2013-07-30

Healthcare Provider Acceptability of a Behavioral Intervention to Promote Adherence

Katherine A. McLean
University of Miami, kmclean@psy.miami.edu

UNIVERSITY OF MIAMI

HEALTHCARE PROVIDER ACCEPTABILITY OF A BEHAVIORAL INTERVENTION TO PROMOTE ADHERENCE

By

Katherine Ann McLean

A THESIS

Submitted to the Faculty
of the University of Miami
in partial fulfillment of the requirements for
the degree of Master of Science

Coral Gables, Florida

August 2013

UNIVERSITY OF MIAMI

A thesis submitted in partial fulfillment of

the requirements for the degree of

Master of Science

HEALTHCARE PROVIDER ACCEPTABILITY OF A BEHAVIORAL INTERVENTION TO PROMOTE ADHERENCE

Katherine Ann McLean

Approved:

Alexandra L. Quittner, Ph.D. Professor of Psychology & Pediatrics	M. Brian Blake, Ph.D. Dean of the Graduate School
Neena Malik, Ph.D. Psychology Training Director Miller School of Medicine	Amanda Jensen-Doss, Ph.D. Assistant Professor of Psychology

MCLEAN, KATHERINE ANN (M.S., Psychology)
(August 2013)

Healthcare Provider Acceptability of
a Behavioral Intervention to Promote Adherence.

Abstract of a thesis at the University of Miami.

Thesis supervised by Professor Alexandra L. Quittner.

No. of pages in text. (74)

Adherence to medical regimens is a difficult and costly issue among individuals with chronic illness, with rates of adherence generally less than 50%. Many types of adherence interventions have been developed to address this issue, including educational, organizational, and multi-component or behavioral interventions. Of these interventions, multi-component or behavioral have been the most effective at improving adherence, yet they have failed to produce lasting gains in adherence or clinical outcomes. This may be due to providers' and consumers' lack of perceived acceptability of the intervention. Treatment acceptability may significantly affect how an intervention is implemented, as well as its efficacy. This study assessed the acceptability of a brief, behavioral intervention to improve adherence in adolescents with cystic fibrosis (CF) implemented by healthcare providers within the specialty clinic setting. Using the Behavioral Interventionist Satisfaction Survey (BISS), this study: 1) assessed HCPs' perceptions of the acceptability, feasibility, and utility of problem-solving, 2) examined associations among the six scales of the BISS, 3) determined the impact of HCP characteristics on BISS scale scores, 4) examined associations between BISS scale scores and HCPs' treatment fidelity, and 5) content analyzed qualitative responses on the BISS. The BISS was found to be psychometrically valid, and scores on the BISS indicated HCPs found PS highly acceptable, feasible, and generalizable. No differences in BISS scale scores were

found based on HCP characteristics. HCPs reported encountering significant clinic-level barriers while implementing PS.

Table of Contents

List of Figures

List of Tables

Chapter 1: Introduction

Prescribed medications and treatments are only effective if patients take them and take them correctly (DiMatteo, 2002). Across both pediatric and adult chronic conditions, adherence to prescribed regimens is at or below 50% (Johnson & Carlson, 2004; Quittner et al. 2008; Sabaté, 2003; Sackett & Snow, 1979). Poor adherence is a complicated, pervasive and costly issue that is associated with many negative health consequences, including increased morbidity and mortality (Balkrishnan, 2005; DiMatteo et al., 2002). In addition to worse health outcomes, poor adherence substantially increases the costs of health care. Recent estimates suggest that 33% to 69% of hospitalizations are due to poor adherence, with annual costs ranging from $100 to $300 billion dollars annually in the United States (Bender & Rand, 2004; Osterberg & Blaschke, 2005). Thus, adherence is one of the greatest challenges faced by health care providers (HCPs) in improving health outcomes for individuals with chronic illnesses. The purpose of this study is to evaluate the acceptability, feasibility and utility of a brief, behavioral intervention to improve adherence in adolescents with cystic fibrosis.

A number of factors have been shown to influence patient adherence, including the complexity of the regimen (Sawicki, Sellers, & Robinson, 2009), knowledge of the disease, barriers such as costs and side effects, and perceptions of treatment efficacy (Balkrishnan, 1998; Briesacher et al., 2011; Modi & Quittner, 2006). Several types of interventions to improve adherence have been tested, including educational, organizational, and behavioral. However, the majority of these interventions have demonstrated limited efficacy and poor maintenance of treatment effects (Kripilani, 2007). In general, multi-component interventions, such as Behavioral Family Systems

Therapy (BFST; Wysocki et al., 2006) have been shown to be most effective (Kripalani et al., 2007; Rapoff, 2010). These multidimensional interventions include education about medications and disease management, organizational strategies to reduce the frequency of dosing, sessions to improve family communication and problem-solving (Rapoff 2010). Although these interventions have demonstrated reasonable efficacy, their wide-spread use has been limited by the high demands they place on patient and family time and resources (Kahana et al., 2008).

In contrast, the current study evaluated a clinic-based adherence intervention that is conducted during routine specialty care. This intervention approach has several advantages. First, adherence challenges are addressed in the clinic setting where the patient receives his/her medical care, and thus, does not require additional time or travel. Second, the intervention is implemented by the HCPs who are familiar with the patient and parents and have already developed rapport with the family. Finally, it integrates the evaluation and treatment of adherence issues into the medical setting, which normalizes these challenges, facilitates open communication and ongoing discussion of adherence issues.

Interventions to Improve Adherence

Educational Interventions. Educational interventions utilize verbal, written, and computer-based information to inform patients and families about diseases, treatments, and potential side effects (Rapoff, 2010). HCPs may provide handouts or websites to their patients to increase their knowledge of the disease and its management, with the aim of improving adherence. In general, these interventions have minimal effects on

adherence, with small effect sizes (Kahana et al., 2008). One possible reason for these outcomes is that education is only indirectly related to adherence behaviors and focuses on remediating only one barrier (e.g., knowledge of when to take medications). In a 2010 metanalysis, Graves and colleagues found slightly better results for educational interventions; however, long-term outcome data are still limited. Researchers (Rapoff, 2010) emphasize that knowledge of disease management and its treatment are necessary but not sufficient to improve adherence.

Organizational Interventions. Organizational interventions modify the way medical care is provided to increase access to care (e.g., contacting HCP more easily), simplify medical regimens, and facilitate HCP supervision of adherence (Rapoff, 2010). Organizational strategies vary, but typically focus on time management and communication about the treatment regimen, using strategies, such as written plans and text messaging (Miloh et al., 2009; Quittner et al., 2000). HCPs can reduce regimen complexity, cost (e.g., patient assistance programs), and side effects to improve adherence (Winnick, Lucas, Hartman, & Toll, 2005). Miloh and colleagues (2009) successfully utilized a multi-step, text-messaging reminder system to improve objective measures of adherence (e.g., blood levels of anti-rejection medications) and clinical outcomes in adolescents who received a liver transplant. However, follow-up data on long-term maintenance of these gains was not reported.

Organizational interventions can be implemented during clinic visits; however, many of these strategies still place most of the burden on the patient to "solve" their adherence problems (Winnick, Lucas, Hartman, & Toll, 2005). In general, they have yielded mixed results, with some studies reporting positive effects on adherence and

clinical outcomes, while others have reported no effect or a worsening of adherence (Baird, et al., 1984; Brown et al., 1997; Kripalani et al., 2007). Organizational strategies may also be more difficult to implement in populations with complex regimens, such as CF. In the Miloh study, adolescents who were prescribed more than two immunosuppressant drugs were at higher risk of non-adherence and rejection, suggesting that more complex regimens may not be addressed by organizational interventions.

Behavioral or Multi-Component Interventions. Currently, behavioral or multi-component strategies are considered the most effective interventions for pediatric populations. They typically utilize cognitive-behavioral therapy (CBT) and problem-solving (PS) techniques, in conjunction with educational and organizational strategies, to create an individualized approach for the patient (Rapoff, 2010). Both CBT and PS are well-validated, evidence-based behavioral interventions that can be adapted to a variety of clinical environments (Durlak et al., 1991, D'Zurrilla & Goldfried, 1971; Morely et al., 1999). In a recent meta-analysis conducted by Kahana and colleagues (2008), behavioral and multi-component interventions had the greatest impact on adherence in pediatric populations with chronic illnesses (mean $d = 0.54$ and mean $d = 0.51$, respectively). However, follow-up data showed a decreasing effect size over time, indicating that these interventions did not produce lasting effects and a more promising strategy might be to integrate these interventions into routine care.

Similar intervention effects have been found with adults. Kripalani and colleagues (2007) found that the most effective interventions had several components, such as education, reduced dosing demands, and CBT. The most effective interventions were also implemented frequently and over multiple time points. Although effect sizes

for some of these interventions were moderate to large (0.43-1.20), only five of the 13 multi-component interventions had a significant, positive effect on rates of adherence, and only three had a positive effect on clinical outcomes (Kripalani et al., 2007). Their limited success may be attributable to difficulties with implementation, acceptability in the medical setting, and the time demands placed on patients. Of note, very few studies in either of these reviews included information on treatment fidelity or acceptability of the intervention to patients or providers. The proposed study will evaluate the acceptability of a brief, behavioral intervention for HCPs and examine perceived satisfaction of patients and caregivers.

BFST, which is the most commonly used multi-component intervention for adherence, illustrates the challenges of integrating this type of intervention into health care. It is a family-based intervention that focuses on problem-solving and minimizing family conflict, and requires the involvement of clinical psychologists and travel to the clinic or patient's home. It consists of 10 to 12 weekly, 90-minute sessions, which are in addition to visits for medical care. BFST has been utilized in pediatric populations, including teens with diabetes (Type 1 and Type 2) and CF, with some success in improving family conflict and communication (Harris et al., 2009; Quittner et al., 2000; Wysocki et al., 1999; Wysocki et al., 2000; Wysocki et al., 2008). BFST's impact on adherence and clinical outcomes has been limited, with slight improvements in self-reported adherence and HbA1C in adolescents with worse initial glycemic control. However, these clinical improvements were not significantly different between the BFST and educational intervention groups (Wysocki et al., 2006). Harris and colleagues (2005) found that after 10 sessions of home-based BFST, initial improvements in family and

diabetes-related conflict were not maintained at a 6-month follow up, and no changes in clinical outcomes were observed. Wysocki and colleagues found some success with a modification of BFST designed specifically for adolescents with diabetes; however, data on the long-term benefits of this modification are limited (Wysocki et al., 2007). In sum, despite the intensity of this intervention, few positive changes in adherence behaviors were found.

Similarly, multisystemic therapy (MST) has been utilized in pediatric populations, including children with perinatally acquired HIV-AIDS. MST addresses barriers to adherence at the child, family, and community levels, and was successful in reducing viral loads (Ellis et al., 2006). MST is intensive and requires a trained mental health specialist to deliver it in patients' homes up to three times weekly, for at least one hour. Duration of treatment is flexible, lasting up to eight months. MST is implemented outside of regular clinic visits, requiring families to be available for frequent home visits. Because of its intensity, clinicians can only carry a small caseload at any given time. This lack of feasibility makes MST difficult to implement on a larger scale and challenging to apply to other disease groups. To date, little data on maintenance of these adherence effects for MST in HIV-AIDS have been published (Ellis et al., 2006). MST was also applied to adolescents with poorly controlled Type 1 diabetes (Ellis et al, 2005; Ellis et al. 2006; Ellis et al., 2007). Some improvement in hospital admissions for diabetic ketoacidosis was found in the MST group at the end of treatment and at the six-month follow-up; however, no lasting improvements in adherence behaviors were found.

A more recent, clinic-based behavioral intervention demonstrated some success in improving HbA1c levels in children and young adolescents with type 1 diabetes. The

WE-CAN program was developed by Nansel and colleagues (2012) and utilized a clinic-based, modified PS intervention to address barriers to medical adherence. Importantly, the authors conducted an earlier feasibility study (Nansel et al., 2009) to assess the practicality of this clinic-based intervention, with good results. WE-CAN was implemented by "health advisors," or study personnel who were trained in the intervention. While study-related assessments were conducted in the home, the intervention was conducted during regularly-scheduled quarterly clinic visits. The authors found better glycemic control in the older age group (12-14 years of age) but not in the younger age group (9-11 years of age) at 24 months.

In sum, several different types of family-based, multi-component adherence interventions have been tested in adolescents with chronic conditions. Although these interventions have shown some success in improving parent-teen interactions and communication, there is minimal evidence of their efficacy in changing adherence behaviors or clinical outcomes. There may be several reasons for these disappointing results. First, both BFST and MST are time-limited interventions which were implemented over a period of four to eight months. It is possible that briefer, less intensive, but more frequent interventions focused on adherence are needed. In the current study, a brief behavioral adherence intervention is being performed at every clinic visit (i.e., quarterly). Thus, conversations, problem-solving and behavioral contracts are part of every medical visit.

