

MCCALL, MARCIA H., Ph. D. Counselor-provided SBIRT for Hospitalized Adults with Substance Misuse or Disordered Use: Evaluating Hospital Utilization Outcomes and Economic Cost. (2019)

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The misuse and disordered use of alcohol and illicit drugs in the United States creates serious consequences for people and their families and communities, such as severe physical health issues (Substance Abuse and Mental Health Administration [SAMHSA], 2017a) and costs to society approaching \$440 billion annually (National Institute on Drug Abuse [NIDA], 2018). Yet, few people receive the treatment they need (Grant et al., 2015; Grant et al., 2016). Instead, they overuse hospital stays and emergency care, among the most expensive medical services (Bernardino, Baird, Liu, & Merchant, 2015; Hankin, Daugherty, Bethea, & Haley, 2013).

White and Kelly's (2011) Addiction Recovery Management theoretical framework suggests that the historical partitioning of medical and mental health care hinders detection, intervention, coordination of services, and recovery from substance misuse and disordered use. Given that most U.S. citizens see a physician at least once per year (Sacks et al., 2016), a technique developed for medical settings is Screening, Brief Intervention, and Referral to Treatment (SBIRT) (SAMHSA, 2013). SBIRT by medical providers is effective for helping patients of clinics and emergency departments reduce alcohol misuse (Jonas et al., 2012; Schmidt et al., 2015), but not effective for patients with disordered alcohol use (Mdege & Watson, 2013; Schmidt et al., 2015), patients with drug use (Saitz et al., 2014), or patients admitted to medical hospitals (Mdege & Watson, 2013).

Recent efforts to integrate medical and mental health care practices have incorporated SBIRT conducted by mental health professionals (Collaborative Family Health Association [CFHA], 2017). Outcomes from early investigations show promise for populations and settings not responsive to SBIRT by medical providers (Barbosa et al., 2017; Watkins et al., 2017). Professional counseling, in particular, aligns with SBIRT's goals and guidelines (Babor & Higgins-Biddle, 2001; CACREP, 2015). Counselors endeavor to build therapeutic alliances with clients; in specialty treatment settings, this alliance predicts positive outcomes (Barber et al., 2001; Crits-Christoph, Johnson, Gibbons, & Gallop, 2013; Van Horn et al., 2015; Watts, O'Sullivan, & Chatters, 2018). Early results for counselor-provided SBIRT in an integrated care setting suggest efficacy for reducing substance use (Veach et al., 2018).

This study extended the work of Veach et al. (2018) by determining if counselor-provided SBIRT in integrated care settings is an effective treatment intervention, guided by Simpson's (2004) Texas Christian University Treatment Model theoretical framework associating patient, program, and treatment factors with outcomes. The study tested three hypotheses. The first hypothesis predicted that interventions for hospitalized patients with alcohol or illicit drug misuse or disordered use were associated with fewer subsequent hospitalizations and emergency department visits. The findings were not significant but did trend in a supportive direction. The second hypothesis was that these outcomes differed by substance use type (alcohol or illicit drugs), substance use severity, and hospital clinical service unit. Significant results were found for all three covariates, including significance for counselor-provided SBIRT and alcohol use. The third

hypothesis, given the substantial financial burden of substance misuse and disordered use on health care systems, predicted that counselor-provided SBIRT interventions reduced economic costs from the health system perspective. The findings supported the third hypothesis with significance, but with caution relative to inconsistency in the results. Given these findings, health system administrators, physicians, and community leaders may support integrating professional counselors into hospital units and other medical settings, raising the likelihood that people who need help with their substance misuse or disordered use actually receive it.

COUNSELOR-PROVIDED SBIRT FOR HOSPITALIZED ADULTS WITH
SUBSTANCE MISUSE OR DISORDERED USE: EVALUATING
HOSPITAL UTILIZATION OUTCOMES
AND ECONOMIC COST

by

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DEDICATION

I dedicate my dissertation to the memory of my parents, Robert E. and Helen P. Huston, both of whom I lost while I was pursuing my doctoral degree. Married more than 60 years, they died within a few years of each other as older couples sometimes do. They taught me perseverance, excellence, and integrity, the very qualities that enabled me to finish this work. Mom and Dad, rest in peace and in God.

APPROVAL PAGE

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CHAPTER I

INTRODUCTION

The misuse and disordered use of alcohol and illicit drugs in the United States creates serious consequences for people and their families, workplaces, and communities. People struggling with substance use are more likely to experience severe physical health issues, poor medical outcomes, and death (SAMHSA, 2017a). Costs to society from substance-related crime, lost work productivity, and injury approach \$440 billion annually (NIDA, 2018).

Alcohol and illicit drug misuse and disordered use means millions of people are risking their lives and health. More than 65 million U.S. residents binge drink – defined as drinking five or more drinks for men and four or more per women on one occasion – at least monthly (SAMHSA, 2017a). Of these, about 15 million use alcohol at disordered levels, consistently consuming 14 drinks or more per week for men and seven or more for women while experiencing serious life consequences (SAMHSA, 2017a). Alcohol-related deaths exceed 88,000 per year (SAMHSA, 2017a). About one in 10 people in the U.S., or 29 million, use drugs illicitly, primarily marijuana, prescription painkillers, and heroin; one-fourth are using illicit drugs at disordered levels, with uncontrollable cravings, drug-seeking behaviors, and losses of relationships and livelihoods (SAMHSA, 2017a). More than 64,000 people die annually from drug overdoses, with opioids such as painkillers and heroin accounting for 49,000 of these deaths (NIDA, 2018). Most

overdose deaths are thought to be unintentional (NIDA, 2018) and are devastating to families and communities. Mortality from prescription painkillers increased from 1.4 deaths per 100,000 people in 1999 to 7.0 in 2015, while heroin-related deaths rose from 0.7 to 4.1 (National Center for Health Statistics [NCHS], 2017). Due to this distressing escalation in fatal overdoses, opioid disorders have been identified as a national public health emergency (White House Office of the Press, 2017).

Despite the serious, life-altering, and expensive consequences of substance misuse and disordered use, most people do not receive the treatment they need. People whose substance misuse is potentially harmful but not yet disordered have limited options, as most treatment programs are intended for people who already use substances at disordered levels (SAMHSA, 2017b). Yet even for the disordered-use population, only about 6.3% of people with alcohol use disorders enter treatment each year (Grant et al., 2015), while 13.4% of those with drug use disorders are treated (Grant et al., 2016).

The stigma associated with obtaining mental health services, particularly substance-related services, is a major barrier to treatment-seeking (Tai & Volkow, 2013). At least partly due to stigma, many people deny their need for treatment, or they attempt to self-manage their substance problems (SAMHSA, 2015). For example, in a study of nearly 4,000 adult health center patients, researchers found that substance misuse and disordered use was considerable but patients' willingness to enter treatment was very low (Lebrun-Harris, Tomoyasu, & Ngo-Metzger, 2014). In this sample, at least 40% of patients had engaged in binge drinking in the past year and one out of every 10 patients were using alcohol at disordered levels. During the prior three months, 14% had used

illicit drugs, with one in eight having a disorder. However, when those with alcohol or drug disorders were asked if they wanted treatment, only 7% of these patients agreed to be helped.

Another barrier to treatment-seeking is the historical separation of medical care from mental health care. Medical care for substance-related physical problems occurs mainly in hospitals and clinics, while most mental health care for substance use takes place in specialty facilities (SAMHSA, 2017b). This body-mind separation of care, along with strict federal privacy laws surrounding substance use treatment that forestall open communication among providers, creates fragmentation of services and failure to coordinate treatment plans (Fornili, 2016a). The absence of coordinated care may be a significant factor in relapse rates. Of people entering specialty treatment, 64% have done so at least once before (White & Kelly, 2011). It takes an average of four-to-five years to recover from alcohol problems from the time people first seek help; for heroin and other opioids, the timeframe is even longer (White & Kelly, 2011). The lifetime recovery rate from substance disorders is only 50-60% (White & Kelly, 2011), a systemic failure that brings enormous personal costs to families, communities, businesses, and governments (Everett & Benjamin, 2014).

The adverse health consequences of chronic, relapsing substance misuse and disordered use are particularly burdensome for medical professionals, who treat the often-serious medical conditions caused by deleterious use. Health care expenditures for alcohol and illicit drug misuse and disordered use are estimated at \$53 billion annually (NIDA, 2018), with medical costs ranking second only after specialty treatment (Sacks,

Gonzales, Bouchery, Tomedi, & Brewer, 2015). People with alcohol and drug use problems overuse hospitalizations and emergency department visits, which are among the most expensive medical services (Bernardino et al., 2015; Cornett & Latimer, 2011; Hankin et al., 2013; Hoffman & Cronin, 2015). They are overrepresented among emergency department patients, needing care for intensive conditions such as trauma, pain, and overdose (Bernardino et al., 2015; Hankin et al., 2013). They are also more likely to be hospitalized. Prolonged substance use is a major cause of chronic medical illness, which increases the frequency of hospital admissions and length of hospital stays (Friedman, Jiang, & Elixhauser, 2008). According to a report from the National Academy of Medicine (Long et al., 2017), chronically ill patients require complex care and consume a disproportionate share of health system resources; they are “...more likely to be publicly insured (83 percent were insured under Medicare, Medicaid, or both), have fair to poor self-reported health, and have a behavioral or substance abuse condition” (p. 20).

Given the onus of substance misuse and disordered use on health systems, and because many people who need treatment for their substance use do not receive it, alternative approaches to detection and treatment in medical settings have become imperative. Since most U.S. citizens see a physician at least once per year (Sacks et al., 2016), an intervention technique was developed specifically for medical settings: Screening, Brief Intervention, and Referral to Treatment (SBIRT) (SAMHSA, 2013). SBIRT debuted over thirty years ago as a World Health Organization alcohol screening and intervention process (Babor, Del Boca, & Bray, 2017). It is a “...public health model

designed to provide universal screening, secondary prevention (detecting substance misuse before the onset of disordered use), early intervention, and timely referral and treatment for people with [substance use disorders]” (SAMHSA, 2013). A key benefit is its universal nature; SBIRT allows health professionals to detect hidden substance problems and to provide treatment even for patients not actively seeking help (SAMHSA, 2013). Patients of medical practices tend to view substance screening and counseling as part of their providers’ roles, so rarely object to these interventions (Sacks et al., 2016). With a growing evidence base, SBIRT is now operational or under implementation in over half of U.S. states (Agle et al., 2014) and is employed in outpatient, emergency department, and inpatient settings (Babor et al., 2017).

SBIRT interventions by medical providers have been studied extensively relative to alcohol use and to a lesser degree for illicit drug use. It has been found most effective in outpatient and emergency medical settings for helping people reduce alcohol misuse (SAMHSA, 2013). However, SBIRT by medical providers has mixed outcomes for interventions in inpatient medical settings, for alcohol use disorders, or any level of illicit drug use (SAMHSA, 2017a). Many possible causes for these disappointing results have been proposed, but one consistent finding is that medical providers are willing to screen for substance use but fail to conduct brief interventions or referrals to treatment when misuse or disordered use is detected (Agle et al., 2014; Chan et al., 2015; Glass, Bohnert, & Brown, 2016)

Studies of SBIRT for alcohol misuse, defined as averaging more than one drink per day for women and older adults and two drinks for men but not meeting criteria for a

disorder (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2018), show consistently positive outcomes when conducted by medical personnel in outpatient clinics and emergency departments. Jonas et al. (2012) performed a meta-analysis of 23 randomized controlled trials (RCTs) where medical personnel provided SBIRT for primary care outpatients with alcohol misuse. SBIRT was associated with significant reductions in number of drinks per week and in the number of heavy drinking episodes, as well as the likelihood of patients transitioning from misuse to low risk drinking. Schmidt et al. (2015) conducted a meta-analysis of 33 RCTs involving 14,456 ED patients who were misusing alcohol, with SBIRT performed by medical providers. The researchers found small effects favoring reduction in alcohol misuse. According to these researchers and others, though, SBIRT has not been found to be effective for outpatients or ED patients who use alcohol at disordered levels (Bray et al., 2007; SAMHSA, 2013; Schmidt et al., 2015). SBIRT outcomes, then, appear to depend on alcohol substance use severity.

SBIRT conducted by medical providers has also been explored with patients hospitalized for medical conditions (i.e., inpatients), with little to no results. A meta-analysis by Mdege and Watson (2013) reviewed 46 studies of SBIRT conducted by medical personnel in inpatient settings ($n=17,231$). Study participants were a mixture of people who misused alcohol and those with alcohol disorders and were not stratified according to severity of use. Across studies, SBIRT by medical providers was not effective with helping hospital inpatients reduce alcohol consumption.

Evidence for SBIRT's effectiveness for illicit drug misuse and disordered use when conducted by medical providers is inconclusive, with research in this area in an early phase (SAMHSA, 2013). A systematic review by Young et al. (2014) for drug-related SBIRT uncovered only five studies, all in outpatient settings with interventions conducted by medical personnel. The reported results were mixed but insufficient for comparison or meta-analysis. An RCT for illicit drug use by Saitz et al. (2014) tested SBIRT ($n=169$ primary care outpatients) against a control group ($n=175$). Nearly all patients were using drugs at severe levels. SBIRT was provided by health educators with high school or bachelor's degrees. The researchers found no effects associating SBIRT and reduced drug use. Consequently, the effectiveness of SBIRT by medical staff on reducing drug use is inconclusive and perhaps depends on severity of use. According to the U.S. Preventative Services Task Force (USPSTF, 2017), although universal SBIRT for drug misuse and disordered use cannot be recommended based on current evidence, the USPSTF has developed a research plan for generating evidentiary support.

An emerging innovation in medical practice structure offers potential for enhancing SBIRT's effectiveness for people with disordered alcohol use, with misuse or disordered use of illicit drugs, or receiving care in inpatient hospital settings. Under new structures known as integrated care practices, mental health professionals trained at the master's level, such as counselors, social workers, and marriage and family therapists, work in cohesive medical/mental health groups, where they collaborate with medical providers to address substance-related problems along with other mental health concerns (Collaborative Family Health Association, 2017). Integrated care is "...the systematic

coordination of general and behavioral healthcare” (SAMHSA, 2018). In integrated care’s most evolved form, mental health and medical professionals are members of collaborative teams, sharing sites and systems, consulting with each other, and co-creating treatment plans, as delineated in a seminal article by Doherty (1995). For patients of integrated care practices, SBIRT is provided by mental health professionals, rather than the traditional model of SBIRT conducted by medical providers (e.g., physicians and nurses) (Collaborative Family Health Association, 2017).

When a new form of practice is introduced to a field, such as SBIRT by mental health professionals in integrated medical settings, it should be considered against an existing theoretical framework to facilitate understanding. A useful and relevant framework for the substance use treatment spectrum is the Addiction Recovery Management (ARM) model, advanced by White and Kelly (2011) and grounded in Bronfenbrenner’s Ecological Systems Theory (1992). White and Kelly recognized that substance treatment was most often a series of acute, medicalized, disjointed incidents with judgmental moral overtones that were hindering recovery for most people. They re-conceptualized recovery from substance problems as a comprehensive staged process: pre-recovery identification and engagement, recovery initiation and stabilization, sustained recovery support, and long-term recovery maintenance. The ARM model suggests processes that bring interventions directly to people in their communities rather than waiting for them to reach out for help, and surrounding people with multidisciplinary treatment teams.

Fornili (2016b) clarified how mental health clinicians conducting SBIRT in integrated care are part of the substance misuse/disordered use treatment continuum, using the four stages of ARM:

Pre-recovery identification and engagement. In integrated care, mental health clinicians use SBIRT to identify and engage early with patients who have substance problems.

Recovery initiation and stabilization. Integrated care clinicians initiate recovery by conducting brief interventions (BI) with patients who are misusing substances. Following the RT process of SBIRT, they refer people with more severe substance problems to clinical mental health clinicians in specialty treatment, who help clients stabilize and move into recovery.

Sustained recovery support. Sustained support is provided or arranged by both integrated care and specialty sites; it includes collaboration with families and peer organizations as well as coordination of services to help with employment, housing, child care, transportation, legal matters, and life skills

Long-term recovery maintenance. Integrated care clinicians use chronic care approaches to help patients learn self-care and self-management, provide checkups, and enable further connection to community resources.

When considered against the ARM framework, SBIRT provided by mental health professionals in integrated care settings aligns with ARM closely, lending support for the appropriateness and potential efficacy of this model.

Early research in SBIRT provided by mental health professionals has shown promising results. A recent study with 968 integrated care patients from inpatient, emergency, and outpatient settings involved SBIRT administered by counselors, social workers, psychologists and health educators, generally holding a master's level or higher and with approximately half certified or licensed in addiction treatment (Barbosa et al., 2017). Substance use had decreased significantly at 6-month follow-up for drug and alcohol misuse and disordered use. In an RCT conducted by Watkins et al. (2017), counselors and social workers conducted brief interventions in primary care settings for problem opioid and alcohol use. The BI intervention arm included 187 patients while the control arm had 190. At 6-month follow-up, the intervention group was significantly more likely to have obtained specialty treatment and to have abstained from substance use. These findings offer promise for having SBIRT interventions provided by mental health professionals in integrated care settings. Patients with substance misuse or disordered use who are not otherwise seeking or accepting their need for treatment may be more likely to make changes when interacting with trained mental health professionals.

