item 5.c., describe the change or addition in detail, include the applicable OSP proposal number(s), and provide a copy of the application as funded (or as submitted to the sponsor if pending). Note that some changes in funding may require a new IRB application.

☐ **Add or remove performance sites**
In Item 5.c., identify the site and location, and describe the research-related procedures performed there. If adding site(s), attach notification of permission or IRB approval to perform research there. Also include copy of subcontract, if applicable. If this protocol includes acting as the Coordinating Center for a study, attach IRB approval from any non-UAB site added.

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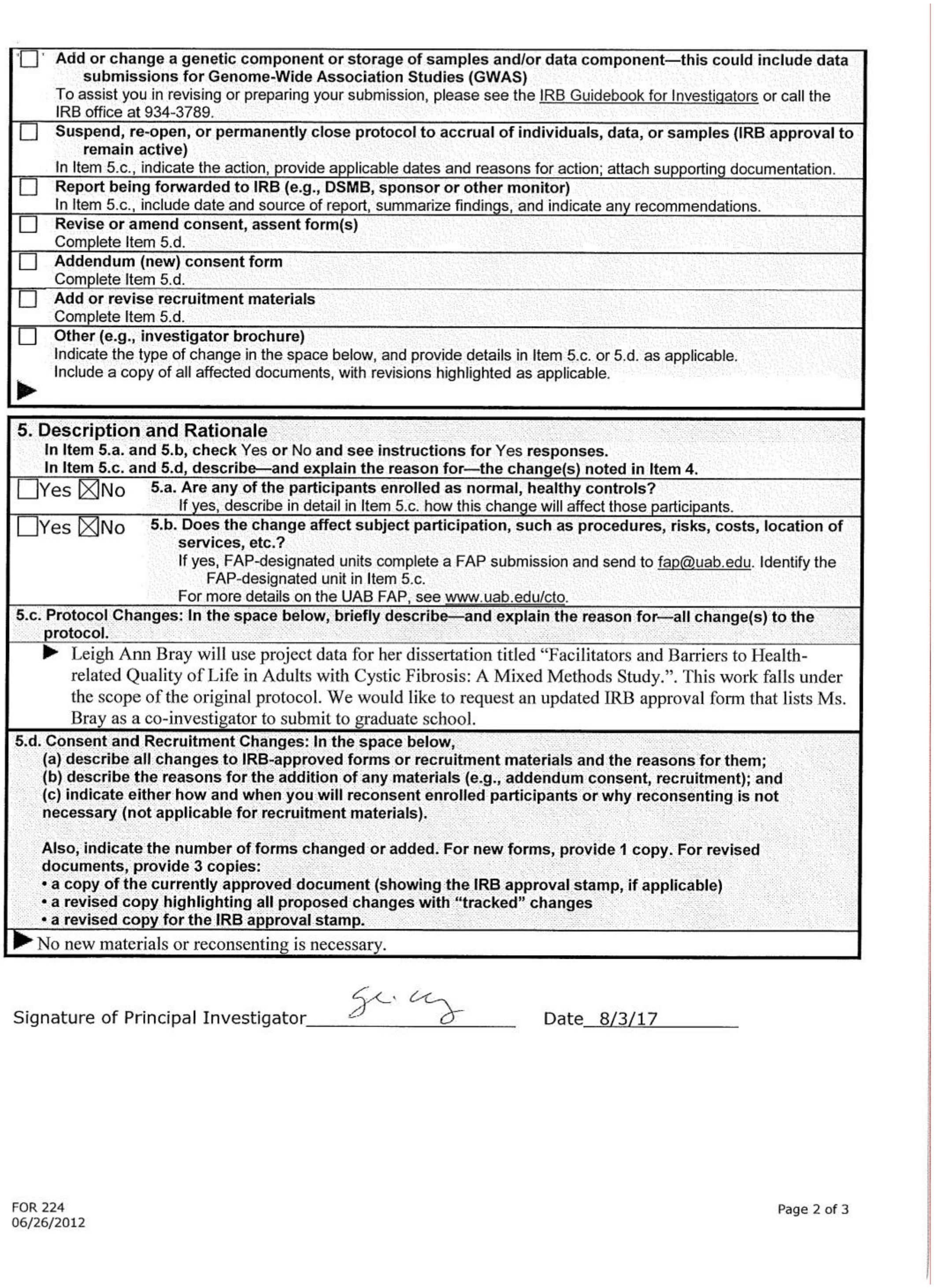

☐ **Add or change a genetic component or storage of samples and/or data component—this could include data submissions for Genome-Wide Association Studies (GWAS)**
To assist you in revising or preparing your submission, please see the IRB Guidebook for Investigators or call the IRB office at 934-3789.