Second, although psychologists or trained counselors are highly qualified to implement these interventions (Kahana et al., 2008), the relationships they establish with the adolescent and family are not maintained once the intervention is over and thus, there

is little continuity of care in relation to adherence. In contrast, if HCPs who are routinely involved in adolescent chronic care (e.g., nurses, social workers, dietitians), are trained to administer this type of intervention, both the interpersonal relationships and focus on adherence could be maintained.

Finally, given that both the adolescents' treatment regimens and lifestyles are changing and in transition (e.g., greater autonomy and socialization, shift of responsibility to teen), their barriers to adherence are also shifting and need to be addressed in real time and on a continual basis. For example, adolescents with CF often experience declines in lung function, triggering the prescription of new medications, which lengthens and complicates their daily regimen. Regularly occurring, clinic-based adherence interventions would be optimal in addressing these changes in disease management. Thus, implementing behavioral, multi-component adherence interventions in real-world clinic settings, with systematic training and supervision of HCPs, may increase the efficacy, feasibility and utility of these interventions. This approach is currently being tested in a national study of adolescents with CF (Quittner, 2011).

*iCARE Randomized Controlled Trial in C*F

CF is the most common genetic, life-limiting chronic illness in Caucasian populations, primarily affecting the respiratory and digestive systems. Prevalence is estimated to be 1 in 3000 live births among Caucasians, 1 in 13,500 among Hispanics and 1 in 15,000 among those of African descent (Cystic Fibrosis Foundation, 2010; Centers for Disease Control, 2007). There are currently 30,000 individuals with CF living in the United States, and approximately 70,000 worldwide (Cystic Fibrosis Foundation, 2012).

CF is caused by a recessive gene which alters the exchange of salt and water across the cell membrane (i.e., cystic fibrosis transmembrane regulator), leading to thick mucus secretions in several organs. This genetic mutation is common among Caucasians of European descent, with an estimated 1 in 25 individuals identified as carriers (Cystic Fibrosis Foundation, 2010). Although the mutation ΔF08 is the most common and accounts for around two-thirds of the cases in the US, over 1800 mutations of this gene have been identified (Cystic Fibrosis Foundation, 2010).

CF is characterized by repeated lung infections and difficulty with weight gain and growth. Currently, projected median life expectancy is approximately 37 years; however, according to the CF Foundation Patient Registry (2007), median age of death is in the mid-20's (Zemanick et al., 2010). Newborn screening for CF is now mandatory in all 50 states in the US, which has resulted in earlier diagnosis and initiation of treatment. The treatment regimen for CF is one of the most complex and time-consuming across chronic conditions, and includes airway clearance, aerosolized medications, increased calorie intake, and pancreatic enzymes with each meal and snack (Rowe & Clancy, 2006). A recent study of pediatric and adult patients with CF found that on average, individuals with CF spent two to four hours a day doing their treatments (Sawicki, Sellers, & Robinson, 2009). Rates of adherence range from 27% to 82% (Modi et al., 2006; Zindani et al., 2006), depending on the treatment and method of assessment, with overall adherence below 50% for the majority of treatments (Eakin et al., 2011; Farach et al., under review). Recently, Eakin and colleagues (2011) showed that worse adherence was directly linked to an increased number of pulmonary exacerbations and hospital

admissions. Adherence interventions that are feasible and effective are needed to address this well-documented challenge.

Quittner and colleagues are currently conducting a randomized controlled trial (RCT) to test the efficacy of a clinic-based, multi-component intervention to improve adherence. I Change Adherence and Raise Expectations (iCARE) is a multi-site study testing a comprehensive adherence program (CAP) versus standard care (SC) at 18 medical centers across the US. Currently, 635 adolescents with CF are enrolled in this RCT.

CAP is a behavioral, multi-component intervention to improve adherence in teens with CF. It has been designed to obviate many of the limitations of prior multi-component interventions. First, it is implemented during regularly scheduled, quarterly clinic visits which allow for continuity of care and an ongoing focus on adherence. Second, HCPs within the CF Care Center are trained to implement the intervention. They have the best understanding of the patient and have an existing relationship with these families. Third, CAP addresses gaps in knowledge of disease management and deficits in treatment skills. Remediation of these "errors" is necessary but not sufficient to change adherence behaviors. For example, if an adolescent believes he/she can take enzymes an hour after eating, when they are no longer effective in facilitating calorie absorption, this gap in knowledge must be corrected before issues of adherence can be addressed (i.e., the teen was adherent to taking enzymes, but took them at the wrong time). Fourth, CAP is patient-centered. The adolescent "leads" the PS session and is the one who chooses the treatment he/she is willing to work on (not the medical team). In addition, the measures given at baseline, 12 and 24 months are personalized, providing

individual data on each patient's gaps in knowledge and skills. Treatment skills are assessed by HCPs, who *observe* patients using their equipment and devices (e.g., nebulizer, metered dose inhaler) and score the steps as they are performed. Feedback reports on each adolescent, with scores, graphic data and missed items are sent to the CF Care Center three to four weeks after the assessment. The CF team then has a full year of quarterly visits to remediate these errors.

Finally, a brief, behavioral PS session is conducted at every clinic visit and during hospital stays, once the teen is stable. It begins with a patient-reported assessment of adherence and barriers, followed by praise for any efforts to perform these treatments. The adolescent then chooses the treatment he/she is willing to work on and describes his/her key barrier. These barriers reflect the teen's current lifestyle (e.g., embarrassed to do airway clearance in front of peers; prefer to go to hockey practice). Next, the adolescent leads a brainstorming session to generate creative, new solutions to his/her barrier. After eight to nine solutions are generated on sticky notes (and placed on the exam room wall), each participant (teen, parent, HCP) votes on each solution, giving it a "+" or "-." The adolescent is responsible for writing all of the solutions on the sticky notes, which increases the teen's engagement and attention. Only solutions that receive all + votes are considered for implementation; the teen picks the solution he/she is "willing to try." The solution is then operationalized (i.e., who, what, when, where) and written on the Prescribed Treatment Plan; all participants sign this as a behavioral contract.

Variations on PS have been successfully utilized to reduce the need for acute medical care in pediatric asthma (Walders et al., 2006) and to reduce negative affectivity

in mothers of children with newly diagnosed cancer (Sahler et al., 2005). Current data within iCARE suggests that HCPs can administer PS consistently and with treatment fidelity (McLean et al., 2011). It is an ideal intervention to utilize in a clinic setting, because it is structured, brief, and relatively simple to implement.

Treatment Acceptability in Behavioral Interventions

For a behavioral intervention to be successful, it must be implemented with integrity (Perepletchikova & Kazdin, 2005), which includes acceptability of the treatment to the providers (Kazdin, 1980). Treatment acceptability is defined as the judgments made by providers and consumers regarding the treatment's fairness, reasonableness, and intrusiveness (Kazdin, 1980). Differentiating between provider and consumer acceptability is important, as they each provide unique contributions to the intervention (Kazdin, 1980; Kazdin et al., 1981). Furthermore, Witt, Martens, and Elliott (1984) argued that treatment integrity could be compromised if treatment acceptability is perceived as inadequate by these stakeholders.

Given the novelty of this intervention and its implementation in a medical setting, it is critically important to evaluate whether iCARE, and PS in particular, are acceptable to HCPs with a variety of backgrounds and training. Several well-validated measures have been developed to address provider and consumer treatment acceptability, but these measures have been designed for school-based or mental health clinic-based interventions and have not been adapted for use in medical settings (Kazdin, 1980a; Kazdin, 1980b; Kazdin, French, & Sherick, 1981; Kelley, Heffer, Gresham, & Elliott, 1989; Elliott & Von Brock Treuting, 1991). They also tend to rely on the use of vignettes to determine

which treatment among several is perceived as the most acceptable; this may be less useful in the context of evaluating an existing, currently implemented intervention.

Assessing the acceptability of behavioral interventions in medical settings could be important for several reasons. First, providers' perceived acceptability of a behavioral intervention can significantly affect its implementation and ongoing use. Even if a newly developed intervention is highly effective, if it is unacceptable to HCPs, it may not be implemented the way it was intended or at all. Second, many behavioral interventions adapted for medical settings were developed outside of these contexts (e.g. BFST, MST). Specialty medical clinics, where most chronic illnesses are treated are hectic, over-scheduled, and crowded. An intervention designed and tested in a controlled research environment may be difficult to transport to clinic settings. Evaluating acceptability may also identify what the key barriers are in that new context. Third, if an evidence-based adherence intervention fails to produce consistent results, it is not known whether it failed due to poor acceptability and implementation.

Currently, much of the literature assessing provider treatment acceptability of behavioral interventions is in the school psychology domain, and evaluates teachers' perceived acceptability of classroom-based behavioral interventions (Cowan & Sheridan, 2003; Elliott et al., 1987; Finn & Sladeczek, 2001; Pisecco et al., 2001). Pisecco and colleagues (2001) found that teachers implementing multiple ADHD interventions in their classrooms rated the daily report card as effective as providing medication, but rated medication as less acceptable. This provided valuable information about an effective alternative to medication in the classroom.

Within the mental health research community, assessment of provider attitudes towards interventions is a growing research area. General measures have been developed to assess provider attitudes toward interventions can affect the dissemination and implementation of evidence-based practices (EBPs) (Aarons, 2004). A recent study by Melas and colleagues (2012) used the Evidence-Based Practice Attitude Scale (EBPAS) to test HCP attitudes towards implementing EBPs within their own clinic. Interestingly, the authors found that HCPs were less accepting of EBPs than mental health professionals. Melas and colleagues also found that HCPs with less experience had more positive attitudes towards EBPs. This finding has been identified in populations of mental health providers administering EBPs under mandate as well (Jensen-Doss et al., 2009). More research is needed to better understand the role of HCPs' perceptions of EBPs in healthcare settings in order to identify and develop more acceptable interventions.

As previously stated, most measures to assess attitudes towards treatments or treatment acceptability are designed to be administered prior to the introduction of an EBP. Jensen-Doss and colleagues (2009) presented a useful example of a survey developed to assess these attitudes while providers are currently implementing EBPs. Their results indicated that mental health provider characteristics such as paraprofessional status and perceptions of coworkers' support predicted more positive attitudes towards the utilization of EBPs. They also investigated perceptions of institutional-level barriers, finding that mental health providers who reported fewer barriers to implementation had more positive attitudes towards EBPs.

Measuring the acceptability of an intervention may also identify important modifications to improve the integrity and feasibility of the intervention. Najavits and colleagues (2004) investigated the acceptability of manualized CBT-based treatments for cocaine addiction; although the majority of treatment providers were satisfied with the interventions, few of them would continue using these interventions without significant modifications. Their changes included increasing the duration and number of treatment sessions. As iCARE is implemented across 18 medical centers, assessment of the acceptability of this treatment from the HCP perspective will provide important guidance on the components that were most effective and likely to be utilized in the future.

Kazdin and colleagues (1981) emphasized the importance of assessing the child or adolescent's acceptability because they are often the target of the intervention and are generally unable to modify or terminate treatment on their own. If consumers (parents and children) report high ratings of satisfaction and acceptability, evidence shows they will be more likely to adhere to the intervention and seek treatment in the future (Rosenberg & Raynes, 1976). Miller, Manne, and Palevsky (1998) assessed patient, parent, and nurse acceptability ratings of various behavioral interventions addressing behavior difficulties in children with cancer utilizing the Treatment Evaluation Inventory-Short Form (Kelley, Heffer, Gresham, & Elliott, 1989). They found differences between ratings of punitive behavioral interventions by parents of children with cancer and registered nurses. This indicated that parents and HCPs may have differing perspectives on the acceptability of behavioral interventions for the pediatric patients they care for. Few examples of provider perceived treatment acceptability assessment in medical settings exist in the pediatric literature (Da Costa et al., 1997).

Despite its importance, assessment of provider acceptability is rare in the intervention literature. In fact, no studies assessing provider acceptability of a behavioral intervention to improve adherence implemented by HCPs in medical settings were found. This is a serious gap in the literature as successful interventions to improve medical adherence often contain a behavioral component (Kahana et al., 2008; Kripalani et al., 2007).

The Current Study: Aims and Hypotheses

Acceptability of the PS treatment, as perceived by HCPs, is likely to have a substantial effect on the implementation and success of the iCARE intervention. To date, no studies have evaluated the acceptability, feasibility, and utility of a structured, behavioral intervention with HCPs in specialty medical clinics. This study measured HCP treatment acceptability among HCPs at 18 CF centers implementing iCARE. The following specific aims and hypotheses were tested:

1) To evaluate HCPs' perceptions of the acceptability, feasibility, and utility of a brief, behavioral intervention to improve adherence using the Behavioral Interventionist Satisfaction Survey (BISS). Given that this is a new scale, psychometric analyses were conducted on the 28 items to identify reliable and meaningful scales (e.g., Supervision, Acceptability/Feasibility, Components of PS).