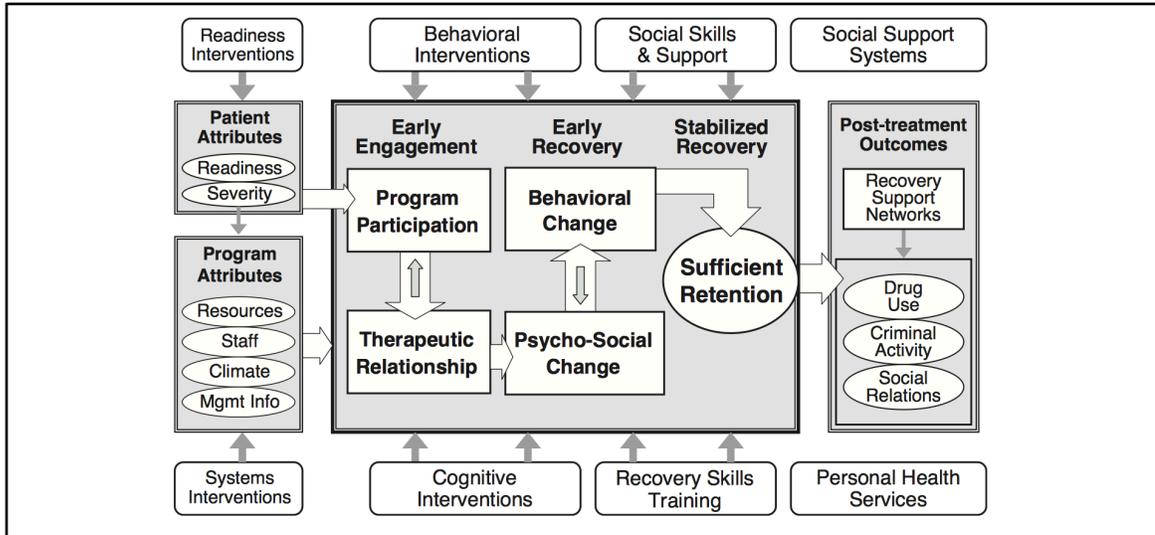
Among all mental health professionals, SBIRT in integrated care seems especially well-suited to the training and skills of professional counselors, whose focus is on the therapeutic relationship and on wellness (Babor & Higgins-Biddle, 2001; CACREP, 2015). Counselor training and practice are allied with SBIRT practice, which may lead to improved outcomes. SBIRT involves facilitative conditions and helping skills that counselors learn and routinely employ. SBIRT guidelines recommend that providers be

empathetic and nonjudgmental, quickly build rapport and trust, recognize and manage resistance, conduct assessments and provide effective feedback, match interventions to readiness to change, set goals, and engage in patient advocacy (Babor & Higgins-Biddle, 2001). SBIRT often takes place with a patient's family members or friends present; counselors are trained in family and group counseling methods (CACREP, 2015). Counselors are educated about trauma and psychiatric diagnoses (CACREP, 2015), conditions that frequently co-occur in substance misuse and disordered use (Patel et al., 2016). If counselors are conducting SBIRT in integrated care settings, more patients may be able to receive treatment services immediately on-site, whereas medical professionals conducting SBIRT must refer higher-risk patients to specialty treatment (Babor & Higgins-Biddle, 2001), a process that has limited demonstrated efficacy (Glass et al., 2015). Given how closely professional counseling is aligned with the SBIRT process, counselor-provided SBIRT may demonstrate significantly improved outcomes in inpatient settings, for alcohol use disorders, and for illicit drug misuse and disordered use. Research is essential for testing this promising intervention model, which has been implemented in at least one major health system. However, it appears that only one article involving counselor-provided SBIRT in integrated care has been published (Veach et al., 2018).

Research involving a new and innovative technique like counselor-provided SBIRT benefits from following an established, evidence-based theoretical framework in the substance use treatment and/or SBIRT fields. Such a framework from the treatment

field was offered by Simpson (2004), who developed the Texas Christian University Treatment Model (Figure 1).

Figure 1. Texas Christian University Treatment Model



In the TCU Model, the four major components of treatment are client factors, program attributes, treatment processes, and post-treatment outcomes (Simpson, 2004). The model is adaptable to most clients, settings, and processes (Simpson, 2004). Certain elements of the TCU Model can be employed as *predictor variables* for research in counselor-provided SBIRT in integrated care settings. For example, a client factor, *substance use severity*; the program attributes, collectively *setting*; and the treatment process, the *SBIRT intervention*, can all be predictor variables (Simpson, 2004). The TCU Model does not address type of use (alcohol and/or illicit drugs), but the SBIRT literature strongly suggests *substance use type* is also an important predictor variable (Mdege & Watson, 2013; Saitz et al., 2014; Schmidt et al., 2015).

The fourth element of the TCU Model concerns post-intervention outcomes. Evaluating innovative treatment interventions, such as counselor-provided SBIRT, requires identifying critical outcomes. For both the substance treatment and SBIRT fields, most researchers have focused on the traditional outcomes of interest to substance treatment programs, specifically participant reductions in substance use levels and/or abstinence (Jonas et al., 2012; Mdege & Watson, 2013; Schmidt et al., 2015). This focus is consistent with “gold standard” RCT methodology, to which individual-level changes are central, but introduces potential bias due to underreporting (Glass et al., 2017).

In medical settings such as integrated care, however, high-value outcomes for clinical programs are hospitalizations and emergency department visits (Bernardino et al., 2015; Cornett & Latimer, 2011; Hankin et al., 2013; Hoffman & Cronin, 2015). These outcomes are not often found in the treatment and SBIRT literature. Bray et al. (2007) examined these organization-level effects as SBIRT outcomes; the researchers concluded that SBIRT delivered by medical providers for alcohol misuse did not predict reductions in hospital admissions or emergency department visits compared to no interventions. A systematic review and meta-analysis of 29 publications by Bray, Cowell, and Hinde (2011) focused on health care utilization of inpatient, outpatient, and emergency services subsequent to SBIRT interventions by medical providers. Only emergency department utilization demonstrated a small reduction. Research studies involving counselor-provided SBIRT may provide important new evidence about hospitalization and ED visit outcomes for health systems, given medical providers’ apparent reluctance to conduct the BI and RT components of SBIRT (Agle et al., 2014; Chan et al., 2015; Glass et al.,

2016). It may be that SBIRT performed by professional counselors will result in more positive outcomes than SBIRT performed by medical providers and even other mental health professionals, due to the alignment between effective counseling and effective SBIRT (Babor & Higgins-Biddle, 2001; CACREP, 2015).

Research in counselor-provided SBIRT that demonstrates efficacy for reducing health utilization burdens may be welcomed by health system leaders and medical providers. However, clinical outcomes alone may not be sufficient to convince health care decision-makers to invest in counselor-provided SBIRT programs. The field of economics offers additional tools for these decision-makers that take into consideration the problems under review, the questions to be answered, and the decision-makers' perspectives and needs for information (Drummond, Sculpher, Claxton, Stoddard, & Torrance, 2015; Link, 2018). At the health system level, where decisions about alternative program investments are made, an appropriate tool is economic cost analysis. According to Drummond et al. (2015), cost analysis allows decision-makers to evaluate alternative programs within budget constraints. The choice of elements to include in the analysis depend on the decision-maker's perspective. Employing cost analysis to analyze hospitalization and ED visit outcomes for counselor-provided SBIRT will add an important dimension to research in this area, as an informative analysis will provide health system leaders with needed data for making organizational investment decisions.

Statement of the Problem

The misuse and disordered use of alcohol and illicit drugs are pervasive, costly public health problems in the United States (NIDA, 2018; SAMHSA, 2017a). The

consequences for people with substance use problems can be severe and sometimes fatal, and those problems extend to their families, communities, and workplaces. Despite these serious outcomes, few people who need treatment for substance use receive it (Grant et al., 2015; Grant et al., 2016). Barriers to treatment-seeking include stigma (Tai & Volkow, 2013) and lack of coordination between medical and mental health providers (Fornili, 2016a). In the current fragmented system, people take years to recover successfully from substance problems (White & Kelly, 2011). The costs to health care systems are substantial, as substance misuse and disordered use increases the likelihood of needing expensive medical services such as emergency departments and hospitalizations (Bernardino et al., 2015; Long et al., 2017).

To reduce the treatment gap through early detection, treatment, and referral, substance-related interventions by medical providers are becoming common through the widespread adoption of SBIRT (Agle et al., 2014). SBIRT by medical providers has demonstrated effectiveness for helping patients of outpatient clinics and emergency departments reduce alcohol misuse (Babor et al., 2017; Jonas et al., 2012; Schmidt et al., 2015) but has mixed outcomes for alcohol use disorders, illicit drug misuse and disordered use, and in inpatient settings (Mdege & Watson, 2013; Schmidt et al., 2015). Higher severity of alcohol and illicit drug use has been associated with worse SBIRT outcomes (Mdege & Watson, 2013; SAMHSA, 2013; Schmidt et al., 2015).

Integrated care, a recent trend involving medical and mental health care providers in collaborative teams, offers promise for improved outcomes when SBIRT is provided by mental health professionals (Barbosa et al., 2017; Watkins et al., 2017). The practice

of professional counseling, in particular, seems well-suited for brief interventions and treatment (Babor et al., 2017; CACREP, 2015); thus, counselor-provided SBIRT may have efficacy for helping people with substance problems other than alcohol misuse. Outcomes of high value to health systems – hospitalizations and emergency department visits – should be studied (Bray et al., 2007) when evaluating counselor-provided SBIRT in integrated care. Economic analysis of these outcomes will provide important information to health system leaders for making programmatic investment decisions (Drummond et al., 2015).

Purpose of the Study

The purpose of this study is to determine whether counselor-provided SBIRT in inpatient integrated care settings is an effective treatment intervention for alcohol and illicit drug misuse and disordered use by evaluating the association between intervention and subsequent hospitalizations and emergency department visits. Inpatient settings were selected for study given inconclusive results from prior research for this category of patient care location. Because counselor-provided SBIRT's effectiveness may depend on type (alcohol or illicit drugs), severity of substance use, and setting, this study also will examine the associations of these variables with post-intervention hospitalizations and emergency department visits. In this study, severity is represented by substance use patterns as well as by frequency of hospitalizations and ED visits prior to SBIRT intervention. Because of the substantial financial burden of substance misuse and disordered use on health care systems, this study also will evaluate whether counselor-provided SBIRT interventions reduce economic costs from the health system perspective.

Need for the Study

Research regarding counselor-provided SBIRT in inpatient integrated care settings may demonstrate its efficacy and economic benefit as a treatment model for substance misuse and disordered use. If so, health system administrators, physicians, and community leaders may become more supportive of integrating professional counselors into inpatient units and other medical settings. In addition, identifying treatments for substance misuse and disordered use that reduce hospital admissions and emergency department visits in a cost-effective way may lead to increased health system funding for SBIRT by professional counselors. These changes may raise the likelihood that people who need help with their substance misuse or disordered use actually receive it.

Research Questions

Research Question 1. For patients with alcohol or illicit drug misuse or disordered use, do patients in inpatient integrated care settings receiving counselor-provided SBIRT experience fewer hospitalizations and emergency department visits compared to patients in the same settings not receiving interventions?

Research Question 2. Do hospitalization and emergency department visit outcomes for patients with alcohol or illicit drug misuse or disordered use differ by substance use type, substance use severity, or inpatient service location?

Research Question 3. Are counselor-provided SBIRT interventions associated with reduced economic costs from the health system perspective?

Operational Definitions

Certain terms are employed throughout this report and are defined here for clarity:

Alcohol misuse: for adult males aged 18-65, exceeding four drinks per day and/or 14 per week and for adult females and males older than 65, three drinks per day and/or seven per week, but not meeting criteria for alcohol use disorder and/or being assigned International Compendium of Diseases-10 alcohol misuse coding following patient encounters with medical and/or mental health providers

Binge drinking: for males, more than four drinks per occasion; for females, and males >65 years old, more than three per occasion

Disordered alcohol or drug use: meeting Diagnostic and Statistical Manual-5 criteria for the disorder of the substance being used and/or being assigned International Compendium of Diseases-10 disorder coding following patient encounters with medical and/or mental health providers

Drug misuse: any use of an illegal drug or use of prescription drugs other than as prescribed, but not meeting criteria for a drug use disorder and/or being assigned International Compendium of Diseases-10 misuse coding following patient encounters with medical and/or mental health providers

Emergency department visit: admission to the emergency department and receipt of medical care in the treatment area

Hospitalization or inpatient: individual with a physician referral for hospital admission has undergone the admission process and occupies a hospital room

Illicit drug use: use of illegal drugs or of prescription drugs other than as prescribed

Outpatient or clinic patient: individual receiving same-day services at a medical clinic

Organization of the Study

This chapter outlines the rationale and need for a research study. In the second chapter, a review of relevant literature is presented, suggesting that counselor-provided SBIRT in integrated care settings is a promising, innovative intervention for people with misuse or disordered use of alcohol and/or illicit drugs and may help reduce health system burdens from treating the effects of harmful substance use. In the third chapter, the research methodology for examining counselor-provided SBIRT in a specific integrated care setting and population is provided. The research questions and hypotheses are stated. The research design, consisting of the study setting, counseling program and intervention process, study population, data procedures, and measures, is explained. The statistical analyses are described, and the pilot study design is proposed.

CHAPTER II

LITERATURE REVIEW

Introduction

In chapter 1, the problems of substance misuse and disordered use were described, a promising new intervention presented – counselor-provided SBIRT in integrated care settings, and the basis for investigation established. In this chapter, the literature supporting these topic areas will be explored, beginning with the mortality, morbidity, prevalence, and social and medical costs arising from alcohol and drug use. The present state of intervention and treatment as well as barriers to treatment will be noted. Two theoretical frameworks will be presented, the first, Addiction Recovery Management (White & Kelly, 2011), defining the substance use treatment continuum and the second, the Texas Christian University Treatment Model (Simpson, 2004), guiding research methodology. Two major components of the treatment continuum, specialty substance use disorder treatment and an intervention common to medical settings, Screening, Brief Intervention, and Referral to Treatment (SBIRT) will be examined, along with relevant outcomes research. The relatively new field of integrated care, with its provision of SBIRT by mental health professionals such as counselors, will be defined. Counselor-provided SBIRT in integrated care will be supported, and important outcomes highlighted, including economic evaluation. Thematic findings of the literature review will be summarized.

Substance Misuse and Disordered Use

Misuse and disordered use of alcohol and illicit drugs are global public health risks, causing pervasive mortality and morbidity (United Nations Office on Drugs and Crime [UNODC], 2018; World Health Organization, 2018). Alcohol use leads to three million deaths annually, or 5.3% of worldwide mortality, more than deaths from HIV/AIDS or diabetes (World Health Organization, 2018). Disability arising from alcohol-related diseases, cognitive conditions, and accidents accounts for 5.1% of morbidity worldwide (World Health Organization, 2018). Illicit drug use is less prevalent than alcohol use, but still takes the lives of 450,000 people each year; of these, one-third die from drug overdoses while most others contract drug-related infectious diseases (UNODC, 2018). Three-fourths of overdoses are from opioids, enabled by a 65% increase in global opium production from 2016 to 2017 (UNODC, 2018).

In the United States, 88,000 people die from alcohol-related causes each year (SAMHSA, 2017a) with 39% succumbing to liver cirrhosis, 35% to cancer, another 16% to traffic fatalities, and the remainder to heart disease and infection (World Health Organization, 2018). Binge drinking – defined as five or more drinks per day for men and four or more per women – is a hazardous monthly custom for more than 65 million U.S. residents (SAMHSA, 2017a). Alcohol misuse and alcohol-related disorders affect 14% of people older than 15 years (World Health Organization, 2018); of these, well over half use alcohol at disordered levels, consistently exceeding 14 drinks per week for men and seven for women and leading to serious life consequences (SAMHSA, 2017a).

In the U.S., approximately 29 million people misuse drugs illicitly. Of these, one-fourth are abusing drugs at disordered levels, with uncontrollable cravings, drug-seeking behaviors, and losses of relationships and livelihoods (SAMHSA, 2017a). Drug overdose death rates have increased precipitously, now claiming 64,000 lives each year. Opioids account for 49,000 of these deaths (NIDA, 2018). Most people become addicted to opioids when they try to manage pain, a condition affecting 110 million U.S. citizens and costing \$600 billion annually (Institute of Medicine, 2011); 14.4 million suffer from severe pain daily (Nahin, 2015). Prescription opioids for pain management are associated with harm, including accidental overdose, illicit use, diversion to others (Chou et al., 2015), and a high rate of conversion to heroin use (Dart et al., 2015). Mortality from non-medical use of prescription painkillers rose from 1.4 deaths per 100,000 people in 1999 to 7.0 in 2015, while heroin-related deaths rose from 0.7 to 4.1 (NCHS, 2017). The recent widespread availability of the drug fentanyl, a synthetic opioid usually manufactured illicitly, is driving up fatalities (UNODC, 2018). Fentanyl recently surpassed prescription painkillers as the leading cause of overdose deaths (Jones, Einstein, & Compton, 2018), most of which are thought to be unintentional (NIDA, 2018). Due to this distressing escalation in fatal overdoses, opioid use disorder has been identified as a national public health emergency (White House Office of the Press, 2017).

Workplace, Governmental, and Health Care Costs

Costs to the economy, governments, and health care providers from alcohol and illicit drug misuse and disordered use are at least \$442 billion annually per federal government estimates, with alcohol accounting for \$249 billion and illicit drugs \$193

billion (Centers for Disease Control [CDC], 2018; National Drug Intelligence Center [NDIC], 2011). While these estimates are the most recent available, it should be noted that they range from 8 (for alcohol) to 11 (for illicit drugs) years old (CDC, 2018; NDIC, 2011); it's probable that they are well short of current costs.

Binge drinking accounts for most of the economic cost of alcohol at \$192 billion, or about \$2 in additional costs for every drink purchased (CDC, 2018). Lost work productivity is associated with 72% of alcohol-related costs; another 11% arises from the cost of providing health care and rehabilitation; 10% is related to costs associated with law enforcement and criminal justice; 5% is associated with motor vehicle crashes, and 2% is from other causes (CDC, 2018). Ultimately, 40% of alcohol costs across these factors are borne by federal, state, and local governments and thus taxpayers (CDC, 2018).

For illicit drugs, the heaviest burden also is on workplace productivity, representing 62% of the total (NDIC, 2011). The proportion attributable to costs associated with law enforcement and criminal justice is 32%, substantially larger than for alcohol, while health care and rehabilitation costs account for 6% of the total (NDIC, 2011).

Health Care Utilization

The present study investigates the effects of substance misuse and disordered use on health care system outcomes, so further emphasis on health care utilization is warranted. People with alcohol and/or drug misuse or disordered use are more likely to have severe physical health issues including chronic pain, comorbid mental health

diagnoses, and poor medical outcomes (SAMHSA, 2017a; Tai & Volkow, 2013). They are less likely to seek preventive medical care, thus delaying treatment until problems are advanced (Ghitza & Tai, 2014), more likely to have low incomes and unable to afford care (Ghitza & Tai, 2014), and are more likely to receive lower-quality care that is not coordinated among providers (Saitz et al., 2013).

Because people with alcohol and illicit drug misuse or disordered use tend to be sicker and lack consistent care, they are prone to excessive emergency department (ED) visits and hospitalizations, which are among the most expensive medical services (Cornett & Latimer, 2011; Hoffman & Cronin, 2015). A three-year study at a large Northeastern U.S. hospital ($n=6,432$ adults) showed that ED patients used illicit drugs at more than double the national average for people 18-25 years old and by four times the average for those aged 26+, while alcohol use was 20% and 4% higher, respectively (Bernardino et al., 2015). Researchers at a large Southeastern U.S. hospital ($n=19,055$ adults) found that 28% of patients divulged alcohol or illicit drug use; of these, 20% of patients were using at disordered levels while experiencing poor health and extreme stress due to substance use (Hankin et al., 2013). They were also frequent ED visitors, having sought care an average of 1.7 times in the prior 30 days (Hankin et al., 2013).