☐ **Suspend, re-open, or permanently close protocol to accrual of individuals, data, or samples (IRB approval to remain active)**
In Item 5.c., indicate the action, provide applicable dates and reasons for action; attach supporting documentation.

☐ **Report being forwarded to IRB (e.g., DSMB, sponsor or other monitor)**
In Item 5.c., include date and source of report, summarize findings, and indicate any recommendations.

☐ **Revise or amend consent, assent form(s)**
Complete Item 5.d.

☐ **Addendum (new) consent form**
Complete Item 5.d.

☐ **Add or revise recruitment materials**
Complete Item 5.d.

☐ **Other (e.g., investigator brochure)**
Indicate the type of change in the space below, and provide details in Item 5.c. or 5.d. as applicable.
Include a copy of all affected documents, with revisions highlighted as applicable.

►

5. Description and Rationale

In Item 5.a. and 5.b, check Yes **or** No **and see instructions for** Yes **responses.**
In Item 5.c. and 5.d, describe—and explain the reason for—the change(s) noted in Item 4.

☐Yes ☒No **5.a. Are any of the participants enrolled as normal, healthy controls?**
If yes, describe in detail in Item 5.c. how this change will affect those participants.

☐Yes ☒No **5.b. Does the change affect subject participation, such as procedures, risks, costs, location of services, etc.?**
If yes, FAP-designated units complete a FAP submission and send to fap@uab.edu. Identify the FAP-designated unit in Item 5.c.
For more details on the UAB FAP, see www.uab.edu/cto.

5.c. Protocol Changes: In the space below, briefly describe—and explain the reason for—all change(s) to the protocol.

► Leigh Ann Bray will use project data for her dissertation titled "Facilitators and Barriers to Health-related Quality of Life in Adults with Cystic Fibrosis: A Mixed Methods Study.". This work falls under the scope of the original protocol. We would like to request an updated IRB approval form that lists Ms. Bray as a co-investigator to submit to graduate school.

5.d. Consent and Recruitment Changes: In the space below,
(a) describe all changes to IRB-approved forms or recruitment materials and the reasons for them;
(b) describe the reasons for the addition of any materials (e.g., addendum consent, recruitment); and
(c) indicate either how and when you will reconsent enrolled participants or why reconsenting is not necessary (not applicable for recruitment materials).

Also, indicate the number of forms changed or added. For new forms, provide 1 copy. For revised documents, provide 3 copies:
- **a copy of the currently approved document (showing the IRB approval stamp, if applicable)**
- **a revised copy highlighting all proposed changes with "tracked" changes**
- **a revised copy for the IRB approval stamp.**

► No new materials or reconsenting is necessary.

Signature of Principal Investigator________________ Date 8/3/17

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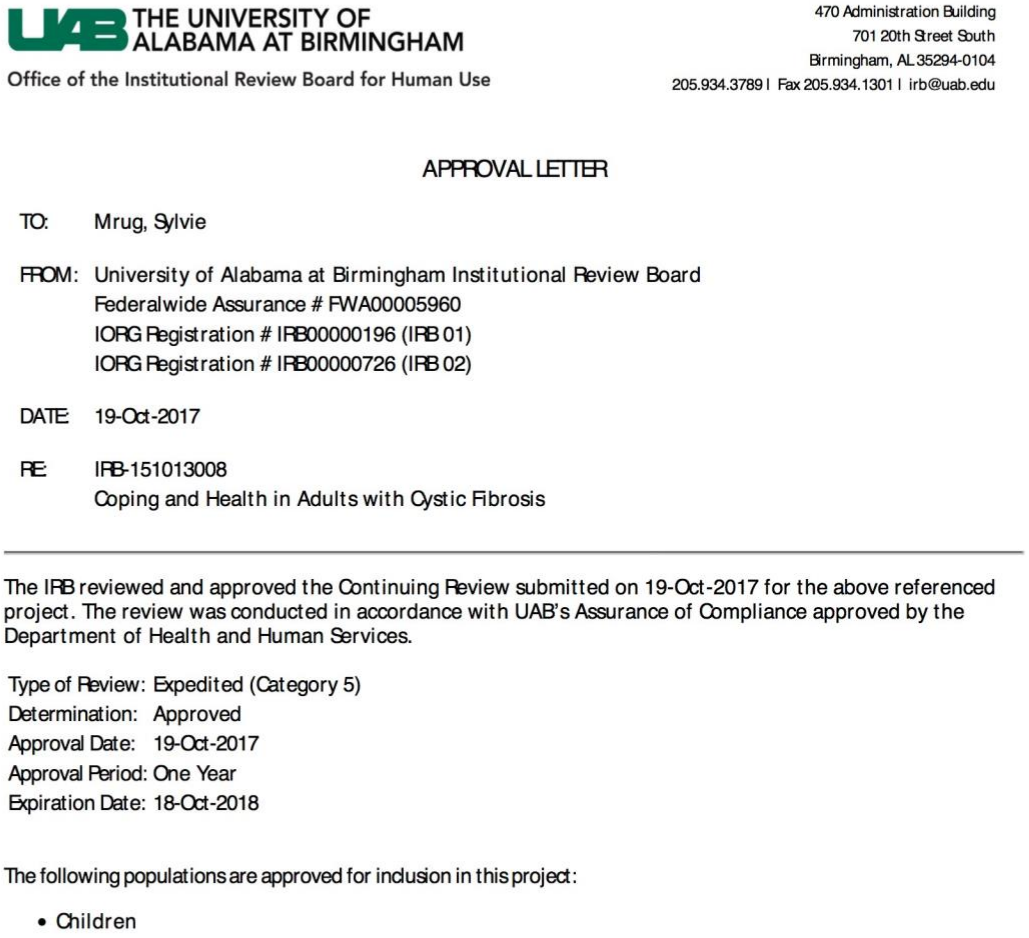