2) To test associations among the BISS scales (i.e., Supervision, Training, Competence, Acceptability/Feasibility, Components of PS, and Generalizability).

Hypothesis 1. Positive associations were expected among these scales.

3) To determine which HCP characteristics (i.e. mental health training, experience with CF, clinical supervision sessions, number of PS sessions conducted) were most strongly predictive of scores on the BISS scales.

> *Hypothesis 2.* HCPs with mental health training will have higher scores on the BISS scales than those with no mental health background. HCPs with more experience working in CF will have lower scores on all of the BISS scales than those with less experience. HCPs with more clinical supervision will have higher scores on the BISS than those with less supervision. HCP's who have conducted more PS sessions will have higher BISS scores than those who have conducted fewer PS sessions.

4) To evaluate whether the BISS scales are significantly associated with scores on the TFRS.

> *Hypothesis 3.* HCPs' BISS scaled scores will be positively associated with scores on the TFRS.

5) To content analyze the HCPs open-ended responses to questions on the BISS using Atlas.ti. Saturation matrices were generated to identify critical content from the open-ended questions on the survey. Questions prompted comments on: modifications to supervision and training, what they liked about PS, what they didn't like about PS, barriers encountered at their center, and suggestions for modifying PS. Descriptive analyses will be conducted on the qualitative information.

Chapter 2: Method

Procedure

This study utilized data from an ongoing multi-site, RCT evaluation of iCARE. This RCT compared the efficacy of CAP versus SC in adolescents with CF. Prior to randomization, CF Centers were stratified by size of the patient population (i.e., small, medium, large) and then randomized to one of two conditions. We utilized a cluster design across 18 CF Centers to prevent contamination of the intervention effects within site and to account for differences between sites. At the end of one year, SC Centers were trained to implement the CAP intervention. This provided an opportunity for replication of possible treatment effects and information about generalizability of the CAP intervention. Thus, by the second year, the majority of HCPs, patients and providers had transitions into the CAP intervention.

This study enrolled 635 adolescents at 18 multidisciplinary CF centers across the United States. Inclusion criteria for adolescents were: 1) age 11-20 years, 2) confirmed diagnosis of CF, 3) attendance at an accredited CF care center, 4) prescription of at least one of the following medications (azithromycin, hypertonic saline, dornase alfa, tobramycin inhalation solution, or inhaled, compounded tobramycin) for at least 6 months prior to informed consent, and 5) prior consent to provide data to the Cystic Fibrosis Foundation Patient Registry. Exclusion criteria included: 1) plan to change CF

care teams within the next 2 years, 2) current listing for lung transplantation, or 3) participation in the CF My Way Pilot Study[1].

Trained healthcare providers (HCPs) administered all components of CAP, including knowledge and skills remediation, provision of a written treatment plan and a brief, PS intervention. An introductory letter describing the current study's requirements and participation were sent to HCPs conducting PS sessions. After reviewing this letter, they could passively consent to participate by clicking a link, which connected them to the BISS survey. They also received a link to opt out of the study. HCPs included physicians, nurses, respiratory therapists, dietitians, psychiatrists, research coordinators, and social workers. Inclusion criteria for HCPs included: 1) 18 years of age or older, 2) participation in the initial CAP training, 3) participation in at least 1 clinical supervision session during the CAP year.

Once HCPs provided consent, they were automatically connected to the survey (BISS), which could be completed online, using Lime Survey software. The BISS took approximately 10-15 minutes to complete. Participants' responses were automatically stored in the server at the University of Miami, which were encrypted and backed-up each night. Upon completion of the survey, respondents had the option to receive a $25 Amazon gift card for their time and effort, via email. HCPs were invited to complete the BISS after they had completed at least one clinical supervision session during iCARE. This resulted in HCPs completing the BISS at different time points during their study participation, as some HCPs would have completed their CAP year of the study, while others would have just started administering PS.

[1] The CF My Way Pilot tested the CAP intervention program and materials in a small study.

To provide relevant clinical supervision, advanced graduate students and a junior faculty member watched videotapes of the PS sessions and rated the fidelity with which the intervention was implemented using the Treatment Fidelity Rating Scale (TFRS; see Appendix A). HCPs who conducted PS sessions were asked to film their first session with each new participant and send it to the University of Miami for clinical supervision. In some cases, adolescents or parents did not give consent for the videotaping, which precluded the assessment of treatment fidelity. Videotaped sessions were reviewed at least twice, once during supervision and once to assess treatment fidelity.

Participants

Of the HCPs conducting PS sessions within iCARE, *N*= 48 HCPs were eligible to complete the BISS. These HCPs were emailed and invited to participate in the BISS. Of those, *N*= 39 completed the BISS, *N*=1 (2.1%) opted out of the survey, *N*= 3 (6.3%) had left the study site and could not be located, and *N*=5 (8.3%) did not respond. This yielded an 81.3% response rate for the BISS. See Figure 1 for more details on BISS participation and *N*s for included measures.

HCPs who completed the survey were predominantly female (*N*= 35, 89.7%). Age was categorized and the majority of respondents were between the ages of 35 and 54 years (*N*= 21, 54%). They represented a range of educational attainment, with 11 having a Bachelor's degree or less (28.2%), 25 with a Master's degree (64.1%), and three having a doctoral-level degree (7.7%). See Table 1.

The CF Centers in the iCARE study are accredited by the Cystic Fibrosis Foundation and as part of this accreditation are required to have a multidisciplinary care

team. Of note, participants could select more than one healthcare discipline when completing the survey. Participants' professional disciplines included: 19 social workers (48.7%), eight research coordinators (20.5%), eight registered nurses (20.5%), three physicians (7.7%), three dietitians (7.7%), three CF Center Coordinators (7.7%), two CF Center Directors (5.1%), two respiratory therapists (5.1%), one nurse practitioner (2.6%), and one psychiatrist (2.6%). Participants had been working in CF for an average of 14.0 years (*SD*= 9.47 years), however there was a large range of experience with CF, from two to 31 years.

Level of experience with the PS intervention also varied among participants. HCPs completed an average of 27.6 PS sessions (*SD*= 30.3) and had been conducting PS for a mean of 15.8 months (*SD*= 7.0). Participants reported receiving an average of 6.4 clinical supervision sessions (*SD*= 4.5), however, the mean number of *documented* supervision sessions was 4.4 (*SD*= 3.1). See Table 2 for details on PS implementation.

Measures

Behavioral Interventionist Satisfaction Survey (BISS). HCPs' perceptions of the acceptability of PS were measured using the BISS, a 47-item questionnaire consisting of both likert ratings and open-ended questions. The survey was divided into several sections: Demographic Characteristics, Site Training, Supervision, and Problem-Solving Sessions. Demographic information included age, gender, professional training, years of experience in CF, and level of experience implementing PS (See Appendix B). The survey asked about acceptability and feasibility in conducting PS sessions, components of PS, generalizability of PS, and competence. Statements were rated on a likert scale from

1 to 5, with 1 representing "Strongly Disagree," 3 representing "Neutral," and 5 representing "Strongly Agree." Sample items included: "Allowing the teen to lead the session was acceptable" and "The clinic was an appropriate setting for conducting Problem-Solving sessions." The survey also included open-ended, qualitative questions assessing which elements of PS they liked and which they would suggest modifying.

Treatment Fidelity Rating Scale (TFRS). Treatment Fidelity was measured using the 35-item TFRS (See Appendix A). The TFRS was developed to operationalize and evaluate each step in the Problem-Solving process. All videotaped PS sessions were scored for fidelity on a scale from 0 to 35, with 35 representing successful completion of all PS steps. Tapes were reviewed by trained graduate-level coders to rate treatment fidelity. A total of 305 tapes were scored, with higher scores indicating better fidelity. Trained coders watched the videotapes and rated them using the TFRS. Ten percent of all tapes were coded by two independent raters to calculate interrater agreement (absolute interrater agreement = .88). TFRS scores were available for N= 36 of the BISS participants.

Qualitative Coding of HCPs Responses. Open-ended responses to the BISS were evaluated and consensus-coded by two raters. Atlas.ti software was used to code the qualitative responses to seven open-ended questions on the BISS. For example, to Question 5 ("How can we improve training in PS?"), a majority of respondents suggested that they needed more training and that ongoing training would be most helpful. After careful review, six family codes across the seven questions were identified.

Chapter 3: Results

Scale Construction of the BISS

The first aim was to evaluate HCPs' ratings on the BISS. However, given that it is a new scale, item and scale level analyses were conducted first across the 28 items. Descriptive statistics were also performed, including item distributions, means, medians, and standard deviations. Item-to-total correlations and internal consistency coefficients (i.e., Cronbach's alpha) were also generated.

At a conceptual level, six scales were expected to emerge from the 28 items. Four items addressed opinions about the training, five assessed satisfaction with supervision, and 19 items directly evaluated the HCPs perceptions of the PS intervention. After completing correlational and item-level analyses, the following scales were identified: 1) Training, 2) Supervision, 3) Competence, 4) Acceptability/Feasibility, 5) Components of PS, and 6) Generalizability.

The Training scale consisted of four questions related to the initial in-person training for PS and included the following items: "I am satisfied with the training I received to conduct Problem-Solving sessions;" "The training increased my knowledge of the steps of Problem-Solving;" "The training helped me feel prepared to conduct Problem-Solving sessions;" and "My expectations for training were met." This scale yielded good internal consistency ($\alpha = .87$). Item-to-total correlations indicated that these items formed a coherent scale, with all values above .40. The item mean was 4.23 (item variance = .00) and the overall scale mean was 16.9 (*SD*= 2.29).

The Supervision scale consisted of five items evaluating HCPs' satisfaction with the clinical supervision they received while conducting PS sessions. The following five items made up this scale: "I am satisfied with the supervision I received for Problem-Solving Sessions;" "The supervision I received increased my knowledge of the steps of Problem-Solving;" "The supervision I received increased my confidence in conducting Problem-Solving sessions;" "It would have been helpful to receive supervision on a patient's later sessions;" and "My expectations for supervision were met." These five items had good internal consistency ($\alpha = .87$), and all item-total correlations were greater than .40. The item mean was 4.01 (item variance = .24) and the scale mean was 20.2 (*SD*= 3.32).

To develop the scales related to the PS sessions specifically, first, item-to-total correlations, followed by internal consistency, were calculated. The item-level analyses indicated that two items did not fit with the other items and had item-to-total correlations below the threshold of .40. These items included "It was appropriate to conduct Problem-Solving sessions while a teen was hospitalized" (*M*= 3.69, *SD*= 1.06, Item-to-total correlation = -.01) and "It was appropriate to conduct Problem-Solving sessions during research visits" (*M*= 3.74, *SD*= .97, Item-to-total correlation= .07). These items were dropped; after their removal, overall internal consistency for the remaining 17 items was $\alpha = .90$.

Next, these items were grouped into four scales conceptually (Competence, Acceptability/Feasibility, Components of PS, and Generalizability). The Competence scale consisted of four items related to the HCP's self-perceived ability to administer PS with confidence: "I feel confident in my ability to conduct Problem-Solving Sessions;" "I

understand the CF My Way Materials;" "I feel knowledgeable in my understanding of the steps of Problem-Solving;" and "I feel skilled at conducting Problem-Solving sessions." Internal consistency was strong (α = .87) and all item-to-total correlations were above .40. The item mean 4.49 (item variance = .01) and the scale mean was 17.9 (*SD*= 1.78). To assess convergent validity, the relationship between scores on the TFRS and the Competence scale were assessed, however, no significant relationship was found (*r* = .08, *p*= .67).

The Acceptability/Feasibility scale consisted of items relating to the perceived appropriateness and feasibility of using the PS intervention. Five items formed this scale: "The amount of time it took to conduct Problem-Solving sessions was reasonable;" "The clinic was an appropriate setting for conducting Problem-Solving sessions;" "Problem-Solving is an appropriate intervention to address adherence in adolescents with CF;" "Problem-Solving positively impacted the way I interact with my patients enrolled in iCARE;" and "Doing Problem-Solving is appropriate for my role on the CF team." Internal consistency was good (α = .79) and all item-to-total correlations were above .40. The item mean was 4.26 (item variance = .13) and the scale mean was 21.3 (*SD*= 2.67).

The Components of PS scale was measured HCPs' perceptions of the process and steps of PS. This scale consisted of four items: "The content of Problem-Solving sessions was useful (i.e. the treatment and barrier discussed);" "The Problem-Solving steps were helpful (i.e. brainstorming, voting rules);" "I felt comfortable allowing the teen to pick the treatment and barrier during Problem-Solving;" and "Allowing the teen to lead the session was appropriate." Internal consistency was good (α = .82) and all

item-to-total correlations were above .40. The item mean was 4.56 (item variance = .01) and the scale mean was 18.2 (*SD*= 1.81).