In addition to ED utilization, substance misuse and disordered use are associated with more frequent hospitalizations. In one of the few studies to compare chronic illicit drug use with inpatient, ED, and outpatient health services utilization and with the cost of medical care, people with chronic drug use were compared to people who did not use drugs ($n=1,480$ adults) (French, McGeary, Chitwood, & McCoy, 2000). People using

drugs were more likely to visit EDs and to be admitted to hospitals, and they were less likely to seek clinic-based outpatient care such as primary and preventive visits. The excess costs associated with their health service utilization exceeded \$1,000 per person (not adjusted for inflation).

According to a report from the National Academy of Medicine (Long et al., 2017), substance-related conditions are prevalent in patients who have high medical needs. High-needs patients account for 50% of our nation's health care expenditures, despite representing only 5% of the patient population (Long et al., 2017). In a study of 2011 and 2012 Medicare insurance claims ($n=6,112,450$ older adults), the majority of costs were for hospitalizations and post-hospital care. Patients who were in the top decile for costs were 1.75 times more likely to have an alcohol or drug diagnosis compared to patients in lower deciles (Joynt et al., 2017). Long et al. (2017) argued that medical treatment alone was insufficient for improving outcomes and reducing hospitalizations and other medical costs for these patients; rather, a full spectrum of care that addressed medical, social, and mental health needs was imperative.

Substance use disorders are key concerns for patients hospitalized with chronic illnesses, a subset of the high-needs patient population. In a study of hospital discharges occurring in 2002 across six states (California, Nevada, New York, Pennsylvania, Tennessee, and Utah), substance-related disorders were identified in 13% of patients with one chronic illness, 16% of those with three chronic illnesses, and 14% of patients with five chronic illnesses (Friedman et al., 2008). In the same population, other mental health disorders were factors in 15% of patients with one chronic illness, 22% of patients with

three and 27% of those with five (Friedman et al., 2008). Taken together, substance and other mental health disorders were among the top four conditions in patients with chronic disease(s), rivaling hypertension, cardiovascular disease, and diabetes (Friedman et al., 2008). Given that personality and mood disorders are predictive of substance use disorders (Sarvet & Hasin, 2016), addressing substance misuse and disordered use is critical in treating hospitalized patients who have chronic diseases. Even small reductions in hospitalizations could yield significant cost savings, particularly if there are reductions in readmissions of patients discharged less than 30 days prior (Hoffman & Cronin, 2015).

Intervention and Treatment

Despite the life-threatening and expensive consequences of substance misuse and disordered use, most people do not receive the interventions or treatments they need, and many who do receive treatment still struggle to reduce their use or abstain. Only about 6.3% of people with alcohol use disorders enter treatment each year (Grant et al., 2015), while 13.4% of those with drug use disorders are treated (Grant et al., 2016). Nearly two-thirds of people entering treatment have done so before, and 40% of people entering treatment have been treated more than three times (White & Kelly, 2011). From the time an individual first seeks help for alcohol use, it takes an average of four-to-five years to recover; for the use of heroin and other opioids, the timeframe is even longer (White & Kelly, 2011). Over their lifetimes, almost half of people using alcohol or drugs at disordered levels are unable to recover (White & Kelly, 2011). People whose substance misuse is potentially harmful but not yet disordered are unlikely to be identified for

intervention or offered help, as treatment programs target alcohol and drug disorders only (SAMHSA, 2017b).

Barriers to Intervention and Treatment

The barriers to intervention and treatment are multifaceted and interwoven, incorporating personal and systemic factors (Tai & Volkow, 2013). People may be unaware that they need treatment, may deny their need for treatment, may attempt to self-manage their substance problems, or fear the stigma of being judged by others if they seek treatment (Office of the Surgeon General, 2016; SAMHSA, 2015; White & Kelly, 2011). Results from a large study of adult health center patients ($n=3,949$ low-income adults) showed that 93% of patients with serious substance-related problems were unwilling to accept treatment when it was directly offered (Lebrun-Harris et al., 2014). Other reasons are structural; people lack health insurance or transportation, do not know where to find treatment, or cannot afford to leave their jobs (Office of the Surgeon General, 2016). Problematic substance use can be missed when communities lack adequate detection and intervention activities (Office of the Surgeon General, 2016). Consequently, many people enter treatment only under familial or justice system coercion at late stages of disordered use (White & Kelly, 2011).

Although substance problems tend to be pervasive and chronic, intervention and treatment are usually short-term, confined to special facilities, and engaged in response to crisis (Tai & Volkow, 2013). Managed care “carve-outs” for behavioral health (Tai & Volkow, 2013), along with historical medical provider beliefs that substance problems are moral failings, not chronic diseases (French et al., 2000), have divided medical care

from substance-related treatment, and separated out insurance reimbursement accordingly. Medical facilities have difficulty getting paid for providing substance misuse or disorder treatment, while specialty treatment programs face obstacles to reimbursement for medical care (Tai & Volkow, 2013). Consequently, medical facilities typically manage physical problems when patients become ill from substance use, while specialty facilities provide mental health care but only for advanced substance disorders (SAMHSA, 2017b). People who misuse alcohol or drugs and would benefit from early detection and treatment are missed (Tai & Volkow, 2013). This body-mind separation of care, along with strict federal privacy laws surrounding substance treatment that forestall open communication among providers, creates fragmentation of services and failure to coordinate treatment plans (Fornili, 2016a). Not surprisingly, the dearth of coordination and communication pre- and post-treatment limits access to supportive, continuous care and contributes to high relapse rates (Tai & Volkow, 2013).

Theoretical Frameworks

Prior to formulating and testing novel solutions to overcoming personal and systemic barriers to treatment and recovery, applying a relevant theoretical framework will help guide understanding and design. A framework organizes structures and processes and properly situates research findings regarding interventions and outcomes. A framework appropriate for this study must include both the specialty substance use disorder treatment field and the medical field, aligning two interdependent helping professions that have been artificially separated to the detriment of individuals, their families, communities, health care providers, and our nation and world. Unfortunately,

no existing framework is comprehensive enough to incorporate both mental health and medical care structure, processes, research, and outcomes relative to substance misuse and disordered use. Instead, two frameworks have been identified that together cover the full spectrum of these fields. The first, to position structure and process, is the Addiction Recovery Management (ARM) Model (White & Kelly, 2011). The second, to guide research, evaluation, and design, is the Texas Christian University (TCU) Treatment Model (Simpson, 2004).

Addiction Recovery Management Model

White and Kelly (2011) recognized that substance misuse and disordered use were chronic, pervasive, systemic conditions that were being treated ineffectively by mental health and medical professionals with uncoordinated, episodic, short-term solutions. They developed the Addiction Recovery Management (ARM) Model from Bronfenbrenner's Ecological Systems Theory (1992), firmly grounding substance misuse and disordered use in the surrounding familial, community, economic, and cultural systems (White & Kelly, 2011). Within ARM, a chronic disease approach is applied to substance problems to guide intervention and treatment (White & Kelly, 2011). Chronic diseases have genetic and environmental risk factors, following prolonged courses that vary widely among people, and can be effectively treated but have no known cures (White & Kelly, 2011). They can be identified via broadly accepted screening tools and diagnostic checklists (White & Kelly, 2011). Health behaviors can worsen or improve chronic disease severity, which is associated with increased disability and elevated risks for premature death (White & Kelly, 2011).

Effective treatment for substance misuse and disordered use requires long-term engagement with provider teams; a multidisciplinary approach to addressing biopsychosocial concerns; full use of information technology for tracking, treatment planning, and telehealth; and teaching patients and families the skills needed for disease management (Tai & Volkow, 2013). Post-treatment support is essential, involving peer recovery groups, advocacy organizations, frequent check-ups, recovery coaching, and early detection of relapse (White & Kelly, 2011). Moving beyond the patient to population health, the ARM model incorporates public education, universal screening, and early intervention (White & Kelly, 2011). Recovery from substance use is conceptualized as a four-stage process called “recovery management,” from pre-recovery identification and engagement, to recovery initiation and stabilization, to sustained recovery support, and to long-term recovery maintenance (White & Kelly, 2011).

White and Kelly (2011) described eight interconnected “performance arenas” to effectively design and organize evidence-based treatment and recovery support services, as follows (all assertions, qualitative and quantitative, were drawn from White and Kelly, 2011):

Attraction and access to treatment. Because only about one in ten people who need treatment receive it, the ARM model offers multipronged strategies for reaching people at the early to middle stages of risk and for making treatment widely available. These tactics can be employed by both medical and mental health organizations. Attraction strategies include public education, messaging that lessens stigma, identification of and outreach to people needing help, and connection to community

support services. Access strategies focus on making intervention and treatment as easy and inviting as possible, with night and weekend hours, telephone availability, warm welcoming, and electronic guides and reminders.

Assessment and level of care placement. In the ARM model, medical and mental health practitioners perform comprehensive biopsychosocial assessment of people with substance issues and also their families and communities. Assessment is strengths-focused and continuous. Decisions about care placement, including inpatient vs. outpatient and intensive vs. episodic, are made in conjunction with individuals, their families, and their family advisors, in consideration of interconnected needs.

Composition of the service team. Currently, specialty substance use disorder treatment by mental health clinicians rarely includes input from family physicians or other primary care providers. Treatment sites also lack meaningful interaction with psychiatrists and psychologists, let alone spiritual mentors, community healers, and peer sponsors. With ARM, these shortcomings are counteracted by engaging primary care providers in early detection, monitoring, and recovery check-ups at their sites; increasing specialty treatment facility access to psychiatrists and psychologists; emphasizing peer support; and including indigenous healers in treatment.

Service relationships and roles. Under ARM, therapeutic relationships are humanistic – collaborative, empowered, consultative – rather than directive, caretaking, and expertise-driven. Recovery is client- or patient-directed, given that active engagement by people in their own treatment planning and goals is predictive of positive

outcomes, such as spending more time in treatment and reducing or abstaining from substance use after treatment.

Service dose, scope, and duration. Because increasing “doses” of treatment predict improved recovery outcomes, the ARM model emphasizes adequate treatment periods of at least 90 days for most substances and one year for opioid replacement medications. The model includes wraparound services before and after treatment, such as early detection and intervention, resolution of barriers to entering treatment, monitoring and support during the waiting period, continuing care immediately post-treatment through careful discharge planning and community resourcing, and long-term follow-up with check-ins. These actions should be carried out both by mental health providers and medical providers, with communication to ensure the wraparound services are appropriately applied and are effective.

Locus of service delivery. Rather than intervention and treatment taking place only in professional offices and facilities, the ARM model recommends robust outreach programs by professionals into communities, in-reach programs that bring community resources such as peer supporters into professional settings, and resource innovation and development to match individual and community needs.

Linkages to communities of recovery. Recovery communities are an essential component of the treatment continuum, providing support, connection, reinforcement, and early detection of potential relapse to people who are considering reducing their substance use or abstaining, as well as people in recovery. Under the ARM model,

medical and mental health providers are assertive in linking people with substance problems to these communities.

Posttreatment monitoring, support, and early reintervention. More than 50% of people who complete specialty substance use treatment restart active use within a year of discharge, and most within 90 days. Up to one-third of all people completing treatment will be readmitted to treatment within a year, and half within five years. Despite this recidivism, only one in five people receive any form of continuing professional care after discharge. Under the ARM model, recovery check-ups and support by medical and/or mental health professionals are critical services following treatment discharge, when people are trying to establish themselves in new environments and with new ways of being.

In summary, the ARM model emphasizes structures and processes supporting early detection and sustained recovery in addition to episodic treatment. The model assumes a systems perspective, engaging families and communities, and expanding the care team beyond traditional providers. The focus is on extensive, effective services that create optimum conditions for people with substance use problems to be found, to get help and then to reduce or abstain from use over the long term.

Texas Christian University (TCU) Model

The Texas Christian University (TCU) Treatment Model is a theoretical framework linking patient, program, and process factors to post-treatment outcomes (Simpson, 2004). The model was developed from studies of specialty community-based treatment for illegal drug use but was designed to apply to all substance types and

treatment settings (Simpson, 2004). Similar to the ARM model, the TCU model follows the perspective that treatment outcomes are influenced not only by personal factors but also by systemic influences like relationships with family and friends and cultural norms (Simpson, 2004). According to the model, examples of treatment factors predicting outcomes are patient readiness to change, substance use severity, duration and intensity of treatment, and successful transitions out of treatment (Simpson, 2004).

Patient factors. The TCU model identifies readiness to change and substance use severity as the patient factors most predictive of outcomes, such as retention (staying in the program) and harm reduction (reducing use or abstaining) (Simpson, 2004). Readiness to change is based on the ‘stages of change’ work of Prochaska and DiClemente (1983) and the motivational strategies work of Miller (1985). The global readiness to change construct has been defined and measured in various ways, but however described, it has been associated consistently with therapeutic engagement, retention, and harm reduction (Simpson, 2004).

Substance use severity incorporates factors such as misusing/abusing more than one substance, levels of criminal activity, poor psychosocial adjustment, and dual psychiatric diagnoses, with greater severity predicting worse outcomes for retention and harm reduction (Simpson, 2004). However, when severity has been matched with increasing intensity of services provided, such as longer times in treatment and more frequent counseling, outcomes tend to improve (Simpson, 2004).

Program attributes. Most specialty substance treatment takes place in community-based residential and outpatient facilities; in general, patients with greater

problem severity have had better outcomes in residential treatment (Simpson, 2004).

Examples of other program attributes are available resources, organizational climate, staff characteristics, and use of information technology; however, research is lacking, as these attributes have rarely been tested vis-a-vis treatment outcomes (Simpson, 2004).

Treatment process. In the TCU model, the treatment process has three stages: early engagement, which means participating in programs and forming therapeutic relationships with counselors; early recovery, which involves cognitive shifts and new ways of behaving; and retention and transition, which means staying through program completion and successfully transitioning out of the program (Simpson, 2004). Keys to successful early engagement are frequent session attendance and a solid therapeutic relationship (Simpson, 2004). Goals in early recovery include reductions in or abstinence from substance use, engaging loved ones in recovery efforts, and strengthening social support (Simpson, 2004). Staying in one's program to the end, the goal of retention, is strongly associated with harm reduction (Simpson, 2004). Successful early engagement predicts early recovery which predicts retention and transition, which ultimately predicts harm reduction and sustained recovery (Simpson, 2004).

In summary, the TCU Treatment Model is an evidence-based theoretical framework that identifies several patient, program, and process factors that are associated with treatment outcomes and that can help frame and guide future research. Most prominent among these are readiness to change, substance use severity, and the patient-counselor therapeutic alliance, all of which predict program engagement and retention and post-treatment harm reduction.

The ARM Model and the TCU Treatment Model theoretical frameworks aid in understanding and evaluating specialty substance use disorder treatment and relevant outcomes research, as well as medical interventions and treatment and outcomes research. These models, particularly the TCU model, will guide development of research methodology for evaluating substance use interventions in medical settings.

Specialty Substance Use Disorder Treatment

Both the ARM and TCU frameworks incorporate specialty substance use disorder treatment as essential to the recovery process. Designed for people at the severe end of the substance use spectrum, specialty treatment takes place in facilities such as community clinics, residential campuses, and hospitals. According to SAMHSA (2017b), there are more than 16,000 such facilities in the U.S. treating 1.15 million clients per day. Half are operated by private nonprofit organizations, one-third by private for-profit companies, and the rest by government entities (mostly local governments) (SAMHSA, 2017b). All sites offer detoxification services, as withdrawal from alcohol or drugs can be deadly. Nine out of ten clients participate in outpatient programs such as medication-assisted therapy, intensive outpatient therapy, and partial hospitalization. About 8% of clients attend short-term (30 days or less) or long-term residential treatment, and 1% are admitted to hospital inpatient treatment programs (SAMHSA, 2017b).

Per SAMHSA (2017b), most programs are staffed by trained substance use counselors such as professional counselors, licensed addiction specialists, and social workers. They offer many different interventions, chief among them motivational interviewing, cognitive-behavioral therapy, relapse prevention, brief intervention, trauma

counseling, 12-step facilitation, and anger management. These interventions are provided in individual, group, family and couples counseling formats. In addition, substance use professionals perform screening and assessment, diagnose substance and other mental health disorders, provide psychoeducation, plan for discharge and post-treatment programs, and conduct case management. More than 30% of facilities offer specialized programs for people with co-occurring disorders, males, females, trauma survivors, criminal justice clients, and young adults.

People who need help enter specialty treatment via many pathways. They may choose treatment on their own or because of family pressure; be mandated to attend treatment after entering the criminal justice system; or be referred by police, emergency services, medical clinics or hospitals, intimate partner violence programs, family service agencies, homelessness advocacy groups, or other entities that frequently encounter people with substance problems (Office of the Surgeon General, 2016). The majority of treatment facilities conduct outreach to their local communities to find people needing help (SAMHSA, 2017b). Augmenting these referral sources to enhance detection and intervention has become a critical priority for governments, communities, and helping organizations (Office of the Surgeon General, 2016). Investing in referral processes may attract more people to treatment and improve access, both goals that are aligned with ARM model principles for the treatment continuum (White & Kelly, 2011).

Patients who stay engaged in treatment and complete programs work with their treatment teams to develop post-discharge plans (SAMHSA, 2017b). Depending on patient severity of use, prior experiences with treatment and relapse, program

experiences, and other relevant factors, discharge plans may include transitions to less intensive treatment programs or be limited to follow-up calls and/or support groups (Office of the Surgeon General, 2016). Rarely are patients' medical teams involved in these aftercare processes, which is a key missing linkage according to the ARM model (White & Kelly, 2011).

Outcomes Research

In specialty treatment for substance use disorders, research has focused on predictors of three primary outcomes: people staying in treatment programs (retention), achieving low-risk substance use or abstinence after program completion (harm reduction), and maintaining harm reduction (relapse prevention). The predictors most often associated with these outcomes are the counselor-client working alliance, substance use severity, and readiness to change, each of which is emphasized in the TCU model.

Counselor-client working alliance. The counselor-client working alliance is characterized by agreement on goals and tasks and the strength of the interpersonal bond (Bordin, 1979). Study outcomes associated with alliance have been largely positive, predicting greater retention and harm reduction (Barber et al., 2001; Crits-Christoph et al., 2013; Van Horn et al., 2015; Watts et al., 2018).