THE UNIVERSITY OF
ALABAMA AT BIRMINGHAM
Office of the Institutional Review Board for Human Use

470 Administration Building
701 20th Street South
Birmingham, AL 35294-0104
205.934.3789 | Fax 205.934.1301 | irb@uab.edu

APPROVAL LETTER

TO: Mrug, Sylvie

FROM: University of Alabama at Birmingham Institutional Review Board
Federalwide Assurance # FWA00005960
IORG Registration # IRB00000196 (IRB 01)
IORG Registration # IRB00000726 (IRB 02)

DATE: 19-Oct-2017

RE: IRB-151013008
Coping and Health in Adults with Cystic Fibrosis

The IRB reviewed and approved the Continuing Review submitted on 19-Oct-2017 for the above referenced project. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services.

Type of Review: Expedited (Category 5)
Determination: Approved
Approval Date: 19-Oct-2017
Approval Period: One Year
Expiration Date: 18-Oct-2018

The following populations are approved for inclusion in this project:

- Children

APPENDIX H

PROCEDURAL DIAGRAM

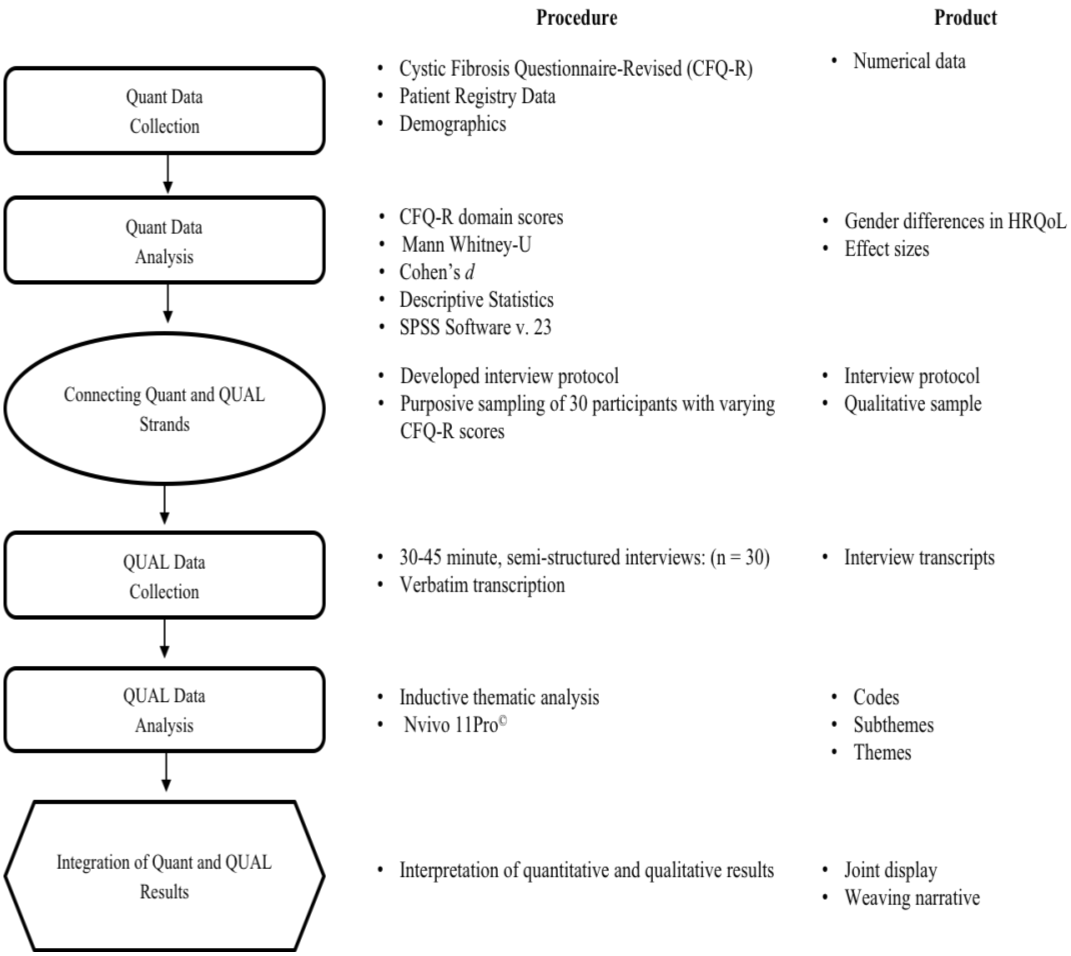

Figure H1. Procedural diagram of sequential Quan → QUAL mixed methods study.

APPENDIX I

JOINT DISPLAY

Table I1

Integrated Findings Presented in a Joint Display

Quantitative Results		Qualitative Themes				
CFQ-R	*p*	Biological and Physiological Factors	External Factors	Functional Status	Perceptions of Preferences, Values, and Mental Health	Perceived Symptom Status
Physical Functioning Men: 66.16 Women: 53.95	**0.02**	Physical strength of men could be a biological factor that could contribute to a better understanding of the statistically significant difference.	Income limitations in order to receive government-funded insurance benefits negatively impacted men's HRQoL related to being able to have a job.	Men were more likely to utilize resources to improve physical functioning such as occupational therapy.	Women preferred more support in completing their treatment regimen. Also, women were more concerned with feeling different or being labeled as disabled by peers.	Perception of symptoms such as coughing, shortness of breath, and digestive symptoms affected how well a person was able to function physically while performing activities of daily living.
Role Functioning Men: 71.05 Women: 67.38	0.42	Both men and women expressed wanting to become a parent despite fertility issues. However, men were concerned with assuming the role of the provider.	Support was the main facilitator for both men and women in making sure that roles at home, work, etc., were fulfilled.	CF interfering with role functioning in the workplace or at school was a common barrier expressed by both men and women.	Both men and women experienced anxiety related to the uncertainty of their health and how the decline of their health could impact their roles as a parent, child, etc.	How a person with CF perceives his or her symptom status subsequently affects how they function in their roles as a student, parent, friend, etc.