The final scale identified was Generalizability. This scale contained items relating to the transportability of PS outside of the iCARE intervention and the possibility of its use in the future. It included four items: "Problem-Solving positive impacted the way I interact with my patients NOT enrolled in iCARE;" "My clinic should continue to use Problem-Solving;" "I would recommend Problem-Solving to other healthcare providers;" and "I plan to continue using Problem-Solving with my patients." Internal consistency was good (α= .88) and all item-to-total correlations were above .40. The item mean was 4.27 (item variance= .02) and the scale mean was 17.1 (*SD*= 2.78). See Table 3 for more details on the six BISS scales.

HCP Responses on the BISS Scales

In general, HCPs were highly satisfied with the PS intervention, including the training session, clinical supervision, and the process and steps of PS. Approximately 90% of HCPs "agreed" or "strongly agreed" that the training increased their knowledge of the steps of PS and helped them feel prepared to conduct PS sessions (see Table 4). Most HCPs (89.7%) also reported being satisfied with the supervision they received and only about half were interested in receiving supervision on a patient's future session. All HCPs felt confident, knowledgeable and skilled in conducting PS sessions. More variability was observed on the Acceptability/Feasibility scale, with a slight majority of HCPs (64.1%) agreeing that the amount of time required for PS sessions was reasonable. A larger number (84.6%) agreed that the clinic was an appropriate setting for PS and that

the intervention was appropriate for addressing adherence challenges (94.9%). Most HCPs (97.4%) reported feeling comfortable allowing the teen to pick the treatment and barrier to work on and all HCPs thought allowing the teen to lead the PS session was appropriate. Approximately three-quarters of HCPs thought that PS positive impacted their interactions with patient *not* enrolled in iCARE. Additionally, the vast majority (84.6%) reported that they plan to continue using PS with their patients. See Table 4 for details on HCP responses to the BISS.

Associations among the BISS Scales

Positive associations were expected among the BISS scales. Pearson's product-moment correlation coefficients were calculated to assess these associations. Mixed support was found for this hypothesis. Significant positive associations were found between the Acceptability/Feasibility scale and all other scales, with correlations ranging from $r = .46$ to $.67$, $p < .01$. Interestingly, Competence was positively correlated with Acceptability and Components of PS, but not with any other scales, including Supervision and Training. Given that these HCPs were highly experienced (average number of years working in pulmonary medicine was 14), they may not have felt they needed specific training in PS or ongoing supervision. In addition, the Generalizability scale positive correlated with Acceptability/Feasibility and Training, but not with Components of PS, Competence or Supervision. There may be complex barriers to implementing PS outside of iCARE that affected these ratings. (See Table 5).

HCP Characteristics in Relation to BISS scores

It was hypothesized that HCPs who had mental health training would have higher scores on the BISS than those with no mental health training. To assess the influence of mental health training on BISS scores, an independent samples t-test was performed. No support for this hypothesis was found. There were no significant differences in the BISS scores for those with or without mental health training (*t*'s(37) -.62 to 1.13, *p* = ns). Effect sizes ranged from small to moderate (*d*= .06 to .39), with the largest effect seen on the Components of PS scale. Mental healthcare providers had higher scores on the Components of PS scale than those without mental health training. A small effect (*d*= .22) was seen on the Generalizability scale, indicating that those without mental health training perceived PS as more generalizable than those with mental health training.

Next, it was expected that HCPs who had work in CF longer would have lower scores on the BISS than those who had spent less time working with this population. To address this hypothesis, first, correlations were conducted between years working in CF and the BISS scales; no significant associations were found (*r*'s -.29 to .07, *p*= ns). Second, HCPs were divided into two groups based on self-reported time working in CF and a frequency distribution was generated to reflect these data. Experience ranged from 2 to 31 years and a natural midpoint in the distribution was observed which divided the groups evenly between: 1) 12 or fewer years' experience (*N* =19) or 2) 13 or more years of experience (*N* = 20). Independent samples t-test were performed. There were no significant differences in BISS scale scores between groups; however, those with more than 12 years of experience in CF had slightly lower scores on the Acceptability/Feasibility scale (*t*(37) = -1.88, *p* = .07) and on the Supervision scale (*t*(37)

= -1.91, p = .06) than those with less than 12 years' experience. Effect sizes were generally in the moderate range (d = .04 to .59), with those with fewer years of experience in CF having higher scores on the Supervision scale (d = .59), Generalizability scale (d= .44), Acceptability/Feasibility scale (d= .59), Competence scale (d= .28), and Components of PS scale (d= .39). In general, those working in CF for less time had higher scores on the BISS.

HCPs with more clinical supervision were expected to have higher scores on the BISS than those with less supervision. Little support was found for this hypothesis. First, a correlation was conducted between number of supervision sessions received and BISS scales. No significant associations were found (r's = -.12 to .25, p = ns). Next, frequency distributions of the number of supervision sessions were calculated, ranging from 1 to 11 sessions. A natural break in the distribution was noted between 3 and 4 sessions; thus, two groups were formed: 1) 3 or fewer supervision sessions (N=18), 2) 4 or more supervision sessions (N=21). Independent samples t-tests were conducted. No significant differences in BISS scores were found by number of supervision sessions (t's(37) -.52 to 1.34, p = ns). Effect sizes ranged from none to moderate (d= 0 to .46), with the majority of them falling in the small range. The largest effect size observed was on the Supervision scale (d= .46), indicating that HCPs who received more supervisions had moderately higher scores on the Supervision scale.

Finally, it was hypothesized that those who had conducted more PS sessions would have higher scores on the BISS. No support was found for this hypothesis. First, correlations were conducted between number of PS sessions conducted and BISS scores. A significant negative association was found between number of PS sessions conducted

and the Acceptability/Feasibility scale of the BISS (r= -.37, N= 39, $p < .05$), indicating that the more sessions they conducted, the less acceptable they found the intervention. Next, a frequency distribution was generated indicating that HCPs conducted between 2 and 150 PS sessions. Two groups were formed: 1) those who had conducted 15 or fewer PS sessions (N=18), and 2) those who had conducted 16 or more sessions (N= 21). Independent samples t-tests indicated there was a statistically significant difference between groups on the Supervision scale of the BISS, indicating that HCPs who had conducted 16 or more PS sessions had lower ratings ($t(37) = -2.16$, $p < .05$). Effect sizes ranged from small to moderate (d= .11 to .70). Some of the strongest effect sizes were observed during these analyses, with moderate effect sizes seen on the Acceptability/Feasibility scale (d = .62), Supervision scale (Cohen's d= .70), and Training scale (d= .54). For all of these scales, HCPs who had conducted fewer PS sessions had higher BISS scores.

TFRS Scores and BISS rating scales

Correlational analyses were conducted to assess the relationships between the TFRS scores and scales on the BISS. Positive associations were expected. Mean treatment fidelity scores were calculated for the 36 HCPs who completed the BISS. Three HCPs who received supervision early in the iCARE study did not send tapes, and thus were not included in the analysis. In the iCARE study, Alpern et al. (2012) found that treatment fidelity trajectories tended to stabilize after the third or fourth supervision session. Therefore, treatment fidelity was averaged across sessions for each HCP up to and including the fourth session (N= 21); for those with fewer than four supervisions, an average was calculated on all tapes there were received (N= 15).

Modest support was found for this hypothesis. A significant, positive association was found between the Supervision scale of the BISS and TFRS scores (r= .38, N= 36, p < .05). No significant associations were found between the TFRS and BISS Competence scale, Acceptability/Feasibility, Components of PS, Generalizability and Training (r's = .08 to .13, p's = ns).

Content analysis of open-ended questions of the BISS

Seven open-ended questions were included on the BISS to enable HCPs to provide qualitative feedback on the various components of PS. These questions included: 1) How can we improve training Problem-Solving?; 2) How can we improve the supervision of Problem-Solving?; 3) What aspects of Problem-Solving did you like most? Why?; 4) If yes [they would change something about PS], what would you change about Problem-Solving?; 5) What aspects of PS did you like the least? Why?; 6) If yes [they encountered barriers to PS at their CF center], please describe the barriers to implementing Problem-Solving you encountered at your CF center; and 7) Please share any general comments or concerns about Problem-Solving sessions.

Thirty-eight HCPs provided qualitative responses to these questions. Content analysis using Atlas.ti yielded six content families: Training, Supervision, What HCPs Liked Most about PS, What HCPs Liked Least about PS, Modifications to PS, and Barriers to Implementing PS. Within each of these content areas, themes were identified and coded. To evaluate whether we had reached saturation of the content, a count of these "subthemes" was used to establish a cut-point. If at least six individuals (16% of the

sample) mentioned that theme, it was retained. See Appendix C for example quotations taken from each content family.

The first content family was Training, which yielded six unique subthemes, in a rank order from most frequently mentioned: 1) Need for ongoing training (*N*=11, 29%), 2) More role plays (*N*=9, 24%), 3) Training helpful (*N*=9, 24%, 4) Train more team members (*N*=3, 8%) , 5) Training requires knowledge of HCP relationship with patient (*N*= 1, 3%), and 6) Training- not standard (*N*= 1, 3%). Saturation was reached for these codes at survey 15. (See Table 7).

Supervision was the next content family identified. The Supervision family consisted of seven subthemes relating to supervision in PS: 1) Supervision helpful (*N*= 19, 50%), 2) Suggestions for supervision (*N*= 9, 24%), 3) Time for supervision (*N*= 5, 13%), 4)Videos hard for patient and HCP (*N*= 4, 11%), 5) Supervision not helpful (*N*= 2, 5%), 6) Supervision and training didn't match (*N*= 2, 5%), and 7) Supervision needed knowledge of HCP's relationship with patient (*N*= 1, 3%). Saturation was reached at interview seven. (See Table 8).

The largest and most diverse content family found was What HCPs Liked Most About PS. This family yielded nine subthemes, including: 1) Empower patient (*N*= 21, 55%), 2) Engaging family (*N*= 12, 32%), 3) PS helpful (*N*= 12, 32%), 4) Positive process of PS (*N*= 11, 29%), 5) Positive components of PS (*N*= 9, 24%), 6) Liked everything (*N*= 8, 21%), 7) Identifying barriers/setting goals (*N*= 7, 18%), 8) PS enhances my practice/generalizes (*N*= 7, 18%), and 9) Reduces conflict (*N*= 3, 8%). For What HCPs Liked Most About PS, saturation was reached at interview 11. (See Table 9).

The content family of What HCPs Liked Least About PS yielded a range of responses; however, the identified subthemes were reported very infrequently compared to the other content areas. This family contained seven subthemes: 1) PS repetitive/possibly not effective (*N*= 5, 13%), 2) Knowledge remediation poorly executed (*N*= 3, 8%), 3) Negative components of PS (*N*= 3, 8%), 4) PS inappropriate for inpatient setting (*N*= 2, 5%), 5) PS has a learning curve (*N*= 1, 3%), 6) PS not well developed (*N*= 1, 3%), and 7) Unsure about later use of PS (*N*= 1, 3%). An exception to the cutoff rule of 6 individual mentions for each subtheme was made for this group, so the subtheme of PS repetitive/possibly not effective was retained. Saturation was reached at interview six. (See Table 10).

The content family of Modifications to PS included specific suggestions by HCPs of how to change PS for future use, and included four subthemes: 1) Modify measures (*N*= 11, 29%), 2) Streamline/reduce time for PS (*N*= 10, 26%), 3) Suggestions for follow-up (*N*= 6, 16%), and 4) PS too formal (*N*= 2, 5%). Saturation was reached for this family at interview three. (See Table 11).

Barriers to Implementing PS consisted of eight subthemes: 1) Time (*N*= 22, 58%), 2) Busy clinic (*N*= 12, 32%), 3) Buy-in from CF team (*N*= 9, 24%), 4) Patient denies adherence problems/has difficulty generating solutions (*N*= 7, 18%), 5) Space for PS (*N*= 6, 16%), 6) Difficult or uncooperative families (*N*=4, 11%), 7) Time burden for patient and family (*N*= 3, 8%), and 8) Patient too young for PS (*N*=1, 3%). Saturation was reached at interview 14. (See Table 12).

Chapter 4: Discussion

Adherence is a central problem in managing a chronic illness. Across chronic conditions, rates of adherence are generally less than 50% (Johnson & Carlson, 2004; Quittner et al. 2008; Sabaté, 2003; Sackett & Snow, 1979). Low rates of medical adherence have important implications for health outcomes (Balkrishnan, 2005; DiMatteo et al., 2002) and for costs related to increased healthcare utilization due to adherence-related complications (Bender & Rand, 2004; Briesacher et al., 2011; Osterberg & Blaschke, 2005). CF has arguably the most complex and time-consuming treatment regimen of any chronic illness (Sawicki, Sellers, & Robinson, 2009), and poor adherence is associated with worse health outcomes in this population (Eakin et al., 2011). iCARE is an ongoing RCT utilizing a CAP intervention to improve adherence in adolescents with CF. This is the largest clinical trial of a brief, behavioral adherence intervention administered by HCPs in the specialty clinic setting.