In research involving residential treatment for clients with substance use disorders and child maltreatment histories ($n=113$ adults), trust predicted the working alliance, which in turn strongly predicted treatment engagement and retention (Watts et al., 2018). In a study of intentional re-engagement and alliance-building with clients who had relapsed after they had dropped out of outpatient treatment, researchers personally

contacted clients and offered re-entry to any of the available treatment programs (Van Horn et al., 2015). All clients reachable by phone ($n=96$ adults) chose to return to various forms of treatment. Of these, over half attended at least one session per week to program completion. A randomized clinical trial of cocaine-dependent clients ($n=308$ adults) enrolled in three types of outpatient counseling – group supportive-expressive therapy, group cognitive therapy, and individual drug counseling – demonstrated that client ratings of working alliance increased with additional sessions for all modalities (Barber et al., 2001). In this particular study, alliance in both supportive-expressive therapy and individual counseling were predictive of increased retention. In cognitive therapy, however, it predicted decreased retention. The researchers noted that previous studies of cognitive therapy and cocaine dependence had found no relationship between working alliance and outcome, so this result may be specific to type of therapy and drug. In another analysis of the same clinical trial ($n=440$), positive working alliances with group counseling facilitators predicted harm reduction, with fewer overall days of drug use and reduced likelihood of drug use between sessions (Crits-Christoph et al., 2013). The findings from these studies signify that the counselor-client alliance is a consistent predictor of positive substance use treatment outcomes.

Substance use severity. Substance use severity – the frequency of use and quantities consumed, along with the extent to which life roles are affected – and its associations with retention, harm reduction, and relapse prevention have been a focus of numerous studies. The most common finding (Allen & Olson, 2016; Siqueland et al., 2002) is that greater severity is associated with worse retention, failure to reduce harm,

and/or increased likelihood of relapse. However, this finding is not universal. A study of patients with co-occurring substance use and other mental health disorders ($n=360$ adults) found these patients more likely to stay in treatment compared to a control group (Griffin et al., 2014). The researchers postulated that the study medications given for substance problems also may have improved psychiatric conditions to some extent, leading to better outcomes. In another study involving 36 outpatient and residential treatment centers ($n=1,939$ adults), researchers investigated aspects of client satisfaction and substance use severity (Hser, Evans, Huang, & Anglin, 2004). They found that satisfaction with counselors and programs – also an indicator of working alliance – and the intentional matching of service intensity (number, type, and length of sessions) to substance use severity improved retention, harm reduction and relapse prevention.

Readiness to change. The readiness to change construct is comprised of both motivation and intention (DiClemente, Schlundt, & Gemmell, 2004). Motivation represents a person's willingness to change and reasons for changing substance use patterns, while intent represents his or her goals and plans to change (DiClemente et al., 2004). In a study of treatment retention for veterans with alcohol use disorders, readiness to change was assessed, with higher readiness scores associated with completing treatment (Edens & Willoughby, 2000). In another study of hospitalized patients with alcohol use disorders, participants ($n=267$ adults) were assessed for readiness to change, for awareness of problems with alcohol, and for specific actions being taken to reduce drinking (Bertholet, Cheng, Palfai, Samet, & Saitz, 2009). Participants were followed up at three months for self-report of alcohol use. Those in the highest one-third of readiness

were 57% more likely than the lowest one-third to be consuming fewer drinks. Those taking action had 42% likelihood of reducing alcohol use. However, people in the highest quartile of problem awareness had 164% likelihood of increased use. The researchers noted that problem awareness can be a proxy for substance use severity, and severity may be associated with worse outcomes.

A randomized controlled trial of both alcohol use disorders and methamphetamine drug use disorders was conducted in three South Africa emergency departments (Myers, van der Westhuizen, Naledi, Stein, & Sorsdahl, 2016). Readiness to change predicted reductions in alcohol use, but not in drug use, at three-month follow-up. The researchers noted that methamphetamine use was a complex syndrome that had been associated previously with high ambivalence to change; they suggested counseling strategies focused on ambivalence. Another study of disordered alcohol and drug use and harm reduction recruited people using both alcohol and opioid drugs ($n=55$) (Hesse, 2006). Readiness to change was associated with reductions in self-reported drug and alcohol use at 18-month follow-up.

Summary of research. With few exceptions, the counselor-client working alliance has been consistently predictive of improved harm reduction and treatment retention outcomes for people struggling with substance use. Given mixed findings for the association of retention and harm reduction with substance use severity, more research is needed to confirm or disconfirm results. For alcohol use, readiness to change generally has predicted outcomes of retention and harm reduction. For illicit drug use, the findings for readiness to change are inconclusive, and further research is warranted. It appears

that few studies have followed participants long enough to determine relapse outcomes or sustainability of harm reduction; this is an additional area for research.

Medical Setting Intervention and Treatment

The substantial barriers to intervention and treatment, along with the shortage of treatment options for people who haven't yet developed substance use disorders, have resulted in a 'treatment gap' for people who misuse alcohol and illicit drugs (Office of the Surgeon General, 2016). Given that substance misuse and disordered use are costly medical conditions, and that most people in the U.S. see a doctor at least once a year, medical settings have moved to the forefront of public health efforts to expand early detection, intervention, and treatment (Sacks et al., 2016). The leading model in use, developed specifically for medical settings, is Screening and Brief Intervention (SBI) (Office of the Surgeon General, 2016). SBI can be implemented with its Referral to Treatment component as SBIRT, the acronym most commonly found in the literature (SAMHSA, 2013). SBIRT helps close the 'treatment gap' by bridging prevention and treatment with screening and brief intervention; it can be implemented in any type of medical setting (SAMHSA, 2013).

SBIRT History

SBIRT was introduced over thirty years ago as a World Health Organization alcohol screening and intervention process (Babor et al., 2017). Its broad expansion in the U.S. was enabled by SAMSHA; in 2003, the agency initiated cooperative agreements for widespread SBIRT adoption in medical, college, and other settings (Babor et al., 2017). By 2017, 32 grants had been awarded to states, territories, and tribal organizations

(Bray, Del Boca, McRee, Hayashi, & Babor, 2017). With a growing evidence base, SBIRT is now operational or under implementation in over half of U.S. states (Agle et al., 2014) and is employed in outpatient, emergency department, and inpatient settings.

SBIRT Model

According to SAMHSA (2013), the SBIRT model has six key features. First, it is a brief process thus suitable for medical settings. Second, screening is applied universally to all patients of a medical practice, permitting detection of hidden substance problems even for patients not actively seeking help. Third, specific behaviors that are precursors to substance use disorders are targeted for screening and intervention. Fourth, SBIRT is flexible and can be conducted in many types of settings, not only medical. Fifth, SBIRT is a comprehensive approach that for many people may be sufficient to help them transition to reduced use and prevent disease progression to disordered use. Finally, SBIRT is supported by substantial research evidence for alcohol misuse while showing promise for other types and levels of substance misuse and disordered use.

SBIRT Process

The preferred application of the SBIRT model begins with screening (Babor & Higgins-Biddle, 2001). To screen, medical care providers can rely on medical test results, observation, or dialogues with patients and family, and/or they may choose among several free, reliable, valid screening tools in widespread use, such as the Alcohol Use Disorders Identification Test and the Drug Abuse Screening Test (Office of the Surgeon General, 2016). Tools may be used as self-reports or as the basis for patient interviews (Office of the Surgeon General, 2016). Screening creates pathways for

discussing substance use with patients, who tend to view substance screening and advice as part of their providers' roles (Sacks et al., 2016). Through screening, patients can be identified at low, moderate, high, or severe levels of health risk given their substance use patterns (SAMHSA, 2013).

The next steps in SBIRT depend on risk level. Patients at low risk should be reinforced for healthy behavior and may be offered educational materials or other preventive measures (SAMHSA, 2013). Interventions are recommended for moderate, high, and severe risk levels, either as a standalone treatment or a segue to more intensive care (SAMHSA, 2013). For moderate risk, Brief Interventions (BI) are appropriate, consisting of one or more short sessions to help patients gain insight and knowledge about their substance use, increase motivation, and encourage behavior change (SAMHSA, 2013). For high risk, the recommended intervention is Brief Treatment (BT), two to twelve sessions of one hour or less wherein a member of the medical team determines patients' interest in and readiness to change, discovers and fills gaps in patient knowledge about health risks, explores patient ambivalence about substance use, and co-creates goals with patients around behavior modification (Del Boca, McRee, Vendetti, & Damon, 2017). Patients at high health risk and at severe risk should be referred to specialty substance use disorder treatment (Referral to Treatment, RT) and followed by the medical team until treatment entry (SAMHSA, 2013).

Several SBIRT formats have been developed from therapeutic modalities used in psychology and counseling. Motivational interviewing (MI) may be the most common (Del Boca et al., 2017), given MI's utility for addressing the ambivalence and resistance

to change often found with substance use (Miller, 1985). MI is based in the holistic, non-judgmental, self-actualizing tenets of humanistic counseling (Miller, 1985). A more structured form of MI in widespread use is Feedback, Responsibility, Advice, Menu of options, Empathy, and Self-efficacy, or FRAMES (Del Boca et al., 2017). A format arising from the psychology field is cognitive-behavioral therapy, a process for transforming the maladaptive thoughts and behaviors driving excess substance use into realistic and healthy alternatives (Bray et al., 2017). Unique to this study and Veach et al. (2018) is the person-centered SBIRT process, which borrows unconditional positive regard, empathy, and therapist congruence from the person-centered counseling theory developed by Rogers (1961).

Impediments to the application of SBIRT are many. Physicians, nurses, and other medical staff have expressed concerns about SBIRT, ranging from discomfort with talking to patients about substance use, to anxiety about learning and incorporating a new process into medical operations, to reluctance to expend valuable practice time for brief interventions (SAMHSA, 2013). Historically, the medical professions have considered substance misuse and disordered use to be moral failings and not in the purview of medical care (Tai & Volkow, 2013), although views of substance problems as diseases and behavioral disorders have gained widespread acceptance (Babor et al., 2017). Medical providers may be unwilling to document substance misuse and disordered use formally in medical records for fear of stigmatizing patients with their insurers and other providers and/or from uneasiness with assigning mental health diagnoses (SAMHSA, 2013). Medical practices often lack linkages to treatment programs (SAMHSA, 2013).

For these reasons, medical practices benefit from having one or more SBIRT champions to change culture and to devote careful consideration to training, implementation, and continuous program evaluation (Agle et al., 2014). In addition, SBIRT was designed to be highly flexible and can be modified as providers see fit, as even simple and very brief interactions can help patients initiate changes in substance use (SAMHSA, 2013).

Outcomes Research

SBIRT interventions by medical providers have been studied comprehensively relative to alcohol use and to a lesser degree for illicit drug use. SBIRT has been found most effective in outpatient and emergency medical settings for helping people reduce alcohol misuse (Glass et al., 2017). Alcohol misuse is defined as averaging more than one drink per day for women and older adults and two drinks for men, but not meeting criteria for an alcohol use disorder (NIAAA, 2018). However, SBIRT has mixed outcomes for interventions in inpatient medical settings, for alcohol use disorders, or for any type of illicit drug use (SAMHSA, 2017a; USPSTF, 2017). It has also not been shown as effective for referring people to specialty treatment (Glass et al., 2015).

Alcohol. Studies of SBIRT for alcohol misuse show consistently positive outcomes when conducted by medical providers in outpatient clinics and emergency departments. Researchers conducted a systematic review and meta-analysis of the Brief Intervention component with primary care outpatients, locating 23 randomized controlled trials (RCT) of at least six months' duration, with some studies lasting four years (Jonas et al., 2012). Most RCTs excluded people with alcohol use disorders. The researchers found that Brief Intervention following screening was associated with reductions in

number of drinks per week ($n=4,332$), the number of binge drinking episodes (consuming five drinks or more for men, or four for women, on one occasion [NIAAA, 2018]), ($n=2,737$), and in the likelihood of patients transitioning from misuse to low risk drinking ($n=5,937$). The researchers identified potential limitations. First, the act of assessing for alcohol use may have been an intervention itself, leading to drinking reductions in control groups and biasing results towards the null hypothesis of no difference between control and intervention groups. Second, the exclusion of people with alcohol use disorders limited the applicability of results to that population. Third, basing outcomes on self-report may have biased the results if participants under-reported use.

A systematic review of SBIRT for alcohol misuse when conducted by emergency department staff resulted in 33 RCTs ($n=14,456$ adults) with 3 to 12-month follow-up periods (Schmidt et al., 2015). SBIRT is of high interest to EDs given that one-third of alcohol-attributable deaths involve traumatic injury, and one in seven ED patients are at moderate, high, or severe risk of harm from their drinking (Schmidt et al., 2015). After meta-analysis, the researchers found small effects favoring subsequent reductions in drinks per week per month, average number of drinks per occasion, and binge drinking episodes. Five moderating variables were tested – intervention type, length, and medical provider; control type; and study quality – but were not associated with outcomes. The study’s metanalytic methodology required imputation of certain parameters was required, a limitation which may have introduced bias. Because effect sizes were small, the researchers recommended additional research in ED-based SBIRT to confirm or

disconfirm findings. They also suggested economic analysis to aid health care leaders in making SBIRT resource decisions.

Brief interventions for alcohol misuse and disordered use among medically hospitalized adults (age 16+) were studied to determine effects on consumption levels and mortality (McQueen, Howe, Allan, Mains, & Hardy, 2011). The researchers conducted a systematic review and meta-analysis, finding 14 controlled trials (n=4,041, >80% male), of which eight excluded people with alcohol use disorders, with follow-up periods from three months to three years. Although reductions in consumption levels were evident up to six months after hospital discharge, by one year there were no differences between the intervention and control groups across studies. The researchers suggested that the inclusion of people with alcohol disorders in several studies may have contributed to the non-significant findings, as previous research had indicated brief intervention might not be effective with this population. However, at one year the intervention group had experienced fewer deaths than the control group, perhaps due to less drinking during the six months following discharge. The limitations identified by the researchers were the overrepresentation of men in the participant group, which affected generalizability, and potential upward bias in outcomes due to subjective self-reported usage. The researchers recommended future investigations regarding SBIRT for hospitalized patients to confirm or disconfirm findings.

Researchers were interested in comparing alcohol brief interventions between primary care outpatient clinic settings and hospital settings, with hospital settings including EDs, trauma units, medical inpatient units, and hospital-based outpatient clinics

(Mdege & Watson, 2013). They sought to determine whether differences in predictive factors explained previous findings that hospital-based SBIRT was less effective than SBIRT in primary care, although in this study ‘hospital’ was defined differently and more broadly compared to others by including EDs and outpatient clinics. A systematic review resulted in 30 controlled trials from primary care settings and 46 from hospital settings ($n=17,231$ adults). Significant differences in predictors between settings were number of sessions, with more sessions occurring in primary care; the inclusion of people with alcohol use disorders in most hospital-based trials, but not in primary care; and shorter follow-up periods for hospital studies (9.3 months vs. 13.5 months for primary care). The researchers surmised that prior evidence showing SBIRT as not effective for people with disordered use contributed to differences in outcomes between settings, as most hospital studies including people with disordered use. A limitation they identified was their inclusion of disparate settings in the hospital category, although secondary analysis did not reveal differences among those settings. Future research focusing on number of sessions and substance use severity was suggested.

The Referral to Treatment (RT) component of SBIRT has received less attention from researchers than other components (SAMHSA, 2013). The researchers of an alcohol-focused systematic review and meta-analysis located 15 randomized controlled trials (total $n=1,930$) with an RT process (Glass et al., 2015). Settings included emergency, outpatient, inpatient, and trauma settings, with three- to 18-month follow-up periods. Meta-analysis of RCTs resulted in non-significant findings, indicating that RT was not a predictor of post-intervention specialty treatment. The study was limited by

vagueness in how referral to treatment processes were defined which hindered comparability, and low power across studies. The researchers suggested future research focused on the referral to treatment component of SBIRT.

Illicit drug. Evidence for SBIRT's effectiveness for illicit drug misuse and disordered use is inconclusive, with research in this area in an early phase (SAMHSA, 2013). A systematic review of drug-related SBIRT yielded only five studies ($n=2,369$), all in outpatient settings with interventions conducted by medical providers (Young et al., 2014). The researchers noted that there were no previously published systematic reviews or meta-analyses for SBIRT and illicit drug use. Their reported results were mixed but insufficient for comparison or meta-analysis, with quality of evidence rated low or very low for all outcomes. However, the researchers noted that 16 new trials of SBIRT and illicit drugs were underway, some with large sample sizes, that might provide improved data compared to the trials in their review.

An RCT for illicit drug use tested an SBIRT intervention group against a control group ($n=344$ adults), with 63% of participants using marijuana, 19% cocaine, and 17% opioids at varying levels of consumption and health risk (Saitz et al., 2014). Brief interventions were provided by health educators with high school or bachelor's degrees. The researchers found no differences between the intervention and control groups for drug use at six-month follow-up overall or when stratified by substance use severity or type of drug used. They identified several aspects of the RCT, such as videotaping brief interventions, compensating participants and a short follow-up period, that limited

generalizability to real-world settings. For future research, they recommended focusing on drug subgroups, such as cocaine or opioids.

Despite these non-significant findings, the rapidly increasing mortality from drug use continues to generate interest in SBIRT as a treatment modality. According to the U.S. Preventative Services Task Force (USPSTF, 2017), although universal SBIRT for drug misuse and abuse cannot be recommended based on current evidence, the USPSTF has proposed a research plan to encourage generation of evidentiary support.

SBIRT in practice. A troubling finding regarding SBIRT efficacy is that although screening is common in the general U.S. population, brief intervention is not. A secondary data analysis of the 2013 National Survey on Drug Use and Health was performed for people who visited outpatient clinics but had not sought hospitalization or emergency services in the prior year ($n=17,266$ adults) (Glass et al., 2016). The researchers discovered that 71% had received an alcohol assessment, but only 4.4% of people who were binge drinking monthly ($n=4,367$) were advised to reduce their drinking. Of people reporting disordered use levels, only 7% were provided with treatment information. Although the prevalence of SBIRT interventions in outpatient settings is rising, implementation of the full SBIRT model may be limited by cultural and operational barriers (Agley et al., 2014). The researchers identified reliance on self-reported usage as a limitation, as its validity is unknown.