Vitality Men: 52.63 Women: 50.51	0.60	Biological and physiological factors, such as a lung transplant, positively impacted participants' perceived energy level.	Social support was an external factor that positively impacted vitality due to participants' finding motivation to keep going from their kids, spouses, etc.	Vitality negatively impacted functional status due to participants tiring out quicker than they would like and needing a	Having a positive outlook was discussed by participants as having a positive impact on vitality due to participants linking energy level to mentality.	Perception of vitality and physical energy were not congruent. Participants spoke about being mentally ready to recover before they were physically

Quantitative Results		Qualitative Themes				
CFQ-R	*p*	Biological and Physiological Factors	External Factors	Functional Status	Perceptions of Preferences, Values, and Mental Health	Perceived Symptom Status
				longer recovery time.		ready and that there was a need to find balance.
Emotional Functioning Men: 74.04 Women: 64.95	**0.02**	Factors such as waiting on a lung transplant can cause a drastic decrease in emotional functioning. Also, presence of a chronic lung infection caused fear and uncertainty pertaining to health in the study sample.	External factors such as social support had a positive impact on emotional functioning. Women more frequently voiced their need for support from others pertaining to their treatment regimen.	When participants voiced not being able to function as well as they wanted to on a daily basis, negative emotions such as depression and/or frustration often resulted.	Personal perception in terms of having a positive perspective positively impacted participant reports of emotional functioning.	Maintaining hope in new therapies and research was depicted as having a positive impact on emotional functioning.
Social Functioning Men: 66.37 Women: 57.91	**0.03**	Receiving a lung transplant allowed social functioning to improve by allowing participants to return to school and/or the gym.	The external factor of social media was portrayed as positively and negatively affecting social functioning. Support was positive, while negativity was also often seen on social media.	Participants reported that being hospitalized was the biggest barrier to their social functioning.	Being open with others about having CF was mentioned as a facilitator to social functioning by men only.	Incorporating others into treatment time promoted social functioning and made participants feel less restricted.
Body Image Men: 62.38 Women: 63.97	0.79	Men expressed frustration with not being able to grow normally due to CF, which resulted in a smaller stature than desired.	Women with CF expressed their desire to be thin even when it required going against healthcare providers' recommendations at times.	Some men reported wearing a shirt at all times due to having a negative body image.	Some women were proud of the scars associated with CF and saw them as a mark of all that they had overcome in their battle with CF.	Men often reported perceiving their body image as negative their entire lives.
Eating Difficulties Men: 84.02 Women: 83.84	0.97	Participants explained that getting a lung transplant allowed them to have their feeding tube	Being in a social setting was portrayed more often by women as promoting eating difficulties because they did	Participants discussed not being able to eat on dates and in social settings due to embarrassment	Some participants explained having to adjust their way of thinking after	Both men and women expressed a link between appetite and feeling like