Acceptability and Feasibility of PS in iCARE

A major aim of this study was to evaluate healthcare providers' perceptions of the acceptability, utility, and feasibility of an evidence-based behavioral intervention implemented in a CF clinic. To provide this type of detailed evaluation, a measure had to be created that reflected the PS intervention in iCARE and enabled providers to rate their perceptions of its implementation in their own clinics.

In general, the psychometric analyses of the BISS provided strong evidence of reliability and construct validity. Good item-to-total correlations supported the six BISS

scales and all scales demonstrated strong internal consistency. Further, the scales appeared to measure independent constructs (i.e., acceptability/feasibility, generalizability), given that they were moderately correlated but did not reflect multi-collinearity. Although the BISS was specifically designed for the iCARE study, it could easily be modified for use in other chronic conditions.

Results on the BISS indicated that HCPs were overwhelmingly positive about the PS intervention, rating it as a highly appropriate to address adherence in CF and the clinic as an appropriate setting for its implementation. They were highly satisfied with the training and supervision, but would have liked more ongoing training and support. A minority, however, did not think that additional supervision would be helpful (33.3%). They also felt confident and skilled in delivering the intervention.

The BISS provided one of the first opportunities to systematically assess perceptions of provider acceptability in a clinic-based, multi-component adherence intervention. Although other interventions have demonstrated efficacy in improving adherence (Ellis et al. 2007; Nansel et al. 2012), no information was reported in these studies on the interventionists' level of satisfaction. Further, neither of these studies used health care providers to deliver the intervention. Other intervention studies have used professionals outside the medical team. For example, several versions of BFST have been implemented and evaluated for teens with diabetes (Wysocki et al., 2007; Harris et al., 2005), however, the providers were highly trained mental health professionals and these sessions were not conducted in the clinic. This means that families must either travel to the medical center to access the intervention outside of routine appointments, or

participate in the intervention at home via Skype. For adolescents with CF and their families, this additional time is a significant barrier.

A more recent, clinic-based treatment (WE-CAN; Nansel et al., 2009; Nansel et al., 2012) tested a problem-solving intervention for adolescents with type 1 diabetes, however, it differed from iCARE in several important respects. First, it utilized "health care advisors," who were college graduates specifically trained to implement this behavioral intervention. These interventionists were hired for study purposes, but had no background in health care and no relationships with the clinic staff or patients. The authors argued that this prevented contamination of the study procedures due to pre-existing relationships between providers and patients, and increased the feasibility of delivering the intervention. College graduates, rather than health care providers, were used to save provider time and to reduce costs.

In contrast, iCARE was delivered by health care providers who were part of the CF team. This approach had several advantages: 1) adolescents and parents had an established relationship with these team members and therefore, did not have to establish rapport and trust with a new person; 2) CF is an extremely complex chronic disease, and members of the CF team had the knowledge and skills to present new options for "fitting treatments in" that were medically sound; 3) our PS intervention was highly structured and focused more on behavioral aspects of solving barriers than on emotional content; and 4) a foundational principle of the iCARE intervention was the idea that adherence challenges should be addressed as part of routine care and fully integrated into each clinic visit.

Further, iCARE directly addressed contamination of intervention versus control procedures by using a cluster design; half of the CF Centers were randomized to CAP or SC in the first year, with SC rotating into CAP in the second year. Thus, until providers were trained in CAP, they did not have the ability to utilize components of the intervention and patients would not be able to discuss this intervention with other people in the clinic. In the WE-CAN study, patients were randomized to the intervention or control condition within medical centers and thus, contamination could have occurred across these two groups of patients. In terms of cost, we provided a stipend to release the time of the medical providers (i.e., $10,000 per year plus indirect costs), which appeared to be a cost-effective approach.

Importantly, in the WE-CAN study, they did not measure provider perceptions of acceptability or feasibility. Thus, it is not clear whether this intervention was "acceptable" to the health advisors or perceived as feasible by the diabetes health care teams. The current study carefully measured these perceptions and found strong support for providers' perceptions of acceptability and feasibility.

Characteristics of Providers in Relation to BISS Scales

iCARE trained a diverse group of health care providers to deliver this intervention, including physicians, nurses and social workers who had a range of professional backgrounds and training. About half of the providers had a background in mental health, but most likely, they have had little exposure or training in EBPs. No significant differences in BISS ratings were found for those with or without mental health training, indicating that a wide range of providers can be trained to implement PS. These

findings contrast with those of Melas and colleagues (2012), who found that mental health providers rated EBPs as more acceptable than medical providers. Importantly, Melas assessed providers' attitudes towards EBPs *before* they were exposed to them or implemented them. No measures of acceptability were collected after the intervention. The current study indicated that when medical providers actually implement a behavioral intervention, they find it highly acceptable.

These lack of differences in provider characteristics are also contradictory to those of findings of Jensen-Doss and colleagues (2009) as well. Although Jensen-Doss and colleagues also assessed perceptions of acceptability *during* the implementation of EBPs, they found that providers with less training and paraprofessional status had more positive attitudes towards the interventions. We found some support for this hypothesis, as professionals with more years of experience in CF had somewhat lower scores on the BISS subscales. Generally, interventionists generally endorsed positive ratings across all components of PS, regardless of the amount of supervision they received. In terms of supervision, there are two possible interpretations of this finding: satisfaction with the intervention did not influence HCPs' willingness to participate in supervision, or additional supervision did not impact perceptions of acceptability.

Our hypothesis that doing more PS sessions would be associated with higher perceptions of acceptability and feasibility was not supported. A negative association was found between number of PS sessions performed and the BISS Acceptability/Feasibility scale, and significantly lower scores on the Supervision scale were found in the group of HCPs who completed more than 15 PS sessions. One possibility is that interventionists became "burned out" by the demands of doing PS sessions with a large number of

adolescents in the clinic. At several study sites, only one or two interventionists were trained to provide PS, and at larger centers who recruited 40 or more adolescents, this may have produced a high caseload. Although funding was provided to release the time of these HCPs, the funds were often used to make up budget "shortfalls" that were not related to iCARE. Thus, these providers did not have any time set aside to conduct PS. These providers may have initially found the intervention acceptable, but over time, they may have become overwhelmed by the demands of the intervention. This is an important issue to consider when implementing adherence interventions in a busy medical center.

Treatment Fidelity in Relation to BISS Scales

Surprisingly, no relationships were found between five of six BISS scores and TFRS scores. Although many providers struggled to achieve adequate treatment fidelity (mean TFRS score = 23 out of 35), this did not affect providers' perceptions of the acceptability of the intervention. This may be due to over confidence on the part of these healthcare professionals. In addition, treatment fidelity was only measured during the provider's first session with a new patient, resulting in lower scores and potentially, a lack of relationship between fidelity and the relevant BISS scales. It is also possible that perceptions of satisfaction by providers are not strongly related to the fidelity with which they deliver the intervention.

In contrast, a positive association was found between TFRS scores and the Supervision scale of the BISS, which included about the helpfulness and appropriateness of clinical supervision during iCARE. Previous research in MST has also shown that

supervision leads to better fidelity (Henggeler et al., 2002). iCARE providers who felt that supervision was helpful implemented the intervention with greater fidelity.

Qualitative Ratings on the BISS

High ratings of acceptability were not only found on the BISS scales, but in the content analysis of the open-ended questions. Providers made a number of comments on the positive aspects of PS, expressing satisfaction with the way PS engaged patients and families, the manner in which it empowered adolescents to take more responsibility for their treatments, and how the process of PS made both difficult topics and "difficult families" easier to manage. Several participants wrote unprompted comments about their plans to continue using PS in the future with their CF patients as well as others in their practice. Negative feedback was relatively rare, however, they did mention systems-level barriers they encountered in implementing PS (e.g., space, time). These results indicated that while HCPs found the behavioral intervention highly acceptable, their effectiveness was compromised by these barriers. Interventionists also provided guidance for future modifications of the intervention, such as shortening the measures, having ongoing training, and continuing clinical supervision.

The implications of these results are important as behavioral interventions begin to be translated into medical care. First, these results indicated that the CAP intervention, including PS sessions, can be implemented successfully in busy, specialty clinics. iCARE trained a diverse group of medical providers, ranging from physicians to dietitians, all of whom found the intervention highly acceptable, feasible and generalizable. However, several critical systems-level challenges were encountered that

were often not within the interventionist's control, such as limited time, lack of space, and lack of support from other team members. As behavioral interventions such as iCARE are "tweaked" and replicated in future studies, the CF Center Directors or department heads should be involved in discussing the barriers uncovered in this study to open a dialogue about how they will be addressed.

Strengths and Limitations

This study had several strengths. First, a new, psychometrically sound measure was developed to assess HCPs perceptions of a brief, behavioral intervention. This measure included the major constructs that underlie program evaluation and dissemination (e.g., acceptability, feasibility, and generalizability), with all scales demonstrating strong reliability and validity. Second, the response rate on the BISS was excellent (81.3%), providing a highly representative sample of health care providers. Third, to reduce social desirability, the author was not involved with the iCARE study personnel or procedures and did not know the study participants. Finally, this is the first study to evaluate these provider variables in a RCT conducted in a specialty medical clinic. Thus, this study laid the groundwork for translating and disseminating a behavioral intervention into medical care.

There were also several limitations. The most important was the small sample size of health care providers who participated. Although there was a good representation of medical disciplines (e.g., nurses, physicians), we could not conduct analyses by type of medical specialist. The sample size also limited the types of statistical analyses that could be performed and resulted in less power to detect group differences. Since many of

the analyses in this study were correlational or utilized multiple tests (i.e. independent samples t-tests and correlational analyses), the small sample size may have led to an increased Type II error rate. Many analyses revealed trends or tendencies towards significance with moderate effect sizes, which may be obscured due to insufficient power to detect group differences. Clearly, this type of study needs to be replicated in another sample to confirm these results.

The results from this study indicated that HCPs working in a busy clinic setting found a brief, behavioral intervention to be highly acceptable and generalizable. Not only did these HCPs feel confident and skilled in implementing PS, they were enthusiastic about the possibility of utilizing it with other patients not in the study and also those without CF. HCPs noted that PS reduced family conflict and led to better communication, not only between parents and adolescents, but between themselves and their patients. As medicine moves toward a more patient-centered approach, this positive feedback on our intervention suggests that we can successfully transport these interventions into health care settings. Similar efforts are being made in adolescents with diabetes (WE-CAN; Nansel et al. 2012).

Additional research is needed on the acceptability of these interventions across different types of health care providers. Given that most specialty clinics utilize a multidisciplinary team, more research on the best model of training is needed. Finally, future research on translations of adherence interventions should focus not only on their acceptability to providers but also on the larger systems barriers that are encountered (e.g., time in a busy clinic). Addressing these barriers will be an important next step in the process of transporting them into medical care.

References

Aarons, G. A. (2004). Mental health provider attitudes toward adoption of evidence-based practice: The Evidence-Based Practice Attitude Scale (EBPAS). *Mental Health Services Research*, *6*(2), 61-74.

Alpern, A.N.**,** McLean, K.A., Marciel, K.K., Zhang, J., Riekert, K.A., Quittner, A.L. (2012, October). Effect of clinical supervision on treatment fidelity in iCARE. Poster presented at the North American Cystic Fibrosis Conference, Orlando, Florida.

Baird, M. G., Bentley-Taylor, M. M., Carruthers, S. G., Dawson, K. G., Laplante, L. E., Larochelle, P., … Talbot, P. (1984). A study of efficacy, tolerance and compliance of once-daily versus twice-daily metoprolol (Betaloc) in hypertension. *Clinical & Investigative Medicine, 7*(2), 95-102.

Balkrishnan, R. (1998). Predictors of medication adherence in the elderly. *Clinical Therapeutics, 20*(4), 764-71.

Balkrishnan, R. (2005). The importance of medication adherence in improving chronic disease-related outcomes. *Medical Care, 43*(6), 517-519.

Bender, B. G. & Rand, C. (2004). Medication non-adherence and asthma treatment cost. *Current Opinion in Allergy & Clinical Immunology, 4*(3), 191-195.

Briesacher, B., Quittner, A., Saiman, L., Sacco, P., Fouayzi, H., & Quittell, L. (2011). Adherence with tobramycin inhaled solution and health care utilization. *BMC Pulmonary Medicine*, *115*.

Brown, B. G., Bardsley, J., Poulin, D., Hillger, L. A., Dowdy, A., Maher, V. M., … Knopp, R. H. (1997). Moderate dose, three-drug therapy with niacin, lovastatin, and colestipol to reduce low-density lipoprotein cholesterol <100 mg/dl in patients with hyperlipidemia and coronary artery disease. *American Journal of Cardiology, 80*(2), 111-115.