A similar study involved a retroactive comparison of screening and follow-up for substance use in rural versus urban primary care clinics (Chan et al., 2015). Participants were from a statewide mental health program for people receiving state financial

assistance. Those included in the study had been identified by their primary care providers as needing treatment for mental health disorders, primarily depression and anxiety ($n=15,843$ from 133 clinics). Of these, 74% had been screened for potential substance use problems, a screening rate similar to the general U.S. population. However, only two out of five patients screening positive were asked about substance use at subsequent appointments. Of patients from small and isolated rural clinics ($n=636$), only 14% were monitored for substance use at later appointments, whereas 40% of patients of large rural clinics ($n=863$) and 42% of patients of urban clinics ($n=14,344$) were asked about their substance use at follow-up appointments. This variability was not explained by patient demographic or clinical factors but was partially explained by patient travel time, which was over twice as far for small rural clinics (20 miles on average) versus other clinics (9 miles). The researchers noted that rural clinics had shortages of case managers, possibly due to travel time, that might explain the low monitoring rate. They suggested that without case managers onsite, physicians and other medical staff may have been reluctant to engage patients with co-occurring disorders about problematic substance use. Among their recommendations for future research was to address systemic and provider barriers to intervening with substance use problems.

Summary of research. Consistently across studies, the outcomes of interest to SBIRT researchers have been changes in self-reported consumption of alcohol or illicit drugs. This was identified by several researchers as a limitation due to potential under-reporting at follow-up. For alcohol misuse, SBIRT has been associated with decreased use; for alcohol use disorders and any level of illicit drug use, SBIRT has not been

associated with decreased use. SBIRT has efficacy for people misusing alcohol who see providers in outpatient clinics and emergency departments, but efficacy for hospitalized patients who misuse alcohol has not been shown. Some researchers identified varied inclusion or exclusion of participants with alcohol use disorders as a limitation across settings. For illicit drug use, some trials appear to suffer from low-quality data and/or limited follow-up periods. New clinical trials are underway, and the U.S. Preventative Services Task Force is encouraging the generation of new evidence for SBIRT and illicit drugs. When SBIRT is conducted in ‘real-world’ settings, only the screening component has been adopted broadly. Brief interventions, brief treatments, and referrals to treatment appear to be exceptional events in actual medical settings.

Suggestions for future research included studies to confirm or disconfirm inconclusive findings, in subpopulations of substance use type and severity, to analyze economic factors, and to address barriers to SBIRT implementation. The International Network on Brief Interventions for Alcohol & Other Drugs (INEBRIA) has suggested other directions for future research, given that the demonstrated efficacy for SBIRT is limited to alcohol misuse and that SBIRT’s adoption in medical settings has been suboptimal (Agle et al., 2014; Glass et al., 2017). Potential areas of focus include pinpointing how SBIRT should be used within the continuum of treatment, analyzing outcomes for multiple vs. single interventions, investigating efficacy for severe substance use and illicit drug use, improving rates of referral to specialty treatment, predicting health outcomes other than self-reported consumption levels, and disseminating best practices for operational implementation in medical settings.

What has not been considered as a research focus is the profession and training of the SBIRT provider. Of note is that most studies to date involve SBIRT conducted by medical providers who may have been ambivalent about SBIRT and substance use in general. The disappointing outcomes for alcohol disorders and illicit drug use may be improved if the SBIRT provider is a trained interventionist with skills in building therapeutic alliances. An emerging model in outpatient and hospital sites is the provision of SBIRT by mental health clinicians who are part of integrated medical and mental health teams.

SBIRT in Integrated Care

The historical division of physical from mental health care, while culturally and operationally still the norm for the U.S. healthcare system, has begun to shift towards integrated medical and mental health structures (Sacks et al., 2016). These structures, known as integrated care practices, offer potential for enhancing SBIRT's effectiveness with populations for which research demonstrates mixed or inconclusive outcomes: people with alcohol use disorders, people who use illicit drugs, and/or people who are hospitalized for medical reasons. For patients of integrated care practices, SBIRT is most often provided by mental health professionals, rather than the traditional model of SBIRT conducted by medical staff (e.g., physicians and nurses) (Sacks et al., 2016). The training and professional practices of mental health clinicians may introduce greater understanding of and skill with the SBIRT process, thus improving outcomes.

Integrated Care

In integrated care, mental health professionals such as counselors, psychologists, social workers, psychiatrists, and marriage and family therapists operate on teams with medical staff, collaborating to address substance-related problems along with other mental health concerns (Collaborative Family Health Association, 2017). In its most evolved form, as delineated in a seminal article by Doherty (1995), mental health and medical professionals share sites and systems, consult with each other frequently, and co-create treatment plans. At times, integration occurs in specialty treatment settings by co-locating primary care teams with specialty mental health treatment teams but more often, mental health care is integrated into medical settings, a model that is rapidly expanding (Sacks et al., 2016).

DeGruy and Etz (2010) argued for incorporating mental health care, substance-related care, and health behavior change into “medical homes,” primary care practices responsible for the full coordination of their patients’ care with specialty physicians, hospitals, substance use treatment centers, ancillary services, and the like. The researchers described the indivisibility of physical and psychological symptoms and noted that one-third of primary care patients meet criteria for at least one mental health disorder. The co-occurrence of chronic diseases (e.g., diabetes and heart disease) with psychiatric diagnoses adds costs, medical complications, and disease management effort. Overall outcomes improve when patients engage in positive health behavior change, which is best guided by mental health clinicians. In fact, adults served by integrated care practices tend to receive more preventive services, use hospital and emergency services

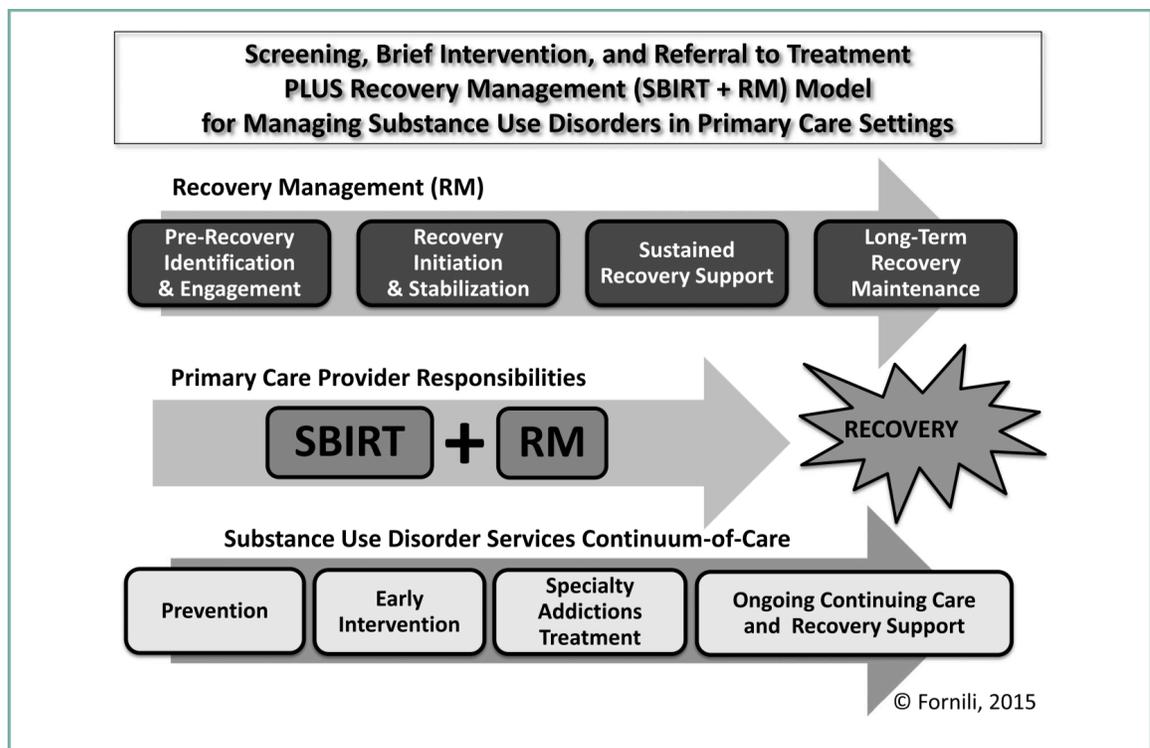
less, and have lower health system costs (Reiss-Brennan et al., 2016). However, DeGruy and Etz (2010) noted, the obstacles to integration are pervasive and daunting: behavioral health carveouts in managed care contracts, barriers to sharing clinical information, differing practice styles, and provider ambivalence regarding the extra time required to address mental health issues. They supported continued vigorous efforts to overcome these obstacles, viewing integration as the only feasible pathway. Dickinson and Miller (2010) concurred, adding that continuity of care, which signifies long-term relationships with patients and multi-specialty care teams, improves outcomes and lowers healthcare costs. Notably, these principles of integrated care, medical homes, care coordination, and care continuity are central to the ARM model (White & Kelly, 2011).

Patients have expressed appreciation for integrated care practices as well. At a large medical center in a major Northeast U.S. city, people with substance misuse and disordered use who were infected with or at high risk for HIV participated in a qualitative study (Drainoni et al., 2014). Participants in focus groups ($n=40$) or providing survey text responses ($n=212$) noted their preferences for the convenience and efficiency of co-located medical and substance use care; supported team-based, collaborative care; recognized the importance of counseling and education to their care; and felt their overall well-being and quality of life had improved. One participant described integrated care as a “circle of help that doesn’t stop” (p. 75). Patients receiving medication-assisted therapy for opioid use disorders were particularly supportive of integration.

Application of ARM Model

When mental health clinicians such as professional counselors conduct SBIRT in integrated care settings, enhanced intervention and treatment can occur within medical practices rather than being referred elsewhere or not performed. Fornili (2016b) clarified how mental health clinicians conducting SBIRT in integrated care are central to the substance use treatment continuum, using the four stages of the ARM model in a combined model entitled SBIRT+RM (Figure 2).

Figure 2. SBIRT + RM Model



Pre-recovery identification and engagement. Pre-recovery identification and engagement aids in the early detection of substance misuse prior to development of disorders. Establishing therapeutic alliances between clients and mental health clinicians

is also a goal. In integrated care, mental health clinicians use the SBIRT process to identify and engage with patients who have substance misuse or disordered use and offer preventive care for patients at low risk for substance problems. People in mental health are also trained to create client-counselor working alliances.

Recovery initiation and stabilization. Recovery is initiated when a person with substance problems accesses and enters a treatment process. Stabilization will vary according to a person's situation and occurs when chaos and unpredictability engendered by substance misuse or disordered use has largely subsided and recovery is well underway. In integrated care, clinicians initiate recovery by conducting brief interventions (BI) with patients who are misusing substances or have disorders. Patients may be able to stabilize with intervention alone. If not, mental health professionals can follow the BT and/or RT processes of SBIRT, providing more intensive on-site interventions or referring people with more severe or recalcitrant substance problems to specialty treatment, where substance use counselors can help clients stabilize and move into recovery.

Sustained recovery support. Helping patients sustain recovery requires the engagement and support of the people and organizations surrounding the patient – families and friends, medical care providers, mental health clinicians, community services, and the like. It involves collaboration with families and peer organizations as well as coordination of services to help with employment, housing, child care, transportation, legal matters, and life skills. Sustained support can be arranged by both integrated care and specialty sites.

Long-term recovery maintenance. Long-term recovery support is currently the weakest link in the substance treatment continuum (White & Kelly, 2011). Ideally, the locus of help shifts from the provider's setting to the patient's environment. In integrated care, mental health clinicians use chronic care approaches to help patients learn self-care and self-management, to provide checkups, and to enable further connection to community resources. They collaborate with specialty treatment counselors if patients return to specialty treatment.

Outcomes Research

Initial research regarding SBIRT provided by mental health clinicians in integrated care settings has shown positive results. The studies presented here are segregated by type of substance.

Alcohol. In an RCT involving professional counselors on a hospital integrated care team, hospitalized trauma patients with alcohol misuse or disordered use ($n=333$) were randomized to receive either a qualitative and quantitative SBIRT intervention (Veatch et al., 2018). Participants were predominantly white males and African-American males (58% and 18%, respectively). Patients were screened prior to intervention using the Alcohol Use Disorders Identification Test (AUDIT) and were followed up at six months for reassessment; however, almost half of participants were lost to follow-up, although there were no significant differences in demographic factors for this group from the remaining participants. No difference was found between the two interventions, but average AUDIT scores decreased by 64% in the quantitative group and 69% in the qualitative group, with both groups shifting from high risk to low risk drinking levels on

average. Limitations of this study included the use of self-reported data; a low response rate at follow-up, which may have biased the results upward if non-respondents had more severe substance use; and a high percentage of male participants, which reduced generalizability of results. The researchers suggested future research to compare counselor-provided SBIRT to SBIRT provided by medical professionals and to follow up with participants for longer periods.

An RCT compared SBIRT provided in Veterans Affairs (VA) primary care clinics to non-VA specialty substance use treatment for veterans with alcohol use disorders ($n=242$) (Oslin et al., 2013). SBIRT was conducted by behavioral health providers, a commonly used title for mental health clinicians in integrated care who are trained at the master's level or above, such as social workers, professional counselors, psychologists, or marriage and family therapists. The format was Brief Treatment, a more intensive version of Brief Intervention; Brief Treatment is suggested by SAMHSA for higher risk and disordered use (SAMHSA, 2013). Patients were scheduled to be in contact with behavioral providers weekly for 30 minutes, in person or by telephone, for three months. After three months, they were to meet twice per month until recovery was well-established. If indicated, medication for alcohol recovery was provided. At six-month follow-up, the intervention group (primary care) was 2.2 times more likely to refrain from heavy drinking than the control group (specialty treatment). The intervention group also self-rated as more motivated and as having fewer alcohol-related problems. The researchers concluded that treatment for high risk to severe risk disorders in a primary care setting was more effective than specialty treatment for this population. However,

they noted that results may not generalize beyond the VA system, which has committed substantial resources to integrating care. Other limitations were self-reported usage and a short follow-up period. Suggestions for future research included longer follow-up periods and a focus on economic factors.

Another RCT involving veterans 65+ years old analyzed health care expenditures from all available sources (e.g., outpatient, inpatient, ED, nursing home, pharmacy) for an SBIRT model in VA facilities vs. a specialty treatment referral model in non-VA facilities for depression, anxiety, and/or at-risk drinking ($n=1,177$) (Domino et al., 2008). The study took place at nine sites, consisting of 30 primary care clinics and 19 specialty treatment facilities, with SBIRT provided by behavioral health professionals. The researchers found no difference in all-source costs between the two models, indicating that SBIRT in primary care is budget neutral compared to non-VA specialty treatment. This finding refuted assumptions held by some that integrated care is costlier than specialty care. The study was limited in generalizability due to the VA setting and a predominance of males among participants (69%), and because one-fourth of costs had to be imputed due to missing data.

Illicit drug. To assess SBIRT brief interventions in primary care for illicit drug use, an RCT was conducted at five urban community health centers serving patients of lower socioeconomic status (Gelberg et al., 2015). Patients screening positive for illicit drug misuse were randomized to intervention and control groups ($n=334$). Patients with disordered use were excluded. The intervention consisted of scripted brief advice from a medical provider, a 2-minute physician video reinforcing the advice, and a health

education booklet. It was followed by 20-30-minute counseling phone calls at two and six weeks with a trained health educator overseen by an addiction psychologist. Control group participants only viewed the video and received the booklet. At three-month follow-up, patients in the intervention group reported illicit drug use of 2.21 fewer days in the prior month compared to patients in the control group, with mean drug use 41% lower for the intervention group. Urine drug screen tests were performed at follow-up to verify self-reported use, with low rates of under-reporting detected; however, participants may have altered use knowing they would undergo urine drug screens. The study was limited because 18% of patients declined the initial screening for substance use, and 10% of eligible participants declined enrollment. The characteristics of these populations are unknown, but their absence may have biased the final results positively. The researchers suggested future RCTs with longer follow-up periods that included economic analyses and that addressed sustainability of SBIRT in clinical operations.

Alcohol and/or illicit drug. The SAMHSA SBIRT grant program, which has funded 32 large state, territorial, and tribal SBIRT initiatives since 2003 (Bray et al., 2017), was the basis for the following two studies. The SAMHSA grants encourage SBIRT to be administered by trained substance use professionals such as counselors, social workers, psychologists and/or health educators, generally holding a master's level or higher.

A retrospective analysis of New Mexico SBIRT grant data examined the relationship between substance use outcomes at baseline and six-month follow-up to the type of SBIRT intervention delivered: brief intervention (71%) or brief treatment with or

without referral to treatment (29%) (Gryczynski et al., 2011). The data used in the study were collected naturalistically in the course of operations at community health centers or Indian Health Service clinic sites. The majority of people included in the study ($n=1,208$) were white (82%) and male (61%). At six months, both interventions were associated with reductions in patient self-reported alcohol and illicit drug use. Analysis of additional data collected for alcohol use showed greater reductions in frequency of drinking and intoxication after receiving BT/RT interventions, while increasing the number of BI sessions also predicted reduced drinking frequency and intoxication. Study limitations were reliance on self-reported usage and the over-representation of male participants. For future investigations, the researchers suggested RCTs and cost-effectiveness studies focusing on the components of SBIRT.

A large retrospective analysis of six SAMHSA state grants (states not identified) investigated outcomes for patients who screened positive for illicit drug misuse or disordered use, with some also screening positive for alcohol misuse or disordered use, who received BI, BT, or RT interventions ($n=104,505$) (Madras et al., 2009). The patient population was notable for its diversity, with Alaska Natives, American Indians, African-Americans, Caucasians, and Hispanics (categories used by SAMHSA). The clinical sites were varied and representative of the health care spectrum, with inpatient hospitals, emergency departments, trauma centers, primary care clinics, specialty care clinics, and community health clinics. Most patients received BI (70%), while BT and RT rates were nearly equal (14% vs. 16%). A random sample of 10% of participants receiving interventions was selected for six-month follow-up. Based on self-reported consumption,

illicit drug use had decreased 67.7%, while alcohol use for the same participants had decreased 38.6%, on average, with comparable findings across all demographic factors. People who received BT or RT self-reported significantly improved general health, mental health, employment, housing status, and criminal behavior. Study limitations included the reliance on self-reported usage as outcomes, as under-reporting may have occurred, and a short follow-up period. The researchers suggested future RCTs with SBIRT and illicit drug use, particularly opioid drugs, focusing on confounding factors and specific at-risk populations, such as people with co-morbid psychiatric diagnoses or poor social determinants of health.

An RCT for opioid and alcohol use disorders was conducted at two community health centers serving patients of lower socioeconomic status, the majority of Hispanic origin ($n=377$) (Watkins et al., 2017). The intervention group was treated under a collaborative care model, a form of integrated care that emphasizes case management and involving primary care physicians, advanced practice providers (e.g., physician assistants, nurse practitioners), psychiatrists, case managers, and mental health clinicians. The control group received a list of community treatment resources. The outcome of interest was whether patients in collaborative care would freely seek brief treatment from the in-house counselors or social workers and/or seek medication therapy. At 6-month follow-up, the intervention group was significantly more likely to have accessed treatment (39% vs. 17%) and to have self-reported abstinence from substance use (33% vs. 22%). A study limitation was the reliance on self-reported usage, as under-reporting was a concern.