Quantitative Results		Qualitative Themes				
CFQ-R	*p*	Biological and Physiological Factors	External Factors	Functional Status	Perceptions of Preferences, Values, and Mental Health	Perceived Symptom Status
		removed and regain their appetite.	not want to take their enzymes in front of a crowd.	or digestive symptoms.	starting Orkambi because it caused them to gain weight and they were no longer able to eat as freely as they wanted.	they were getting sick.
Treatment Burden Men: 53.80 Women: 50.51	0.30	The presence of a chronic lung infection was portrayed as increasing the treatment burden.	External factors, such as avoiding contact with sick people, was depicted as often increasing the treatment burden of CF.	Participants felt caught between being able to function socially and doing their treatments because skipping treatments also rendered them unable to go to social events.	Perceptions of other people who have CF's experiences on social media could increase anxiety and corresponding treatment burden related to milestones such as lung transplant.	Some participants perceived their treatments as less important than school and/or work obligations, which at times increased the treatment burden.
Health Perception Men: 63.35 Women: 56.06	0.11	The presence of a lung infection greatly influenced health perception because of uncertainty, worries, and fears related to the subsequent health decline.	Overall health perception was portrayed as being greatly influenced by support system and having a positive perspective related to CF.	Health perception was depicted as being transient from day-to-day and affected how the person with CF was able to function on any given day. Participants mentioned having "bad days."	Those who were optimistic and looked at CF in a positive light had an overall positive perception of their health.	Factors that participants mentioned as having a negative effect on their overall health perception included feeling out of breath and not having a lot of energy.
Weight Men: 57.31 Women: 73.74	**0.02**	The presence of a chronic lung infection often caused weight loss and, in some cases, participants had to get a	Healthcare providers' perceptions of participants' weight were brought up when discussing the participant's perception of	Multiple women attributed their high FEV1 and functional status to their stable and healthy weight.	Women most often desired to be thin and perceived their weight as "good" or "normal," even when the healthcare	Men desired to gain weight but expressed difficulty in doing so despite prescribed therapies aimed at

Quantitative Results		Qualitative Themes				
CFQ-R	*p*	Biological and Physiological Factors	External Factors	Functional Status	Perceptions of Preferences, Values, and Mental Health	Perceived Symptom Status
		feeding tube placed.	weight and body image. The providers' opinions had both positive and negative impacts on the participants.		provider did not agree.	improving weight.
Respiratory Functioning Men: 60.04 Women: 58.08	0.65	The presence of a chronic infection was often portrayed by participants as causing their respiratory function values to decrease.	External factors, such as bacteria and viruses carried by friends and family had a negative impact on respiratory functioning.	Women often discussed their worry about how low their FEV1 would get before they were unable to function socially with their friends or family.	Participants talked about going through a state of rebellion in young adulthood and being non-compliant. This often resulted in decrease in FEV1 and hospitalization.	Relationship between respiratory functioning and overall quality of life was depicted by most participants. When they lost lung function, they felt that all other areas of their HRQoL decreased as well.
Digestive Symptoms Men: 71.54 Women: 72.39	0.84	Women were negatively affected by bloating and were mistaken for being pregnant, which negatively impacted body image.	Men talked about how digestive symptoms did not embarrass them and that they did not let them impact going out with their friends or others within their support system.	Digestive symptoms were a barrier to both social and role functioning due to being restrictive on social and work activities.	Both men and women reported having diet preferences that improved digestive symptoms, including fermented tea and limiting spicy and fatty foods.	Women perceived the digestive symptom of bloating as a barrier to HRQoL.

*Bolded *p*-values indicate statistical significance at $p \leq 0.05$