Centers for Disease Control and Prevention. (2007). National Office of Public Health Genomics: Cystic Fibrosis Clinical Validity. Accessed March 26, 2012, from http://www.cdc.gov/genomics/gtesting/ACCE/FBR/CF/CFCliVal_21.htm#21.

Cowan, R. J. & Sheridan, S. M. (2003). Investigating the acceptability of behavioral interventions in applied conjoint behavioral consultation: Moving from analog conditions to naturalistic settings. *School Psychology Quarterly, 18*(1), 1-21.

Cystic Fibrosis Foundation. (2012). About Cystic Fibrosis. Accessed March 26, 2012, from http://www.cff.org/AboutCF/ .

Cystic Fibrosis Foundation. (2010). Patient Registry Data Report. Accessed March 26, 2012, from http://www.cff.org/UploadedFiles/LivingWithCF/CareCenterNetwork/PatientRegistry/2010-Patient-Registry-Report.pdf

Da Costa, I. G., Rapoff, M.A., Lemanek, K., & Goldstein, G. L. (1997) Improving adherence to medication regimens for children with asthma and its effect on clinical outcome. *Journal of Applied Behavior Analysis, 30*(4), 687-691.

DiMatteo, M. R., Giordani, P., Lepper, H., & Croghan, T. (2002). Patient adherence and medical treatment outcomes: A meta-analysis. *Medical Care, 40*(9), 794-811.

Durlak, J. A., Furhman, T., & Lampman, C. (1991). Effectiveness of cognitive-behavior therapy for maladapting children: A meta-analysis. *Psychological Bulletin, 110*(2), 204-214.

D'Zurilla, T. J., & Goldfried, M. R. (1971). Problem solving and behavior modification. *Journal Of Abnormal Psychology*, *78*(1), 107-126.

Eakin, M. N., Bilderback, A., Boyle, M. P., Mogayzel, P. J., & Riekert, K. A. (2011). Longitudinal association between medication adherence and lung health in people with cystic fibrosis. *Journal of Cystic Fibrosis, 10,* 258-264.

Ellis, D., Frey, M. A., Naar-King, S., Templin, T., Cunningham, P., & Cakan, N. (2005). Use of multisystemic therapy to improve regimen adherence among adolescents with type 1 diabetes in chronic poor metabolic control: A randomized controlled trial. *Diabetes Care, 28*(7), 1604-1610.

Ellis, D., Naar-King, S., Cunningham, P., & Secord, E. (2006). Use of multisystemic therapy to improve antiretroviral adherence and health outcomes in HIV-infected pediatric patients: Evaluation of pilot program. *AIDS Patient Care and STDs, 20*(2), 112-121.

Ellis, D., Naar-King, S., Templin, T., Frey, M., & Cunningham, P. (2007). Improving health outcomes among youth with poorly controlled type I diabetes: The role of treatment fidelity in a randomized clinical trial of multisystemic therapy. *Journal of Family Psychology, 21*(3), 363-371.

Elliott, S. N., Turco, T. L. & Gresham, F. M. (1987). Consumers' and clients' pretreatment acceptability ratings of classroom-based group contingencies. *Journal of School Psychology, 25,* 145-154.

Elliott, S. & Von Brock Treuting, M. (1991). The Behavior Intervention Rating Scale: development and validation of a pretreatment acceptability and effectiveness measure. *Journal of School Psychology, 29*, 43-51.

Farach, L., Chau, H., Yang, S., Hernandez, C., Rutkowski, A., & Quittner, A. (2012). Adherence to pulmonary medications and enzymes: associations with demographic, geographic and medical variables. *Journal of Cystic Fibrosis,* In Review.

Finn, C. & Sladeczek, I. (2001). Assessing the social validity of behavioral interventions: A review of treatment acceptability measures. *School Psychology Quarterly, 16*(2), 176-206.

Graves, M. M., Roberts, M. C., Rapoff, M., & Boyer, A. (2010). The efficacy of adherence interventions for chronically ill children: a meta-analytic review. *Journal of Pediatric Psychology*, *35*(4), 368-382.

Harris, M., Harris, B., & Mertlich, D. (2005). Brief report: In-home family therapy for adolescents with poorly controlled diabetes: Failure to maintain benefits at 6-month follow-up. *Journal of Pediatric Psychology, 30*(8), 683-688.

Harris, M., Freeman, K., & Beers, M. (2009). Family therapy for adolescents with poorly controlled diabetes: Initial test of clinical significance. *Journal of Pediatric Psychology, 34*(10), 1097-1107.

Henggeler, S. W., Schoenwald, S. K., Liao, J. G., Letourneau, E. J., & Edwards, D. L. (2002). Transporting efficacious treatments to field settings: The link between supervisory practices and therapist fidelity in MST programs. *Journal of Clinical Child and Adolescent Psychology*, *31*(2), 155-167.

Jensen-Doss, A., Hawley, K. M., Lopez, M., & Osterberg, L. D. (2009). Using evidence-based treatments: The experiences of youth providers working under a mandate. *Professional Psychology: Research and Practice*, *40*(4), 417.

Johnson, S., & Carlson, D. (2004). Medical regimen adherence: Concepts, assessment, and interventions. In J. M. Raczynski, L. C. Leviton, (Eds.), *Handbook of Clinical Health Psychology: Volume 2. Disorders of Behavior and Health* (pp. 329-354). Washington, DC US: American Psychological Association.

Kahana, S., Drotar, D., & Frazier, T. (2008). Meta-analysis of psychological interventions to promote adherence to treatments in pediatric chronic health conditions. *Journal of Pediatric Psychology, 33*(6), 590-611.

Kazdin, A. (1980a). Acceptability of alternative treatments for deviant child behavior. *Journal of Applied Behavior Analysis, 13,* 259-273.

Kazdin, A. E. (1980b). Acceptability of time-out from reinforcement procedures for disruptive child behavior. *Behavior Therapy, 11,* 329-344.

Kazdin, A., French, N. & Sherick, R. (1981). Acceptability of alternative treatments for children: Evaluations by inpatient children, parents, and staff. *Journal of Consulting and Clinical Psychology, 49*(6), 900-907.

Kelley, M. L., Heffer, R. W., Gresham, F. M., & Elliott, S. N. (1989). Development of a modified treatment evaluation inventory. *Journal of Psychopathology and Behavioral Assessment, 11*(3), 235-247.

Kripalani, S., Yao, X., & Haynes, R. B. (2007). Interventions to enhance medication adherence in chronic medical conditions: A systematic review. *Archives of Internal Medicine, 167,* 540-550.

McLean, K. A., Kimberg, C. I., Marciel, K. K., Zhang, J., Riekert, K. A., & Quittner, A. L. (2011). Dissemination of a behavioral adherence intervention to multi-disciplinary CF team members: Treatment fidelity in the I Change Adherence and Raise Expectations (iCARE) study. [Abstract] *Pediatric Pulmonology, 46*(S34), 205.

Melas, C. D., Zampetakis, L. A., Dimopoulou, A., & Moustakis, V. (2012). Evaluating the properties of the Evidence-Based Practice Attitude Scale (EBPAS) in health care. *Psychological Assessment*, *24*(4), 867-876.

Miller, D., Manne, S., & Palevsky, S. (1998). Brief report: Acceptance of behavioral interventions for children with cancer: Perceptions of parents, nurses, and community controls. *Journal of Pediatric Psychology, 23*(4), 267-271.

Miloh, T., Annunziato, R., Arnon, R., Warshaw, J., Parkar, S., Suchy, F., Iyer, K., & Kerkar, N. (2009). Improved adherence and outcomes for pediatric liver transplant recipients by using text messaging. *Pediatrics*, *124*(5), e844-e850.

Modi, A. C., & Quittner, A. L. (2006). Barriers to treatment adherence for children with cystic fibrosis and asthma: What gets in the way?. *Journal Of Pediatric Psychology*, *31*(8), 846-858.

Morley, S., Eccleston, C., & Williams, A. (1999). Systematic review and meta-analysis of randomized controlled trials of cognitive behavior therapy and behavior therapy for chronic pain in adults, excluding headache. *Pain, 80,* 1-13.

Nansel, T. R., Anderson, B. J., Laffel, L., Simons-Morton, B. G., Weissberg-Benchell, J., Wysocki, T., ... & Lochrie, A. S. (2009). A multisite trial of a clinic-integrated intervention for promoting family management of pediatric type 1 diabetes: feasibility and design. *Pediatric diabetes*, *10*(2), 105-115.

Nansel, T. R., Iannotti, R. J., & Liu, A. (2012). Clinic-integrated behavioral intervention for families of youth with type 1 diabetes: Randomized clinical trial. *Pediatrics*, *129*(4), e866-e873.

Najavits,L., Ghinassi, F., Van Horn, A., Weiss, R., Siqueland, L., Frank, A., Thase, M., & Luborsky, L. (2004). Therapist satisfaction with four manual-based treatments on a national multisite trial: An exploratory study. *Psychotherapy: Theory, Research, Practice, Training, 41*(1), 26-37.

Osterberg, L. & Blaschke, T. (2005). Drug therapy: Adherence to medication. *The New England Journal of Medicine, 353*(5), 487-497.

Perepletchikova, F., & Kazdin, A. E. (2005). Treatment integrity and therapeutic change: Issues and research recommendations. *Clinical Psychology: Science and Practice*, *12*(4), 365-383.

Perepletchikova, F., Treat, T. A., & Kazdin, A. E. (2007). Treatment integrity in psychotherapy research: Analysis of the studies and examination of the associated factors. *Journal Of Consulting and Clinical Psychology*, *75*(6), 829-841.

Pisecco, S., Huzinec, C., & Curtis, D. (2001). The effect of child characteristics on teachers' acceptability of classroom-based behavioral strategies and psychostimulant medication for the treatment of ADHD. *Journal of Clinical Child Psychology, 30*(3), 413-421.

Quittner AL, Drotar D, Levers-Landis C, Seidner D, Slocum N, Jacobsen J. (2000). Adherence to medical treatments in adolescents with cystic fibrosis: The development and evaluation of family-based interventions. In D. Drotar (Ed.), *Promoting Adherence to Medical Treatment in Childhood Chronic Illness: Concepts, Methods, and Interventions* (pp. 383–407). Mahwah, NJ: Erlbaum.

Quittner, A. L., Modi, A. C., Lemanek, K. L., Levers-Landis, C. E., & Rapoff, M. A. (2008). Evidence-based assessment of adherence to medical treatments in pediatric psychology. *Journal Of Pediatric Psychology*, *33*(9), 916-936.

Quittner, A. L. (2011). Solving the adherence puzzle in teens with CF: Can we be successful? Presented at the North American Cystic Fibrosis Conference, Anaheim, CA.

Rapoff, M. A. (2010). *Adherence to Pediatric Medical Regimens* (2nd ed). Kansas City, KS: Springer.

Rosenberg, C. M. & Raynes, A. E. (1976). *Keeping Patients in Psychiatric Treatment.* Oxford, England: Ballinger.

Rowe, S. M. & Clancy, J. (2006). Advances in cystic fibrosis therapies. *Current Opinion in Pediatrics, 18*(6), 604-613.

Sabaté, E. Adherence to long-term therapies: evidence for action. Geneva: World Health Organization, 2003.

Sackett, D. L., & Snow, J. C. (1979). The magnitude of compliance and noncompliance. In R. B. Haynes, D. W. Taylor, & D. L. Sackett (Eds.), *Compliance in health care* (pp. 11–22). Baltimore: Johns Hopkins University Press.

Sahler, O. J., Fairclough, D. L., Phipps, S., Mulhern, R. K., Dolgin, M. J., Noll, … Butler, R. W. (2005). Using Problem-solving skills training to reduce negative affectivity in mothers of children with newly diagnosed cancer: Report of a multisite randomized trial. *Journal of Clinical and Consulting Psychology, 73*(2), 272-283.

Sawicki, G. S., Sellers, D. E., & Robinson, W. M. (2009). High treatment burden in adults with cystic fibrosis: Challenges to disease self-management. *Journal of Cystic Fibrosis, 8*(2), 91-96.

Walders, N., Kercsmar, C., Schluchter, M., Redline, S., Kirchner, L., & Drotar, D. (2006). An interdisciplinary intervention for undertreated pediatric asthma. *Chest, 129*(2), 292-299.

Winnick, S., Lucas, D., Hartman, A., & Toll, D. (2005). How do you improve compliance? *Pediatrics, 115*(6), e718-e724.

Witt, J. C., Martens, B. K., & Elliott, S. N. (1984). Factors affecting teachers' judgments of the acceptability of behavioral interventions: Time involvement, behavior problem severity, and type of intervention. *Behavior Therapy, 15*(2), 204-209.

Wysocki, T., Miller, K., Greco, P., Harris, M., Harvey, L., Taylor, …White, N. (1999). Behavior therapy for families of adolescents with diabetes: Effects on directly observed family interactions. *Behavior Therapy, 30,* 507-525.