Summary of research. Investigations into SBIRT provided by mental health professionals for people with alcohol, illicit drug, or co-occurring alcohol and drug misuse and disordered use have demonstrated consistently positive outcomes for harm reduction across outpatient, emergency department, and inpatient settings, and for diverse populations. Many of these investigations were randomized controlled trials, enhancing validity. Most studies, however, relied on self-reported usage as outcomes, a limitation that can bias results upward if participants intentionally under-report usage. Short follow-up periods were also limitations in several studies, along with the use of distinctive settings and populations that reduced generalizability. Suggestions for future research included comparing outcomes for mental health vs. medical providers of SBIRT interventions, investigating the components of SBIRT, following up with participants for longer periods, controlled trials for illicit drug use, and economic analysis of findings.

SBIRT and Professional Counselors in Integrated Care

Research investigations of SBIRT by mental health professionals on integrated care teams have shown promising outcomes, especially for settings and populations that have not responded well to SBIRT provided by medical professionals. Among mental health professionals, the training and skills of counselors may be most closely aligned with the SBIRT process, as well as the ARM and TCU models supporting it.

Alignment of SBIRT and Counseling

SBIRT involves facilitative conditions and helping skills that professional counselors learn and routinely employ. Counseling programs offer specialty training in the foundations, context, and practice of substance use counseling (CACREP, 2015).

Relationships with patients. According to SBIRT guidelines, providers should be empathetic and nonjudgmental, working to quickly build rapport and trust (Babor & Higgins-Biddle, 2001). Similarly, the ARM model suggests relationships that are collaborative and empowering (White & Kelly, 2011). Central to the counseling relationship are unconditional positive regard and empathy, which facilitate rapport and trust (Rogers, 1961). A primary goal of counseling is to strengthen the counselor-client working alliance (Bordin, 1979), which in turn is predictive of treatment retention and harm reduction per the TCU model (Simpson, 2004) and according to research findings (Barber et al., 2001; Crits-Christoph et al., 2013; Van Horn et al., 2015; Watts et al., 2018).

Working with resistance. According to guidelines, SBIRT providers should recognize and manage resistance in the relationship, and should match interventions with readiness to change, a significant predictor of outcomes according to the TCU model (Simpson, 2004). Counseling incorporates psychodynamic, Gestalt, and motivational interviewing techniques for working with resistance and identifying client readiness to change (Gehart, 2016).

Working with groups. SBIRT interventions may take place with patients' family members or friends present and engaged with the SBIRT process along with the patient (Babor & Higgins-Biddle, 2001). Counselors are trained in effective group-level counseling, which is one of the profession's eight core curriculum areas, and in working with families (CACREP, 2015).

Assessment and diagnosis. SBIRT involves conducting substance use assessments and providing effective feedback, while comprehensive biopsychosocial assessment is foundational to the ARM model (Babor & Higgins-Biddle, 2001; White & Kelly, 2011). Counselors receive thorough training in assessment/testing, also one of the eight common core areas of the counseling curriculum (CACREP, 2015). In addition, counselors are educated about and trained to work with people who have mental health diagnoses, including trauma, depression, and anxiety (CACREP, 2015), conditions that frequently co-occur in substance misuse and abuse (Office of the Surgeon General, 2016).

Advocacy. Patient advocacy is a principal value both of the SBIRT process and of the ARM model (Babor & Higgins-Biddle, 2001; White & Kelly, 2011). Advocacy is also fundamental to the counseling professional identity, as counselors are called to overcome institutional and societal barriers to client access, equity, and success (CACREP, 2015). As members of integrated care teams, counselors have the opportunity to advocate with medical providers for the needs of patients and for the profession of counseling.

Research Investigation

Given the alignment of professional counseling with the SBIRT process and the ARM and TCU models, counselor-provided SBIRT may be associated with improved outcomes compared to SBIRT conducted by medically-trained providers, and comparable to or even more positive than outcomes for other mental health professionals. To date, however, only one study has explored the association of SBIRT counseling interventions

with outcomes (Veatch et al., 2018), with positive results for reduced consumption of alcohol.

Without a research canon, it is important to examine research gaps and limitations identified in similar fields and to build on suggestions from those fields. For counselor-provided SBIRT, researchers in specialty substance use disorder treatment and of SBIRT interventions by medical and mental health providers have offered directions for research investigation. Populations suggested for future study are those most frequently associated with mixed or non-significant results for SBIRT: people with disordered use of alcohol, people with illicit drug misuse and disordered use, and people hospitalized in inpatient units. Substance use severity, a related construct, is also associated with mixed and sometimes opposite results. To address limitations in previous designs, researchers have suggested selecting outcomes other than self-reported consumption, extending follow-up periods beyond six months, and increasing statistical power. Suggested alternative outcomes for investigation are barriers to real-world implementation of SBIRT, effects of multiple vs. single interventions, and focusing on individual components of SBIRT e.g. BI, BT, RT. A final suggestion for several researchers was to conduct economic evaluations, with a goal to ensure SBIRT funding and sustainability. This review has explored the research literature regarding populations, constructs, limitations and outcomes, with the exception of economic evaluation.

Economic Evaluation

Economists have developed widely-used evaluative tools for informing decision-makers, which are selected after careful consideration of the problems under review, the

questions to be answered, and the decision-makers' perspectives and needs for information (Drummond et al., 2015; Link, 2018). Among these tools are cost-effectiveness analysis, its variant cost-utility analysis, cost-benefit analysis and its reduced form, cost analysis.

According to Drummond et al. (2015), cost-effectiveness analysis (CEA) allows decision-makers to rank and compare alternative programs that have a common identified outcome, using monetary and non-monetary costs and benefits. The choice of elements to include in the CEA depend on the decision-maker's perspective; for example, a societal perspective might include lost wages and accidents, whereas an organizational or health care provider perspective may focus more on revenues, expenses, and facility costs (Drummond et al., 2015). CEAs can help clarify investment options by identifying programs that are both more effective and less costly than alternatives using a preference process called 'dominance' (Drummond et al., 2015). Cost utility analysis (CUA) is a ratio used in health care decision-making, with the difference between costs and benefits as the numerator, and a standardized measure of life quality with a health condition (Quality-Adjusted Life Years, or QALYs), or life years lost to a condition (Years Life Lost, or YLL), or disability from a condition (Disability-Adjusted Life Years, or DALYs) as a common denominator (Drummond et al., 2015).

In cost-benefit analysis (CBA), relevant costs and benefits are valued monetarily, then costs are netted against benefits, thus allowing comparison of programs with disparate outcomes (Drummond et al., 2015). If costs and/or benefits will occur in the future, they may be discounted to a net present value (NPV) using an agreed-upon

discount rate, generally a federal treasury rate or bank prime rate (Drummond et al., 2015). A program with a positive CBA or NPV can be considered on its own for investment or compared with other programs, with the highest net value program(s) selected for investment within the decision-maker's financial constraints (Drummond et al., 2015). Using information from the cost-benefit analysis, a benefit cost ratio can be calculated as discounted benefits divided by discounted costs, with ratios greater than 1.0 worthy of investment (Link, 2018). In cost analysis, only costs are considered, with programs of differing costs compared to each other (Drummond et al., 2015).

Economists and others have used these tools to evaluate SBIRT programs. A systematic review included 23 studies that applied CEA, CUA, CBA, and/or variants of these to SBIRT programs (Angus, Latimer, Preston, Li, & Purshouse, 2014). Of note, nearly all SBIRT interventions in Angus et al. (2014) were performed by medical personal such as general practitioners and nurses. Overall, the researchers found that most studies, regardless of evaluation type, reported SBIRT as a beneficial investment. Nearly half of studies utilized CUA with a common denominator of QALYs or DALYs. Five studies reported using CEA, three CBA, and three other cost-based analyses. There were substantial methodological differences among studies that used similar evaluation tools, perhaps due to different intended audiences. For example, some CUA studies included only intervention costs, while other studies also included societal costs. However, because researchers did not identify the decision-making audience for each study, comparison of analyses was challenging.

Four recent SBIRT economic evaluation studies were not included in Angus et al. (2014). An alcohol SBIRT program in Wales was compared to minimal intervention using CUA (Drummond et al., 2009). SBIRT interventions were provided by trained nurses and alcohol substance use counselors, and the target decision-makers were health policy-makers. Included in the numerator were staff time valued using salaries and benefits, educational and training materials, facilities, and overhead. Societal costs were estimated from health services and social program utilization, accidents, and criminal activity. The denominator was QALYs. The SBIRT program interventions were cost-effective compared to minimal intervention.

A randomized controlled trial investigating four-session SBIRT interventions for alcohol misuse in India was evaluated using 12-month follow-up results (Nadkarni et al., 2017). The interventions were conducted by trained non-professional staff. Two types of decision-makers were targeted – health care system leaders and policy-makers. Costs were valued similarly to Drummond et al. (2009) but also included staff time and travel for a home-based component of the study, while the denominator for comparison was QALYs. Costs were offset by reductions in health utilization at the health system level for the SBIRT group. The societal perspective added labor productivity for patients and their family members. The CUA results indicated that the SBIRT intervention program dominated usual care and was therefore the preferred economic investment. For SBIRT, total costs were less than total benefits due to health utilization reductions and the avoidance of most societal costs, so the brief intervention resulted in a net benefit per QALY.

SBIRT interventions for alcohol misuse performed in emergency departments (ED) were compared to SBIRT interventions in outpatient settings (Barbosa, Cowell, Bray, & Aldridge, 2015) using data from a SAMHSA SBIRT grant recipient. The target decision-makers were health care providers and policy-makers. Program costs were developed in a similar manner to Drummond et al. (2009). Societal costs – health care utilization, criminal activity, automobile accidents, and lost income – were collected from a subset of patients for six months before and after interventions then valued using peer-reviewed literature and patient wage self-reporting. The researchers found that SBIRT in EDs was less costly and more effective than SBIRT in outpatient settings. Because this was due in part to fewer interventions per patient in EDs, a sensitivity analysis was developed assuming the maximum recommended interventions for both settings; the ED setting still dominated.

Based on data from another SAMHSA SBIRT grant recipient, SBIRT brief intervention (1-4 sessions) was compared to brief treatment (5-12 sessions) for alcohol and drug misuse and disordered use across six outcome conditions (Barbosa et al., 2017). The target decision-makers were treatment providers; therefore, program costs were included but societal costs were not. Brief treatment was more cost-effective than brief intervention for one condition, probability of alcohol use, but brief intervention was more cost-effective for the other five conditions (days of alcohol use, probability of using alcohol to intoxication, days using alcohol to intoxication, probability of using drugs, days using drugs).

Based on economic theory and prior research, evaluating counselor-provided SBIRT requires identifying the relevant target audience. For the present study, the stated target audience is health system leaders who must choose among disparate programs for investment and balance many priorities in a budget-constrained environment; therefore, cost analysis was selected, with health system costs included but not societal costs.

Summary and Conclusions

Substance misuse and disordered use are prevalent throughout the world, implicated in death and disability and with widespread effects on families, communities, economies, and societies. The costs to workplaces, local governments, and health care providers are immense. Yet most people struggling with alcohol and drug use are not identified as needing help and do not receive help in the form of interventions or specialty treatment. The reasons are many, but include stigma, denial or minimization of problems, difficult finding help, lack of coordination between mental health and medical treatment, and shortages of intervention and treatment services. The Addiction Recovery Management (ARM) Model delineates these challenges and proposes systematic changes to address them, thus making recovery from substance misuse and disordered use more likely. The Texas Christian University Treatment Model connects system components with outcomes, identifying predictive variables such as readiness to change, substance use severity, and counselor-client alliance.

Specialty substance use disorder treatment is designed for more severe levels of substance use, with research generally supporting its efficacy for reducing alcohol and drug intake. For people who need help but aren't receiving it, interventions in medical

settings have been on the rise in the form of Screening, Brief Intervention, and Referral to Treatment (SBIRT). SBIRT extends intervention and treatment as recommended by the ARM model. When conducted by medical professionals, SBIRT has been shown effective for alcohol misuse in outpatient and emergency department settings, but not drug use or alcohol use disorders, or for hospital inpatients. A newer medical practice model, integrated care, offers promise for improving outcomes overall. In integrated care, SBIRT is provided most often by mental health professionals who are trained to work with mental health problems such as substance misuse and disordered use. Early research results have shown that SBIRT by mental health professionals is associated with reductions in alcohol and drug use regardless of severity level or setting.

An intriguing innovation is the provision of SBIRT by professional counselors, a subset of mental health professionals. The training and professional identity of professional counselors is closely aligned with SBIRT guidelines as well as the ARM and TCU models, and counselors have been part of multi-specialty mental health provider teams from prior studies. However, only one study has investigated counselor-provided SBIRT, with promising results. Additional investigation is needed, with designs that can incorporate recommendations by prior researchers, such as testing outcomes other than self-reported consumption; associating outcomes with severity, type of substance used, and setting; incorporating follow-up periods longer than six months; and conducting economic evaluation of findings.

Accordingly, the present study is designed to associate counselor-provided SBIRT with outcomes important to the health care systems that bear significant costs from

treating patients with substance misuse and disordered use, specifically hospitalizations and emergency department visits. Because investigations regarding SBIRT for hospital inpatients have been inconclusive, this setting has been selected for the present study. The effects of severity and type of substance used will be estimated, and an economic evaluation of outcomes performed. Positive outcomes may lead to additional investment in counselor-provided SBIRT, bringing needed intervention and treatment to people who need it the most.

CHAPTER III

METHODOLOGY

The rationale and need for a research study presented in Chapter 1, along with the review of relevant literature in Chapter 2, suggest that counselor-provided SBIRT in integrated care settings is a promising, innovative intervention for people with alcohol or illicit drug misuse or disordered use. In this chapter, the research methodology for examining counselor-provided SBIRT in a specific integrated care setting and population is provided. The research questions and hypotheses are stated. The research design, consisting of the study setting, counseling program and intervention process, study population, data procedures, and measures, is explained. The statistical analyses and the pilot study are described.

Research Questions and Hypotheses

Research Question 1. For patients with alcohol or illicit drug misuse or disordered use, do patients in inpatient integrated care settings receiving counselor-provided SBIRT experience fewer hospitalizations and emergency department visits compared to patients in the same settings not receiving interventions?

Research Hypothesis 1. Patients with alcohol or illicit drug misuse or disordered use and receiving counselor-provided SBIRT in integrated care settings experience fewer hospitalizations and emergency department visits compared to patients not receiving interventions.

Research Question 2. Do hospitalization and emergency department visit outcomes for patients with alcohol or illicit drug misuse or disordered use differ by substance use type, substance use severity, or inpatient service location?

Research Hypothesis 2. Hospitalization and emergency department visit outcomes for patients with alcohol or illicit drug misuse or disordered use differ by substance use type, substance use severity, and/or inpatient service location.

Research Question 3. Are counselor-provided SBIRT interventions associated with reduced economic costs from the health system perspective?

Research Hypothesis 3. Counselor-provided SBIRT interventions are associated with reduced economic costs from the health system perspective.

Research Design

The study was a retrospective analysis of data to determine whether counselor-provided SBIRT treatment interventions for adults with substance misuse or disordered use who were hospitalized on integrated care services predicted reductions in hospitalizations and ED visit outcomes when compared to no intervention, and whether these outcomes differed significantly by substance use type, substance use severity, or inpatient service location. This study was also an evaluation of whether counselor-provided SBIRT was associated with economic cost reductions for health care systems.

Study Setting

The setting for this study was the primary teaching hospital of a large academic health system in the southeastern U.S. comprised of a medical school, several hospitals and clinics, allied health organizations, and foundations. The hospital admits 50,000

inpatients per year to its 885 licensed inpatient beds and observation units, while 111,000 patients visit the Emergency Department annually (Wake Forest Baptist Medical Center [WFBMC], 2018b). The health system offers primary, specialty, trauma, and intensive care to patients, most of whom live in the surrounding 24 counties (WFBMC, 2018b). The health system's budget exceeds \$2.6 billion, with 2,000 faculty and resident physicians and a total workforce of 15,000 people (WFBMC, 2018b).

Counseling Program and Intervention Process

The study population was drawn from patients receiving SBIRT interventions from the counselors and counselor trainees of an inpatient substance use counseling program. This program operates on the hospital's integrated care medical services (Trauma, Burn, and General Medicine) and has been active for more than a decade. The program's founder/director is a faculty member who is a licensed professional counselor and licensed substance use counselor. The program employs licensed professional counselors at the master's and doctoral levels. It serves as a training site for master's- and doctoral-level counseling students during their practicum and internship experiences. The program has established procedures, both verbal and written, that are followed by the director and staff counselors and are taught to each trainee; program procedures are documented in Veach et al. (2018). These procedures are the basis for the patient selection and counseling intervention narratives that follow.

Program patient selection for SBIRT intervention. In the course of daily program operations, counselors and/or trainees (hereinafter referred to collectively as 'counselor' or 'counselors') first review electronic medical records and/or consult with medical

providers to identify patients with known or potential substance misuse or disordered use. The electronic medical record (EMR) system is the repository for data collected during patient admission to the hospital and medical care. Aspects of the EMR reviewed by counselors are the following:

- *Demographics, specifically language(s) spoken.* Patients identified for intervention are limited to English-speaking adults, with English denoted as the patient's primary language in the EMR. Due to limited hospital resources, translators are not readily available to the counseling program.
- *Medical problem list.* The problem list contains all active and historical medical issues of patients, including specific substance use disorders. Problems are recorded by physicians during patient encounters with the health system.
- *Alcohol and drug screening questions.* During hospital admission procedures, nursing staff are prompted by the EMR to ask patients about their alcohol and illicit drug use. If patients respond positively about use, nurses are expected to obtain weekly frequencies and/or quantities as well as the type(s) of alcohol and/or drug(s) consumed. In practice, depending on the patient's condition (e.g., incoherent or unresponsive) or nursing error, the screening questions may be left unanswered until the patient or an accompanying person is able to respond.
- *Laboratory test results.* Physicians routinely order blood alcohol levels (BAL) for Trauma patients. BALs are sometimes ordered for Burn and

General Medicine patients if alcohol use is concerning based on patient clinical presentation or histories provided by patients or persons accompanying them to the hospital. Urine drug screens (UDS) are ordered for Trauma, Burn, and General Medicine patients if drug misuse and/or disordered use are clinical concerns.

- *History and physical* reports (H&Ps). Prepared by admitting physicians, H&Ps are text-based documents in the EMR that include data such as thorough patient histories; results of physical exams; interpretations of diagnostic laboratory, radiology, and similar tests; and treatment plans.

Counselors also consult collaboratively with physician and/or nursing staff about patients, usually during daily medical rounds or nursing multi-disciplinary morning meetings. They sometimes learn about substance misuse or disordered use concerns that have not yet been recorded in the EMR and arise from medical provider interactions with patients and/or the persons accompanying them.

A patient is selected for an SBIRT counseling intervention if he or she is English-speaking and *any* of the following conditions are met:

- Patient has active or historical substance use disorders appearing on the medical problem list, such as alcohol use disorder or opioid use disorder
- Patient either answers the nurse screening questions with responses indicating potential misuse or disordered use of alcohol and/or illicit drugs, or the screening question are blank in the EMR

- Patient has a positive blood alcohol level, represented in the EMR laboratory results by a score of 10 or greater. When divided by 1000, the score represents the actual blood alcohol concentration at the time of testing (e.g., $100/1000 = .10$ blood alcohol concentration)
- Patient has a positive urine drug screen for any of six substances (amphetamines, barbiturates, benzodiazepines, cannabis, cocaine, and opiates), provided there is no prior medical explanation for the positive screen (e.g., drug appears in the patient medication list in the EMR or drug was provided at the hospital)
- Patient has written indications of substance misuse or disordered use in the physician H&P
- Physicians, nurses, or care coordinators share verbal concerns with counselors about the patient's known or potential substance misuse or disordered use (according to program procedures, recording these concerns in program documentation is not required)

Procedures for SBIRT counseling interventions. For newly admitted patients selected for SBIRT intervention, counselors enter patient names, medical record numbers, demographic information, screening question responses, laboratory test results, and other related clinical data to spreadsheets stored on secure program servers. The same data are recorded on paper intake documents. Counselors review the status of patients previously admitted and selected for intervention; some of these patients already would have been seen for SBIRT while others would not. Newly available data, such as

test results (e.g., BAL, UDS), are entered on spreadsheets and intake documents for these patients. Counselors then attend physician rounds and/or multi-disciplinary meetings where patient conditions and treatment plans are discussed, and where they may receive additional input from medical providers about patient substance use.

Once a complete list of patients selected for intervention is established for the day, the counselors conduct SBIRT interventions for as many patients as possible and make return visits to patients previously seen. Following each intervention or attempted intervention, the patient intake form is completed for the encounter, documenting such factors as components of SBIRT performed, length of time in session, and assessment scores. These results are transferred to spreadsheets, which are accumulated by month for each integrated care service.

During the first (and sometimes only) session with a patient, the counselor adheres to program procedures by making a brief introduction, discussing confidentiality, obtaining verbal consent for counseling, then, upon consent, spending 10-20 minutes developing a therapeutic relationship. The counselor then follows World Health Organization (WHO) guidelines for the SBIRT process (Babor & Higgins-Biddle, 2001). The counselor will seek the patient's verbal consent to administer the Alcohol Use Disorders Identification Test (AUDIT) (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001) and/or the CAGE Questionnaire (Dhalla & Kopec, 2007). If a screening test and/or patient declaration indicates no substance use, the session will conclude. At times, patients will self-disclose substance use issues early in the session; when this occurs, the

counselor may decide to bypass the screening tests and proceed directly to brief intervention.

For patients who misuse alcohol and/or illicit drugs or have disordered use, SBIRT guidelines recommend an intervention of at least 15 minutes (Babor & Higgins-Biddle, 2001). If, per the screening test or patient disclosure, low risk use is present, the counselor will provide psychoeducation and materials intended to prevent progression to misuse or disordered use (Babor & Higgins-Biddle, 2001). If misuse or disordered use is detected, brief interventions will be attempted to help patients identify deleterious consequences from using substances, fortify desires to reduce harm or abstain, create a harm reduction plan, work on relapse prevention skills, and/or discuss post-discharge treatment options (Babor & Higgins-Biddle, 2001).

Patients who are hospitalized for several days or weeks may have multiple brief interventions. They may also be visited by a different counselor or trainee for some or most of these visits, depending on the service schedule. If patients are hospitalized more than once during the study period, they may have more than one hospitalization with an intervention.

Study Population

The study population consisted of English-speaking adults aged 18 years and older who were admitted to the integrated care inpatient services of the hospital between January 2014 and December 2017, were selected for SBIRT intervention, and met criteria for study inclusion. The patients included in the study population were those admitted to the hospital and identified by or referred to the Trauma and Burn integrated counseling

services beginning in January 2014 and those admitted to the hospital and identified by or referred to the General Medicine integrated counseling service beginning in September 2015 (the month this service was first integrated).

The start date of January 2014 was based on electronic health record data availability. The health system installed new, comprehensive health record software in September 2012 (WFBMC, 2018a). Medical records data prior to the implementation month were not readily accessible. The study design included a one-year lookback period (see Data Procedures), so the first full calendar year of health data available for the lookback period began in January 2013. Therefore, the start date for including patients selected for SBIRT interventions in the study population was January 2014.

Study inclusion criteria. Patients identified for SBIRT counseling interventions during the time period of interest (January 2014 – December 2017) were considered for inclusion in the study population. The *intervention group* was comprised of patients who received one or more SBIRT counseling interventions during a single hospitalization. The total intervention time met or exceeded the recommended guideline for SBIRT brief interventions of at least 15 minutes (Babor & Higgins-Biddle, 2001). For patients who received interventions during more than one hospitalization, the first hospitalization involving an intervention became the target hospitalization for inclusion in the intervention group, to avoid potential confounding effects from increasing “doses” of counseling.

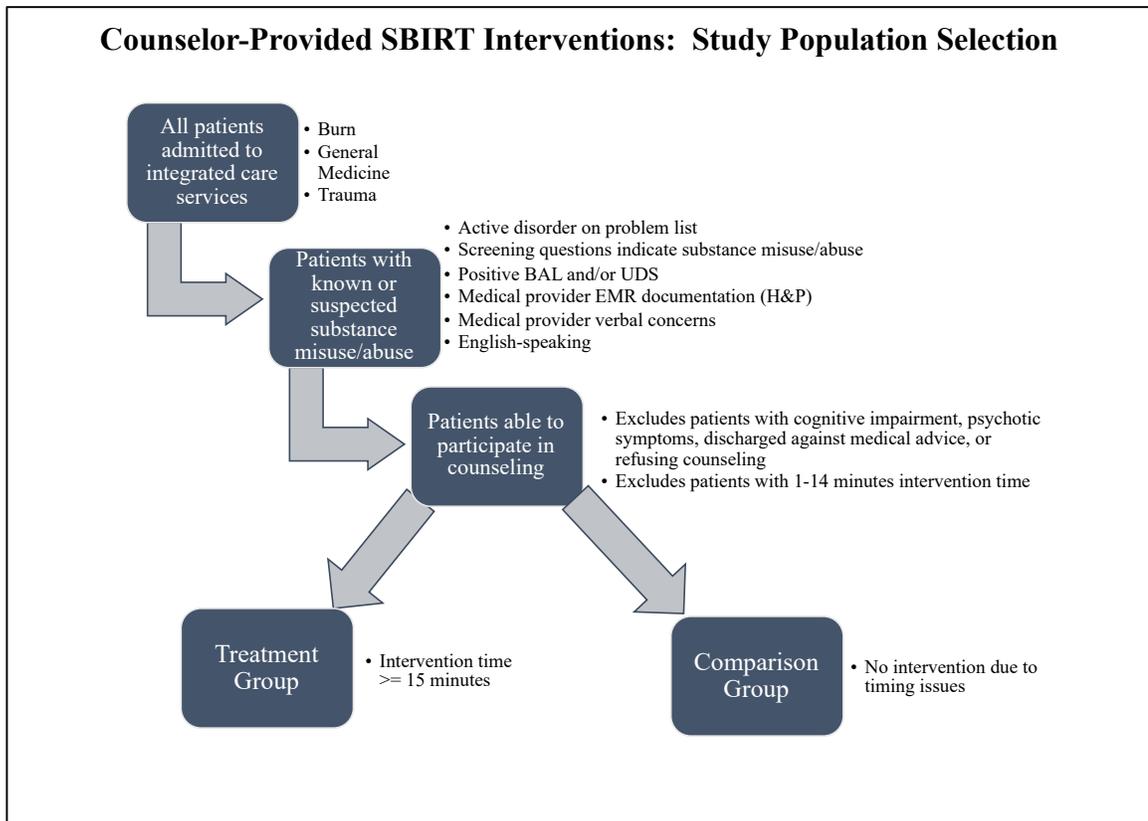
The *comparison group* included patients who were identified for SBIRT intervention but did not receive them due to timing issues, such as being absent from the

hospital room or being discharged prior to counselor availability for intervention. Patients might not have received interventions for several other reasons, including temporary or permanent cognitive deficits, active psychotic symptoms, refusal of intervention, or departure from the hospital against medical advice (AMA). As patients with these cognitive, psychiatric, and behavioral factors were likely to be qualitatively different from the intervention group, only patients who did not receive interventions for timing were included in the comparison group.

Study exclusion criteria. Patients with direct contact time with counselors, but not exceeding 14 minutes for any hospitalization during the study period, were excluded from the study population as not meeting the minimum time recommendation for brief interventions. Patients with cognitive deficits, with psychotic symptoms, refusing intervention, and leaving the hospital AMA were unable to participate in counseling interventions by condition or by choice and were excluded from the study population.

Figure 3 provides a flowchart summarizing the study population selection process.

Figure 3. Study Population Selection



Data Procedures

Institutional Review Board (IRB) approvals were obtained for the study from both Wake Forest Baptist Medical Center and The University of North Carolina at Greensboro. A patient dataset was created from 120 individual monthly spreadsheet tabs for all patients meeting inclusion criteria during the investigation time period (January 2014–December 2017). Extracted from the spreadsheets were patient names and medical record numbers, inpatient service, age, gender, and ethnicity/race. Also extracted was total intervention time for patients receiving SBIRT interventions greater than 15 minutes.

Using medical record numbers along with admission and discharge dates for intervention and comparison hospitalizations, dates of all hospitalizations and ED visits one year prior to admission and one year subsequent to discharge for these hospitalizations, thus occurring sometime between January 2013 and December 2018, were obtained from the data analytics warehouse. Other data extracted were clinical disease coding, measures of illness severity and risk of mortality, physician clinical service overseeing the patient's care, room location at time of discharge, and payers (entities responsible for bill payment such as insurance companies or patients). Patient-specific costs for each encounter were obtained to test economic outcomes. Marital status was acquired as an additional demographic variable.

Clinical disease coding data was extracted from the data warehouse to determine whether substance use was noted as a concern by a physician(s) for a given hospitalization or visit. While coding cannot be assigned for undetected substance use or use that is not thought to be a problem for a patient, coding is assigned if the substance use was managed, evaluated, assessed, or treated in any way during the patient encounter (M. Matthews, personal communication, September 11, 2018). Using disease coding for this study may underestimate substance use in the study sample, although from the health system's perspective it is the active substance use effects on medical care and treatment that is of highest priority, and these effects are most likely to be captured by the coding (M. Matthews, personal communication, September 11, 2018).

Disease coding was used to assign substance use severity and type for the intervention and comparison groups. Coding was also used to identify hospitalizations

and ED visits during the study period that involved substance use, misuse and/or use disorders. Counts of hospitalizations and ED visits and economic costs were summarized separately by encounters with substance use coding and encounters without coding, as well as in total, then added to the patient dataset.

Disease coding from the World Health Organization's International Compendium of Diseases, Clinical Modification (ICD-CM), Ninth Version (1999) was in effect from January 2013 through September 2015. Disease coding from the World Health Organization's ICD-CM, Tenth Version (2016) has been in effect since October 2015. To ensure consistency between versions when using disease coding in this study, the Classification of Mental and Behavioural Disorders: Conversion Tables Between ICD-8, ICD-9 and ICD-10, Rev. 1 (World Health Organization, Division of Mental Health, 1994) was followed. See Appendix A for substance use disease coding for both the ninth and tenth versions.

Measures

To guide research in this emerging area, the Texas Christian University (TCU) Treatment Model provides an evidence-based theoretical framework (Simpson, 2004). The TCU Model delineates the factors most predictive of treatment outcomes in substance misuse. Aligning the TCU Model with counseling program and available health record data reveals several variables of common interest: patient-level factors such as substance use severity and time spent in treatment, plus program-level factors such as staff and climate (Simpson, 2004). These factors are also critical to the SBIRT process, along with substance use type (Sacks et al., 2016).

Accordingly, the *predictor variables* included in this study were counselor-provided SBIRT interventions; substance use type; substance use severity; and inpatient location, representing program staff and climate. The *outcome variables* were prior and subsequent hospitalizations and ED visit counts and per-patient encounter costs.

Counselor-provided SBIRT interventions. The intervention was coded in two ways. First, a dichotomous *predictor variable* was coded as ‘1’ for intervention or ‘0’ for no intervention. This variable was an indicator of whether a patient was in the intervention group (‘1’) or the comparison group (‘0’). The intervention variable was dichotomous to allow for propensity scoring techniques in data analysis. Assignment of this variable was as follows:

- A ‘1’ specified that a patient received at least 15 minutes of counselor-provided SBIRT during one hospitalization of the study period. The 15-minute floor represents the time duration recommended by the WHO for a brief intervention (Babor & Higgins-Biddle, 2001). The first hospitalization experienced by a patient that included at least 15 total minutes of counseling time was labeled as the index hospitalization. Provided the patient met other inclusion criteria, this hospitalization entered the patient into the intervention group. Future hospitalizations were excluded from intervention or comparison groups to avoid double counting of prior and subsequent hospitalizations.
- A ‘0’ specified that a patient did not receive any minutes of counselor-provided SBIRT or other professional counseling interventions at any time

during the study period. Provided the patient met other inclusion criteria, the patient's first hospitalization was labeled as an index hospitalization, and the patient was entered into the comparison group. Future hospitalizations were excluded from intervention or comparison groups to avoid double counting of prior and subsequent hospitalizations.

Second, a categorical variable was created based on length of time spent counseling. This variable was inspected for natural groupings then stratified into quintiles. The reference group of '0' for no intervention was added to this categorical variable, resulting in six levels, coded as follows:

- A '0' specified that no intervention occurred, using the criteria from the comparison group of the dichotomous intervention variable
- Using the criteria for the intervention group of the dichotomous variable, the following levels were assigned to divide the distribution of session times into five roughly equal parts:
 - '1' for sessions between 15 and 25 minutes
 - '2' for session between 26-30 minutes
 - '3' for sessions between 31-45 minutes
 - '4' for sessions between 46-60 minutes
 - '5' for sessions exceeding 60 minutes

Prior and subsequent hospitalizations. Studies comparing SBIRT interventions with hospitalization and ED visit outcomes used frequency counts to measure these variables (Bray et al., 2007; Freeborn, Polen, Hollis, & Senft, 2000), as did studies of

integrated care practice outcomes using these outcomes (Driscoll et al., 2013; Reiss-Brennan et al., 2016; Yoon, Chow, & Rubenstein, 2016). Therefore, hospitalizations were a count variable, with count representing the number occurring during each one-year period of interest. The one-year periods are consistent with studies involving hospital and ED utilization for hospitalized patients (Bray et al., 2007; Saitz et al., 2014) and in other studies of substance misuse outcomes (Bloor, Neale, Weir, Robertson, & McKeganey, 2008; Glass et al., 2015; Jonas et al., 2012). For both the intervention and comparison groups, the date one year prior to the admitting date became the beginning of the one-year period prior to hospitalization. The date of patient discharge was the starting point for the one-year period following hospitalization. Counts from both one-year periods were *outcome variables*. For the intervention group, the count period followed the first hospitalization during the study period wherein a patient received a counselor-provided SBIRT intervention(s) of at least 15 minutes. For the comparison group, the count followed the first hospitalization wherein the patient was identified for intervention but not counseled.

Prior or subsequent hospitalizations with clinical disease coding for substance misuse or disordered use were counted separately from those without substance codes, then were added together to obtain another count level. Patients can experience other conditions leading to frequent hospitalizations that are not directly associated with substance use (e.g., congestive heart failure or uncontrolled diabetes); however, because past or current substance use can interact with chronic conditions to deleterious effect, both types of encounters were included as outcome variables along with their totals.

Prior and subsequent emergency department visits. ED visits were a count variable, with count representing the number of visits during each period of interest. The counts were derived according to the process described for hospitalizations and were used as *outcome variables*. Prior and subsequent visits with and without clinical disease coding for substance misuse or disordered use were included in the counts separately and in total. Other health conditions that can cause frequent medical emergencies may be exacerbated by past or current substance use. ED visits from which patients were subsequently admitted to the hospital were not counted as ED visits because of how patients are classified in the electronic health record. ED visits resulting in hospitalizations are designated as hospitalizations, whereas ED visits without hospitalizations (“treat and release”) are designated as ED visits.

Cost estimates. For each patient hospitalization or ED visit included in the study, proprietary patient cost estimates were extracted from the health system’s data analytics warehouse to use as separate *outcome variables*. Costs were managed similarly to counts. In the proprietary patient costing system, a cost accounting process is used to fully allocate all health system costs to patient encounters, including hospitalizations and ED visits (WFBMC, 2017; G. Carter, personal communication, February 7, 2019). Costs and metrics to allocate costs are obtained from several financial sources, including the accounting system and the payroll system.

In the cost accounting process, departments are categorized as “direct,” meaning people in those departments provide direct billable services to patients such as surgical services, or as “indirect,” for departments not billing patients for services, such as

executive leadership. Indirect departments are only those associated with the clinical mission of the health system, so that research, teaching, and related administrative activities are not allocated to clinical costs. Direct department costs are allocated to the patient charges billed by direct departments using bases such as “relative value units” (RVU) or “diagnostic related groups” (DRG). Both mechanisms are foundational to health care billing and payment. Indirect department costs are allocated across all direct departments reasonably associated with their activities using various metrics or other allocation methodologies.

A categorization between “variable,” or activity that varies with patient volumes, and “fixed,” activity that does not vary with patient volumes, is applied to each job code in the health system. For example, a nurse would be in a variable job code category whereas a marketing manager would be in a fixed job code category. Costs associated with variable job codes are allocated to the patient charges (again, RVUs, DRGs, or other basis) associated with those job codes, while fixed job codes are allocated across patient charges using metrics or other allocation methods.

Both direct/indirect and fixed/variable add up to the same total costs. Total costs for each inpatient hospitalization and ED visit were extracted from the data warehouse for use in this study as economic outcomes.

The combinations of counts, costs, hospitalizations, ED visits, and presence/absence of substance use coding resulted in 24 possible outcome variables for consideration in the analysis, as described in Table 1.