Wysocki, T., Harris, M. A., Greco, P., Bubb, J., Danda, C. E., Harvey, L. M., …White, N. (2000). Randomized, controlled trial of behavior therapy for families of adolescents with insulin-dependent diabetes mellitus. *Journal of Pediatric Psychology, 25*(1), 23-33.

Wysocki, T., Harris, M., Buckloh, L., Mertlich, D., Lochrie, A., Taylor, …White, N. (2006). Effects of behavioral family systems therapy for diabetes on adolescents' family relationships, treatment adherence, and metabolic control. *Journal of Pediatric Psychology,31*(9), 928-938.

Wysocki, T., Harris, M., Buckloh, L., Mertlich, D., Lochrie, A., Mauras, N., & White, N. (2007). Randomized trial of behavioral family systems therapy for diabetes: Maintenance of effects on diabetes outcomes in adolescents. *Diabetes Care, 30*(3), 555-560.

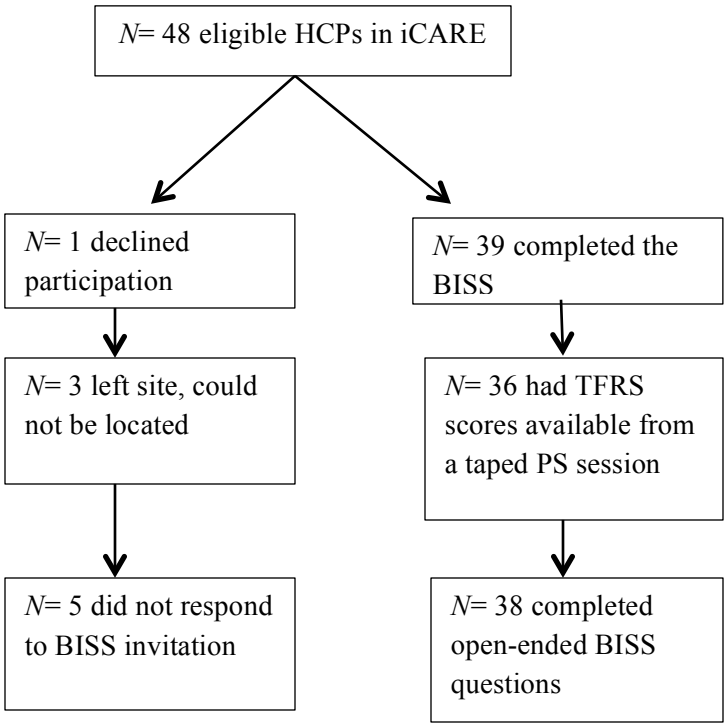
Wysocki, T., Harris, M., Buckloh, L., Mertlich, D., Lochrie, A., Sadler, M., & White, N. (2008). Randomized, controlled trial of behavioral family systems therapy for diabetes: Maintenance and generalization of effects on parent-adolescent communication. *Behavior Therapy, 39,* 33-46.

Zemanick, E., Harris, J., Conway, S., Konstan, M., Marshall, B., Quittner, A., … Accurso, F. (2010). Measuring and improving respiratory outcomes in cystic fibrosis lung disease: opportunities and challenges to therapy. *Journal of Cystic Fibrosis: Official Journal Of The European Cystic Fibrosis Society*, *9*(1), 1-16.

Zindani, G. N., Streetman, D. D., Streetman, D. S., & Nasr, S. Z. (2006). Adherence to treatment in children and adolescent patients with cystic fibrosis. *Journal of Adolescent Health, 38,* 13–17.

Figures

Figure 1. *Study enrollment details*



Tables

Table 1

Basic demographics of BISS participants

	N	*%*
Age	39	
25-34 years	6	15.4
35-44 years	10	25.6
45-54 years	11	28.2
55-64 years	9	23.1
65 and older	3	7.7
Gender (Female)	35	89.7
Highest Level of Education Attained		
Bachelor's Degree or Less	11	28.2
Master's Degree	25	64.1
Doctoral Degree	3	7.7
Healthcare Discipline		
Social Worker	19	48.7
Research Coordinator	8	20.5
Registered Nurse	8	20.5
Physician	3	7.7
CF Center Coordinator	3	7.7
CF Center Director	2	5.1
Respiratory Therapist	2	5.1
Nurse Practitioner	1	2.6
Psychiatrist	1	2.6

Table 2

BISS participants' experience with CF and PS

	M	*SD*
Number of years working in CF	14.0	9.5
Number of PS sessions completed	27.6	30.3
Number of months conducting PS	15.8	7.0
Number of self-reported clinical supervision sessions	6.4	4.5
Number of actual clinical supervision sessions received	4.4	3.1

Table 3

Item and scale-level BISS psychometrics

	Item *M*	Item *SD*	Median	Range	Cronbach's α	Scale Mean	Scale SD
Training							
I am satisfied with the training I received to conduct PS sessions.	4.18	.79	4	2-5			
The training increased my knowledge of the steps of PS.	4.26	.64	4	3-5			
The training helped me feel prepared to conduct PS sessions.	4.26	.60	4	3-5			
My expectations for training were met.	4.23	.67	4	3-5			
			16	11-20	.87	16.9	2.29
Supervision							
I am satisfied with the supervision I received for PS sessions.	4.31	.66	4	3-5			
The supervision I received increased my knowledge of the steps of PS.	4.33	.62	4	3-5			
The supervision I received increased my confidence in conducting PS sessions.	4.21	.80	4	3-5			
It would have been helpful to receive supervision on a patient's later sessions.	3.18	1.14	3	1-5			
My expectations for supervision were met.	4.18	.79	4	2-5			
			20	13-25	.87	20.2	3.32
Competence							
I feel confident in my ability to conduct PS sessions.	4.49	.51	4	4-5			
I understand the CF My Way materials.	4.33	.58	4	3-5			
I feel knowledgeable in my understanding of the steps of PS.	4.59	.50	5	4-5			
I feel skilled at conducting PS sessions.	4.54	.51	5	4-5			
			19	15-20	.87	17.9	1.78
Acceptability/Feasibility							
The amount of time it took to conduct PS session was reasonable.	3.74	.91	4	2-5			
The clinic was an appropriate setting for conducting PS sessions.	4.03	.87	4	2-5			
PS is an appropriate intervention to address adherence in adolescents with CF.	4.46	.60	5	3-5			
PS positively impacted the way I interact with my patients enrolled in iCARE.	4.46	.60	5	3-5			
Doing PS is appropriate for my role on the CF team.	4.62	.54	5	3-5			
			21	13-25	.79	21.3	2.67
Components of PS							
The content of the PS sessions was useful.	4.49	.60	5	3-5			
The PS steps were helpful.	4.49	.60	5	3-5			

Table 4

HCP responses on the BISS

	Strongly Disagree *N* (%)	Disagree *N* (%)	Neither agree nor disagree *N* (%)	Agree *N* (%)	Strongly Agree *N* (%)
Training					
I am satisfied with the training I received to conduct PS sessions.	0 (0%)	1 (2.6%)	6 (15.4%)	17 (43.6%)	15 (38.5%)
The training increased my knowledge of the steps of PS.	0 (0%)	0 (0%)	4 (10.3%)	21 (53.8%)	14 (35.9%)
The training helped me feel prepared to conduct PS sessions.	0 (0%)	0 (0%)	3 (7.7%)	23 (59.0%)	13 (33.3%)
My expectations for training were met.	0 (0%)	0 (0%)	5 (12.8%)	20 (51.3%)	14 (35.9%)
Supervision					
I am satisfied with the supervision I received for PS sessions.	0 (0%)	0 (0%)	4 (10.3%)	19 (48.7%)	16 (41.0%)
The supervision I received increased my knowledge of the steps of PS.	0 (0%)	0 (0%)	3 (7.7%)	20 (51.3%)	16 (41.0%)
The supervision I received increased my confidence in conducting PS sessions.	0 (0%)	0 (0%)	9 (23.1%)	13 (33.3%)	17 (43.6%)
It would have been helpful to receive supervision on a patient's later sessions.	2 (5.1%)	11 (28.2%)	9 (23.1%)	12 (30.8%)	5 (12.8%)
My expectations for supervision were met.	0 (0%)	1 (2.6%)	6 (15.4%)	17 (43.6%)	15 (38.5%)
Competence					
I feel confident in my ability to conduct PS sessions.	0 (0%)	0 (0%)	0 (0%)	20 (51.3%)	19 (48.7%)
I understand the CF My Way materials.	0 (0%)	0 (0%)	2 (5.1%)	22 (56.4%)	15 (38.5%)
I feel knowledgeable in my understanding of the steps of PS.	0 (0%)	0 (0%)	0 (0%)	16 (41.0%)	23 (59.0%)
I feel skilled at conducting PS sessions.	0 (0%)	0 (0%)	0 (0%)	18 (46.2%)	21 (53.8%)
Acceptability/Feasibility					
The amount of time it took to conduct PS session was reasonable.	0 (0%)	4 (10.3%)	10 (25.6%)	17 (43.6%)	8 (20.5%)
The clinic was an appropriate setting for conducting PS sessions.	0 (0%)	4 (10.3%)	2 (5.1%)	22 (56.4%)	11 (28.2%)
PS is an appropriate intervention to address adherence in adolescents with CF.	0 (0%)	0 (0%)	2 (5.1%)	17 (43.6%)	20 (51.3%)
PS positively impacted the way I interact with my patients enrolled in iCARE.	0 (0%)	0 (0%)	2 (5.1%)	17 (43.6%)	20 (51.3%)
Doing PS is appropriate for my role on the CF team.	0 (0%)	0 (0%)	1 (2.6%)	13 (33.3%)	25 (64.1%)
Components of PS					
The content of the PS sessions was useful.	0 (0%)	0 (0%)	2 (5.1%)	16 (41.0%)	21 (53.8%)
The PS steps were helpful.	0 (0%)	0 (0%)	2 (5.1%)	16 (41.0%)	21 (53.8%)
I felt comfortable allowing the teen to pick the treatment and barrier during PS sessions.	0 (0%)	0 (0%)	1 (2.6%)	13 (33.3%)	25 (64.1%)
Allowing the teen to lead the session was appropriate.	0 (0%)	0 (0%)	0 (0%)	14 (35.9%)	25 (64.1%)
Generalizability					
PS positively impacted the way I interact with my patients NOT enrolled in iCARE.	1 (2.6%)	0 (0%)	8 (20.5%)	16 (41.0%)	14 (35.9%)
My clinic should continue to use PS.	1 (2.6%)	0 (0%)	5 (12.8%)	14 (35.9%)	19 (48.7%)
I would recommend PS to other healthcare providers.	0 (0%)	0 (0%)	4 (10.3%)	17 (43.6%)	18 (46.2%)

Table 5

Pearson product-moment correlation coefficients between scales of the BISS

	Competence	Acceptability	Components of PS	Generalizability	Training	Supervision
Competence	———					
Acceptability	.46**	———				
Components of PS	.58**	.55**	———			
Generalizability	.27	.67**	.29	———		
Training	.28	.63**	.35*	.42**	———	
Supervision	.05	.52**	.29	.27	.61**	———

*$p < .05$ level (2-tailed)
**$p < .01$ level (2-tailed)

Table 6

Pearson product-moment correlation coefficients between scores on the TFRS and BISS scales

	TFRS Scores
Training	.04
Supervision	.38*
Competence	.08
Acceptability/Feasibility	.11
Components of PS	.13
Generalizability	.10

*$p < .05$ level (2-tailed)
**$p < .01$ level (2-tailed)

Table 7

Content analysis: "Training"

Subtheme															15																								
Ongoing Training	0	0	0	1	0	0	1	0	1	0	1	1	0	0	0	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	11
More role plays	0	1	0	0	0	0	0	1	0	1	0	0	0	0	0	1	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	9
Training helpful	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	1	1	1	9
Train more team members	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Training-Knowledge of BI relationship with pt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Training-Not standard training	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1

Table 8

Content analysis: "Supervision"

Subtheme							7																																	
Supervision helpful	0	0	0	0	0	0	1	1	1	1	0	1	0	1	1	0	1	0	0	1	0	1	1	1	0	0	0	0	1	1	0	0	0	1	1	1	1	1	19
Suggestions for supervision	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	9
Time for supervision	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	5
Videos hard for pt and BI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	4
Supervision-not helpful	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2
Supervision and training didn't match	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
Supervision-knowledge of BI relationship with pt	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Table 9

Content analysis: "What HCPs Liked Most About PS"

Subtheme										11							..	Total (*N*= 38)
Empower patient	0	1	1	1	0	0	1	1	1	1	1	0	1	0	1	1	1	21
Engaging family	0	0	0	1	0	0	1	0	1	0	1	0	0	0	0	1	1	12
PS helpful	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	12
Positive process of PS	0	0	0	0	0	1	1	0	0	0	1	1	0	1	0	0	1	11
Positive components of PS	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	1	9
Liked everything	0	0	0	0	0	0	0	0	1	1	0	1	0	0	1	1	1	8
Identifying barriers/Setting Goals	1	0	1	0	1	0	1	1	0	0	0	1	0	0	0	0	0	7
PS enhances my practice/generalize to others	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	7
Reduces conflict	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	3

Table 10

Content analysis: "What HCPs Liked Least About PS"

Subtheme	6	Total
PS repetitive/effective?	0 0 0 0 0 1 | 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 0	5
Knowledge Remediation poorly executed	0 0 0 0 0 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 1 0 0 0 0 0 0	3
Negative components of PS	1 0 0 0 0 0 | 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	3
PS inpatient setting	0 0 0 0 0 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0	2
PS learning curve	0 0 0 0 0 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0	1
PS not well developed	0 0 0 0 0 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0	1
Unsure about later use	0 0 0 0 0 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1

Table 11

Content analysis: "Modifications to PS"

Subtheme			3																																				To tal
Modify measures	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	1	0	0	0	0	1	1	1	1	1	0	1	0	0	0	0	0	0	11
Streamline/Reduce time for PS	0	0	1	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	1	0	0	0	0	10
Suggestions for follow-up	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	6
PS too formal	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2

Subtheme														14																									Total
Time	1	0	0	1	0	1	0	1	1	0	0	0	1	1	0	1	0	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1	0	0	0	0	0	1	22
Busy clinic	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	1	1	1	0	1	1	0	0	1	0	1	0	1	0	12
Buy-in from team	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	9
Deny adherence problems/Generating barriers and solutions	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	7
Space for PS	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	6
Difficult families	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	4
Time burden for family	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Patient too young	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Appendices

Appendix A. Treatment Fidelity Rating Scale (TFRS)

iCARE Supervision Checklist

ID #: _____

Behavioral interventionist:_____

Behavioral interventionist discipline: _____

People participating in session: Parent(s) □ Sibling □ Friend □ HCP □ Other □

Supervisor: _____

Method of feedback (ex. Phone, written, individual, group):_____

Start Time: _____ **Stop Time**: _____

	Problem-Solving Steps	Yes	No
Self-reported adherence and barriers			
1.	Adolescent completes form independently	1	0
2.	BI refers to form	1	0
3.	BI provides praise	1	0
4.	BI asks open-ended question to elicit problem from teen without providing suggestions ("what do you want to work on?")	1	0
5.	Adolescent selects treatment	1	0
6.	Adolescent selects barrier ("what gets in the way?")	1	0
Define the problem ("last time this barrier happened…")			
7.	Who?	1	0
8.	What happened? (describe treatment & barrier)	1	0
9.	When?	1	0
10.	Where?	1	0

Set the ground rules			
11.	Explains brainstorming process	1	0
12.	States no judgments or evaluations	1	0
13.	Explains voting	1	0
Problem-Solving Steps, continued		**Yes**	**No**
Brainstorming			
1.	Teen writes on sticky notes	1	0
2.	Starts with teen	1	0
3.	Goes in order (teen, parent, BI)	1	0
4.	Generates 8 or more solutions	1	0
5.	Facilitates teen's brainstorming (give a point if not needed)	1	0
6.	Redirects criticism/evaluations at least once (include active ignoring; give a point if not needed)	1	0
7.	Solutions brief with little explanation (BI cuts off rambling if needed)	1	0
Voting			
8.	Re-explains voting process ("+" for something you are "willing to try," "-" to veto)	1	0
9.	Teen records votes	1	0
10.	Starts with teen	1	0
11.	Goes in order (teen, parent, BI)	1	0
12.	Redirects criticism/evaluations (give a point if not needed)	1	0
13.	Identifies solutions that receive all '+'s	1	0
14.	Directs teen to select 1 solution	1	0
15.	Uses clinical judgment if teen wants to combine solutions	1	0

	(give a point if not needed)		
Operationalize solution			
16.	Who?	1	0
17.	What?	1	0
18.	When will you start using the solution?	1	0
19.	When will the solution occur (in your day/schedule)?	1	0
20.	Where?	1	0
21.	Explains follow-up phone call	1	0
22.	Writes solution on PTP	1	0

Appendix B. Behavioral Interventionist Satisfaction Survey (BISS)

iCARE- Behavioral Interventionist Satisfaction Survey

Demographic Information

1. Please select your gender

☐ Male
☐ Female

2. Please select your age

☐ 18-24
☐ 25-34
☐ 35-44
☐ 45-54
☐ 55-64
☐ 65 or older

3. Please select the highest level of education you have attained

☐ Bachelor's Degree or less
☐ Master's Degree
☐ Doctoral Degree
☐ Other (please describe)_____

4. Please select your discipline (Select all that apply)

☐ CF Center Director
☐ Physician
☐ Clinical Nurse Practitioner
☐ Physician's Assistant
☐ CF Clinic Coordinator
☐ Research Coordinator
☐ Registered Nurse
☐ Dietitian
☐ Social Worker
☐ Respiratory Therapist

☐ Physical Therapist
☐ Psychiatrist
☐ Psychologist
☐ Other (please type in)_____

5. How long have you been working with people with CF? (Select one)
   - ☐ Drop down menu with selection Less than 1 year – 50 years

6. What are your roles in the iCARE study at your site? (Select all that apply)

☐ Center Director
☐ Behavioral Interventionist
☐ Data Coordinator
☐ Recruitment
☐ Administration of Measures
☐ Skills Training in Respiratory Devices
☐ Knowledge Deficit Remediation
☐ Other (please type in) _____

7. Have you conducted Problem-Solving sessions during the iCARE study?
   - ☐ Yes
   - ☐ No

   (a) If Yes, how many Problem-Solving sessions have you conducted?

   ☐ Drop down menu with selection 1 – 160 or more

   (b) If Yes, for how many months have you been conducting Problem-Solving sessions?

   ☐ Drop down menu with selection Less than 1 month – 24 months

   (c) If Yes, how many clinical supervision sessions have you received?

   ☐ Drop down menu with selection Less than 3 – 100 or more

Please choose the number that best represents how much you agree with the statement.

Initial In-Person Training

	1- Strongly Disagree	2. Disagree	3. Neutral	4. Agree	5. Strongly Agree
1. I am satisfied with the training I received to conduct Problem-Solving sessions.	1	2	3	4	5
2. The training increased my knowledge of the steps of Problem-Solving.	1	2	3	4	5
3. The training helped me feel prepared to conduct Problem-Solving sessions.	1	2	3	4	5
4. My expectations for training were met.	1	2	3	4	5
5. How can we improve training in Problem-Solving?	OPEN ENDED				

Supervision

1. I am satisfied with the supervision I received for Problem-Solving sessions.	1	2	3	4	5
2. The supervision I received increased my knowledge of the steps of Problem-Solving.	1	2	3	4	5
3. The supervision I received increased my confidence in conducting Problem-Solving sessions.	1	2	3	4	5
4. It would have been helpful to receive supervision on a patient's later sessions.	1	2	3	4	5
5. My expectations for supervision were met.	1	2	3	4	5
6. How can we improve the supervision of Problem-Solving?	OPEN ENDED				

Problem-Solving Sessions

1. I feel confident in my ability to conduct Problem-Solving sessions.	1	2	3	4	5
2. The content of the Problem-Solving sessions was useful (i.e. the treatment and barrier discussed).	1	2	3	4	5
3. The Problem-Solving steps were helpful (i.e. brainstorming, voting rules).	1	2	3	4	5
4. Allowing the teen to pick the treatment and barrier was acceptable.	1	2	3	4	5
5. It was appropriate to conduct Problem-Solving sessions while a teen was hospitalized.	1	2	3	4	5
6. Allowing the teen to lead the session was acceptable.	1	2	3	4	5
7. The amount of time it took to conduct Problem-Solving sessions was reasonable.	1	2	3	4	5
8. I understand the CF My Way™ materials.	1	2	3	4	5
9. The clinic was an appropriate setting for conducting Problem-Solving sessions.	1	2	3	4	5
10. Problem-Solving is an appropriate intervention to address adherence in adolescents with CF.	1	2	3	4	5
11. I feel knowledgeable in my understanding of the steps of Problem-Solving.	1	2	3	4	5
12. I feel skilled at conducting Problem-Solving sessions.	1	2	3	4	5
13. Problem-Solving positively impacted the way I interact with my patients enrolled in iCARE.	1	2	3	4	5
14. It was appropriate to conduct Problem-Solving	1	2	3	4	5

sessions during research visits.					
15. Problem-Solving positively impacted the way I interact with my patients NOT enrolled in iCARE.	1	2	3	4	5
16. Doing Problem-Solving is appropriate for my role on the CF team.	1	2	3	4	5
17. Implementing Problem-Solving in my clinic should be continued.	1	2	3	4	5
18. I would recommend Problem-Solving to other healthcare providers.	1	2	3	4	5
19. I plan to continue Problem-Solving with my patients.	1	2	3	4	5
20. What aspects of Problem-Solving did you like the most? Why?	OPEN ENDED				
21. (a) If you were to continue using Problem-Solving, would you make any changes?	YES/NO				
(b)If Yes, what would you change about Problem-Solving?	OPEN ENDED				
22. What aspects of Problem-Solving did you like the least? Why?	OPEN ENDED				
23. (a) Did you encounter any barriers to implementing Problem-Solving at your CF center?	YES/NO				
(b) If Yes, please describe the barriers to implementing Problem-Solving you encountered at your CF center.	OPEN ENDED				
24. How can we improve Problem-Solving sessions?	OPEN ENDED				
25. Please share any general comments or concerns about Problem-Solving sessions.	OPEN ENDED				

Appendix C. Content Analysis: Selected Quotes

"Training"

- *More role plays*
  "Some roleplaying in small groups"

  "The training was very quick, did not have time to role play problem-solving sessions"

- *Ongoing training*
  "Training sessions could be longer"

  "Check in after a year to review strategies for keeping study participants engaged"

- *Training helpful*

  "I feel that the training for the iCARE study is well done"

  "I had a really good training, I felt it helped a lot"

"Supervision"

- *Supervision helpful*

  "Supervision was well done and very helpful"

  "Appreciate the observation, detailed feedback, and praise!"

- *Suggestions for Supervision*

  "Consider giving BI [behavioral interventionist] videos to review as needed"

  "It might be cool to actually do a PS in real time over skype so that we could get immediate feedback right after the PS"

“What HCPs Liked Most About PS”

- *Empower patient*
  “Letting the patient choose what they want to work on”

  “To encourage more participation in their CF care”

- *Engaging family*

  “…engage patient and family”

  “It brings the parent and child together in a non-judgmental way to generate ideas”

- *PS helpful*

  “This is an extremely helpful and portable tool.”

  “Assisting patients and families to find ways to fit in therapies.”

- *Positive process of PS*

  “This non-judgment has a powerful way of eliciting true feelings”

  “Using humor in the sessions also helped people to relax on issues that have usually been very stressful”

- *Positive components of PS*

  “Voting = surprising”

  “The intervention is structured and clear”

- *Liked everything*
  “Love it”

  “I’m a very big fan”

- *Identifying barriers/setting goals*

  "Teens have commented that they like the specific goals"

  "Encouraging the teen to identify barrier and solution she wants to work on"

- *PS enhances my practice/generalizes to others*

  "It will be very useful for patients who are launching into self-care/transition"

  "It has enhanced my practice working with other children with chronic medical conditions and their families"

"What HCPs Liked Least About PS"

- *PS repetitive/effective?*

  "It can be repetitive- sessions going over the same things"

  "It doesn't seem to translate into changed behavior as often as I'd like to see."

"Modifications to PS"

- *Modify measures*

  "The goal planning tear off sheet should be simplified."

  "Filling out meds and other info on sheet, felt like it was a waste of my time and very difficult to find the time to complete."

- *Streamline/Reduce time for PS*

  "Shorten the process."

  "If they have an idea, speed up the process by not going through everything."

- *Suggestions for follow-up*

  "Follow-up by email?"

  "I would use text messaging more with teens for follow-up"

"Barriers to Implementing PS"

- *Time*

  "Finding time continues to be a barrier"

  "Time, especially when there are several other disciplines needing time with patients and families…"

- *Busy clinic*

  "How our clinic runs it often made things feel rushed"

  "Sometimes it is hard to fit into a busy clinic"

- *Buy-in from team*

  "Not all team members are as enthusiastic about conducting a PS session as others."

  "It would have been much easier if other disciplines on my team helped more with the sessions as I could not always get them done!"

- *Deny adherence problems/Difficulty generating barriers and solutions*

  "When there would be silence and I would have to watch the person struggle to think. I need more practice with helping them out here."

  "Sometimes difficult for teen to identify aspects of their care they need to improve on"

- *Space for PS*

“We have very limited space”

“…needing the exam rooms.”