Table 1. Planned Outcome Variables

Outcome Type	Variable Description
Count	Pre-intervention hospitalizations with substance use coding
Count	Pre-intervention emergency visits with substance use coding
Count	Pre-intervention hospitalizations without substance use coding
Count	Pre-intervention emergency visits without substance use coding
Count	Pre-intervention hospitalizations, all
Count	Pre-intervention emergency visits, all
Count	Post-intervention hospitalizations with substance use coding
Count	Post-intervention ED visits with substance use coding
Count	Post-intervention hospitalizations without substance use coding
Count	Post-intervention ED visits without substance use coding
Count	Post-intervention hospitalizations, all
Count	Post-intervention ED visits, all
Costs	Pre-intervention hospitalizations with substance use coding
Costs	Pre-intervention emergency visits with substance use coding
Costs	Pre-intervention hospitalizations without substance use coding
Costs	Pre-intervention emergency visits without substance use coding
Costs	Pre-intervention hospitalizations, all
Costs	Pre-intervention emergency visits, all
Costs	Post-intervention hospitalizations with substance use coding
Costs	Post-intervention ED visits with substance use coding
Costs	Post-intervention hospitalizations without substance use coding
Costs	Post-intervention ED visits without substance use coding
Costs	Post-intervention hospitalizations, all
Costs	Post-intervention ED visits, all

Substance use type. Substance use type was a categorical *predictor variable* with four levels and codes: ‘0’ absence of substance use; ‘1’ alcohol use; ‘2’ illicit drug use; and ‘3’ use of both alcohol and illicit drugs. The purpose of these categories was to associate outcome variables with type of use, given that SBIRT has demonstrated consistent effectiveness only for alcohol misuse. Clinical disease coding for substance use was stratified according to type for both ICD-CM9 and ICD-CM10 codes. Using

lookup and pivot table functions in spreadsheet software, patients were assigned one of these categories based on coding from their index hospitalizations. Patients without substance use codes defaulted to the category of absence of substance use.

Substance use severity. Substance use severity was a categorical *predictor variable* with four levels and codes, using the terminology of clinical disease coding: ‘0’ absence of substance use; ‘1’ substance use (detection of use); ‘2’ substance abuse (equivalent to substance misuse); and ‘3’ substance use disorders (equivalent to substance use dependence in the codes). The purpose of these categories was to associate outcomes with severity of use, given that SBIRT may not be effective for more severe levels of alcohol use, or for any level of drug use. Clinical disease coding for substance use was stratified according to severity for both ICD-CM9 and ICD-CM10. Using lookup and pivot table functions in spreadsheet software, patients were assigned to one of these categories based on coding from their index hospitalizations. Patients without substance use codes defaulted to the category of absence of substance use.

Inpatient location. Inpatient service location was a categorical *predictor variable* with six levels and codes: ‘0’ Burns patients hospitalized in the Burns unit; ‘1’ Burns patients hospitalized elsewhere in the hospital; ‘2’ Medicine on-unit; ‘3’ Medicine off-unit; ‘4’ Trauma on-unit; and ‘5’ Trauma off-unit. These categories represented the three hospital services that have integrated medical and mental health care for patients with substance use issues, separated by patients who stayed on the three physical units that are the main locations for these services, and patients assigned to the physician service teams but, due to lack of available beds, stayed elsewhere. The off-service categories also

include occasional patients referred to the Trauma, Burn, or General Medicine counseling teams by physicians elsewhere in the hospital. The purpose of this variable was to associate outcomes with inpatient location, as the inpatients who are admitted to these three hospital services are cared for by physicians of differing specialties and treatment approaches and have different medical conditions.

Table 2 summarizes the constructs measured, the research questions (RQs) and research hypotheses (RHs), the variables, and the data sources in the preceding narratives.

Table 2. Constructs Tested, Research Questions and Hypotheses, and Variables

Construct(s) Tested	Research Questions and Hypotheses	Relevant Variables and Sources
Counselor- provided SBIRT intervention	<p><i>Research Question 1.</i> For patients with alcohol or illicit drug misuse or disordered use, do patients in inpatient integrated care settings receiving counselor-provided SBIRT experience fewer hospitalizations and emergency department visits compared to patients in the same settings not receiving interventions?</p> <p><i>Research Hypothesis 1.</i> Patients with alcohol or illicit drug misuse or disordered use and receiving counselor-provided SBIRT in integrated care settings experience fewer hospitalizations and emergency department visits compared to patients not receiving interventions.</p>	<ul style="list-style-type: none"> • Intervention(s) from program documentation (spreadsheets, intake forms), defined as counselor contact of 15 minutes or more per World Health Organization guidelines for SBIRT • Hospitalizations and ED visits with and without substance use ICD-CM coding, one year prior to initial intervention, from data warehouse • Hospitalizations and ED visits with and without substance use ICD-CM coding, one year subsequent to initial intervention, from data warehouse
Type of substance use	<p><i>Research Question 2.</i> Do hospitalization and emergency</p>	<ul style="list-style-type: none"> • Hospitalizations and ED visits with and without

Severity of substance use	<p>department visit outcomes for patients with alcohol or illicit drug misuse or disordered use differ by substance use type, substance use severity, or inpatient service location?</p>	<p>substance use ICD-CM coding, one year prior to initial intervention, from data warehouse</p>
Type of clinical service	<p><i>Research Hypothesis 2.</i> Hospitalization and emergency department visit outcomes for patients with alcohol or illicit drug misuse or disordered use differ by substance use type, substance use severity, and/or inpatient service location.</p>	<ul style="list-style-type: none"> • Hospitalizations and ED visits with and without substance use ICD-CM coding, one year subsequent to initial intervention, from data warehouse • Substance use type of alcohol, illicit drug, both, or none from ICD-CM clinical disease coding • Substance use severity of disordered use, misuse, use or absence of use from ICD-CM clinical disease coding • Inpatient service location from program documentation (spreadsheets) – Trauma, Burn, General Medicine and data warehouse
Economic cost reduction	<p><i>Research Question 3.</i> Are counselor-provided SBIRT interventions associated with reduced economic costs from the health system perspective?</p> <p><i>Research Hypothesis 3.</i> Counselor-provided SBIRT interventions are associated with reduced economic costs from the health system perspective.</p>	<ul style="list-style-type: none"> • Patient costs per hospitalization or ED visit from data warehouse

Data Analysis

Prior to analysis, the dataset was checked, verified, and modified using recommended data cleaning processes from Cody (2008). Data cleaning was performed in Microsoft Excel and Stata statistical software using data validation tools, filtering, and sorting and by validating the dataset against the data warehouse. The spreadsheet data was visually inspected for unexpected data and trends using filtering and sorting, with unusual results and outliers reviewed and, if erroneous, repaired. Data validity checks were performed for invalid values such as character entries in numerical data; errors were manually corrected by group if possible or individually. Checks for duplicate records were performed and duplications removed. Both numerical and character data were checked for missing values, with hand-searching of electronic health records and paper records to complete the dataset.

Propensity scores. In this study, the intervention and comparison groups were not randomly assigned. Without randomization, group differences in observed covariates can create selection bias, in that certain covariates may make it more or less likely that patients will receive counselor-provided SBIRT interventions. Selection bias is a confounder that can threaten a study's internal validity, that is, whether its conclusions about associations between predictor and outcome variables are valid (Heppner, Wampold, Owen, Thompson, & Wang, 2016).

For this study, observed demographic covariates included a continuous variable, age, and three categorical variables: gender ('0' male, '1' female); ethnicity/race ('0' White, '1' African-American/Black, and '2' other [American Indian, Asian, Hispanic or

Latino/a, other]); and marital status ('0' single, '1' married, and '2' other [divorced, separated, widowed, unknown]). Other observed covariates were also categorical variables. Severity of illness and risk of mortality are standardized measures of patient clinical status that were obtained from the data warehouse, each stratified by four levels: '0' minor, '1' moderate, '2' major, and '3' extreme. Payer, also obtained from the data warehouse, was a covariate proxy for observed differences in economic circumstances among patients. Health care payers include government (provided through Medicare for older adults and Medicaid for poorer adults) and commercial (provided by employers or commercial markets). Patients without insurance are classified as "self-pay." Payer was a categorical variable with five levels: '0' managed care, '1' Medicaid, '2' Medicare, '3' all other insurances, and '4' self-pay. Finally, to capture potential seasonality of treatment, the calendar quarter of the index hospitalization was calculated from the admission date, with '1' January – March, '2' April – June, '3' July – September, and '4' October - December. The availability of counselors for interventions somewhat followed educational scheduling, as many of the counselors were counselor trainees from academic institutions. Seasonality helped balance counselor availability and other seasonal factors, such as holidays and weather, between groups.

Propensity scores (Austin, 2011; D'Agostino & Rubin, 2000) were calculated using logistic regression with these covariates as predictors and the dichotomous intervention variable as the outcome. Propensity scores represent the conditional probability of receiving interventions given the covariates (D'Agostino & Rubin, 2000). With observational data, propensity scores are more likely to reduce selection bias than

traditional covariate analysis (Austin, 2011; D'Agostino & Rubin, 2000). The scores were used as additional predictor variables of all outcome variables.

Power. Per G*Power analysis (Faul, Erdfelder, Buchner, & Lang, 2009), a sample size of 366 was needed for the planned analysis using an a priori one-tailed Z-test at alpha of 0.05 for Poisson distributions ($\beta_1=1.2$, $[1-\beta]=0.80$, $\beta_0=0.5$, R^2 other than $X = 0.5$). The moderate power level of 0.80 was selected based on Balkin and Sheperis (2011). The remaining components represent G*Power default values for Poisson distributions.

Regression. The overarching model was a differences-in-differences (DID) approach to assess the effects of an intervention. According to Crown (2014), the DID model is a quasi-experimental research design intended to control for unobserved covariates that remain stable over time. It has widespread use in program evaluation. DID is appropriate when two or more periods of data are available for both intervention and comparison groups: a baseline period where neither group receives the intervention, and a following period(s) where one group receives the intervention and the other does not (Crown, 2014). For this study, the year prior to the index hospitalization was the baseline period, with the intervention occurring at the beginning of the following period, then the year after the hospitalization completing the following period.

Regression analysis was performed using generalized linear models. Because the outcome variables of hospitalizations and ED visits were counts, generalized linear regression models were recommended (Hilbe, 2014). Given an excess number of zeros in the count outcome data (over-dispersion), negative binomial regression models were

used with the count data (Cameron & Trivedi, 2009). Generalized linear models were used with the cost data, employing the gamma distribution and log link options to account for excess zeros which positively skewed the data (McCue et al., 2008).

The predictor variables for a first set of regression models for the count and cost outcomes were counselor-provided SBIRT intervention (dichotomous), substance use type (categorical), substance use severity (categorical), and clinical service (categorical). A time variable was included for DID and interacted with the intervention variable. The intervention/time interaction demonstrates whether an intervention during the second time period of the DID model changes the outcomes for the intervention group. For a second set of models, the same predictors and DID model were used, except counselor-provided SBIRT was measured as session time quintiles, a categorical variable.

Interpretation of results. Wald's test statistic and McFadden's Pseudo R^2 , the proportion of variance explained by the model, were examined to assess negative binomial model fit to the data. Akaike's Information Criterion (AIC) and Bayesian Information Criterion (BIC) test statistics were used to assess generalized linear model fit. Given acceptable fit, significance of the random coefficients and variance components were compared to an alpha level of 0.05 to test the research hypotheses. Significant coefficients for interventions provide support for the hypothesis that counselor-provided SBIRT in inpatient integrated care settings is an effective treatment intervention for reducing patient hospitalizations and emergency department visits as well as economic costs. Coefficients for substance use type, substance use severity, and

clinical service that are significant support the hypothesis that hospitalization and/or emergency department visit outcomes differ by these predictors.

Pilot Project

The purpose of the pilot project for this research study was to determine the feasibility of transforming operational, pragmatic counseling data into a usable, testable dataset and to estimate the size of the study sample. The research questions associated with this purpose were the following:

Is it possible to assemble a complex multi-year dataset from retrospective operational counseling data and if so, what are the procedural considerations in doing so?

Can the inclusion and exclusion criteria outlined in the research methodology be applied to the data, and if so, what is the estimated number of participants in each group, by clinical service?

Methods

The counseling data was collected and stored in 120 separate Microsoft Excel spreadsheets from the integrated care services for the period January 2014 through December 2017, with 48 spreadsheets from Burn, 48 from Trauma, and 24 from General Medicine (the service that was integrated two years into the study period). The spreadsheet format differed among the services and across the years for a given service, although the basic data elements needed for this research study were present in all spreadsheets in some form – patient names, medical record numbers, admission dates, demographic information, and, if counseling intervention(s) were performed, the intervention dates and durations. An Excel workbook per service per year was created

from individual spreadsheets, representing two years of Burn data, one year of Medicine, and one year of Trauma. The following categories by service assigned to each patient after applying inclusion/exclusion criteria, and categories separated by worksheets:

On-service intervention group. The on-service counseling intervention groups consist of patients receiving counseling interventions who stayed on the hospital unit(s) operated by the integrated care clinical service. At WFBMC, each clinical service is assigned to one or more physical units (building floors) with a fixed number of inpatient rooms and dedicated allied health professionals such as nurses and physical therapists. The Trauma and Burn services have one integrated care unit each, while the General Medicine service has two units.

Off-service intervention group. The off-service counseling intervention groups include two types of patients: those assigned to the service who stayed on other units due to rooms not being available on the primary unit, and those referred to the counseling service from other hospital units. At times, physicians who had worked on integrated care teams with counselors and then rotated to other hospital units would ask the counseling team to treat one of the patients on their unit. The off-service intervention group is segregated because these patients were not on an integrated care unit but did receive counseling interventions, so are of interest.

On-service comparison group. The on-service comparison groups consist of patients on the clinical service identified for intervention but not receiving them.

Off-service comparison group. The off-service comparison groups are patients staying off the clinical service but assigned to it, and patients referred by physicians on other units, identified for interventions but not receiving them.

Excluded for intervention time. These patients are excluded because interventions were between 1-14 minutes and so did not meet the 15-minute intervention threshold.

Excluded for other causes. These patients are excluded for cognitive deficits, leaving the hospital against medical advice, refusing counseling, seen at physician request for a mental health concern other than substance use (e.g. PTSD, depression, anxiety, anorexia, delusions/hallucinations), dying while in the hospital, and other causes, with reason for exclusion noted.

To estimate the study sample, data from all 120 spreadsheets were reviewed and patients classified into two groups, Intervention and No Intervention, totaled by service by year. The groups were obtained from the spreadsheets without applying inclusion/exclusion criteria and without separating patients into on-service and off-service groups. Classifying patient into Intervention and No Intervention groups was a simpler process than the laborious application of criteria and location to each patient. Once the Intervention and No Intervention totals were created, an estimation process was followed to separate each Intervention group into SBIRT intervention group (included in study) and mental health interventions (excluded from study), and to separate the No Intervention group into the comparison group (included in study) and the exclusion group. The estimation process employed group proportions derived from the partial creation of the dataset. Detailed estimation of rule-out causes, on-service vs. off-service

locations, and similar granularity was not performed for the pilot project but were performed for the full study.

Results

Creation of a multi-year dataset from pragmatic counseling data is feasible, and the inclusion/exclusion criteria can be applied to each patient. The entire dataset is estimated at 4,790 patients, of which 2,635 patients are in the intervention group and 834 patients in the comparison group. The patients excluded from the study are estimated at 1,321. Details of these estimates are provided in Table 3.

Table 3. Pilot Study Estimation of Study Sample

	Intervention	Comparison	Excluded/ 1-14 Min	Total
Burn Service				
2014	59	33	48	140
2015	85	48	73	206
2016	86	48	5	209
2017	110	63	96	269
Subtotal	340	192	292	824
General Medicine Service				
2014				
2015	64	10	25	99
2016	143	37	81	261
2017	466	12	71	549
Subtotal	673	59	177	909
Trauma Service				
2014	319	139	285	743
2015	280	132	268	680
2016	438	134	155	727
2017	585	178	144	907
Subtotal	1,622	583	852	3,057
Total All Services				
2014	378	172	333	883
2015	429	190	366	985

	Intervention	Comparison	Excluded/ 1-14 Min	Total
2016	667	219	311	1,197
2017	1,161	253	311	1,725
Total	2,635	834	1,321	4,790

Discussion

Procedural obstacles were considerable. The allocation of patients to these groups required time-intensive patient-by-patient review. There were no grouping techniques that could be employed due to the complexity of the inclusion/exclusion criteria and the disparate formats of the spreadsheets. Often, to distinguish between whether a patient received a substance use intervention or was seen for other mental health concerns at a physician's request required reviewing individual patient data and reading text-based notes entered by counselors.

Various errors were encountered during this pilot project. Data entry errors were common, such as incorrect medical record numbers, incorrect names, and data elements entered into wrong columns on the spreadsheets. Missing values were also discovered such as missing medical record numbers or names and missing values for other columns (e.g., admission dates, ethnicity, gender). At times, accessing EMR records was required to fill in forgotten data points such as intervention session lengths. Missing data seemed to be more of concern for the earlier years in the study period, 2014 and 2015.

Differences in recording methods among services added to the complexity of this process. For example, the Burn service recorded the length of time for intervention sessions using text; these had to be converted one-by-one to numbers to be suitable for analysis. For several months during one study year, the Burn data was commingled with

the Trauma data. The Trauma and Medicine services used color-coding to identify different types of patients (e.g. intervention completed, intervention not done, other mental health counseling only) but the Burn service did not.

Implications for Full Study

The sample size appeared to be sufficient power for analysis. The full dataset could be created by completing the application of inclusion and exclusion criteria to all patients and allocating patients to the groups identified in the pilot project. Paper records had to be accessed to complete missing data, and data errors noted and repaired. All data accumulation procedures and decisions were documented, and limitations arising from these procedures identified.

Summary

Innovative, accessible, and effective treatment interventions are imperative for people who misuse alcohol or illicit drugs, or struggle with alcohol or drug disorders, as most are failing to access the treatment they need. Counselor-provided SBIRT in integrated care settings holds substantial promise as an intervention but suffers from a lack of research investigation. The purpose of this study was to determine the effectiveness of this intervention for helping people reduce their use of hospitalizations and emergency care and to assess the economic costs of this intervention. In this chapter, the research methodology for examining counselor-provided SBIRT in a specific integrated care setting and population was provided. The research questions and hypotheses were stated. The research design, consisting of the study setting, counseling program and intervention process, study population, data procedures, and measures, was

explained. The statistical analyses were described, and the pilot study rationale, methods, results, and implications were presented.

CHAPTER IV

RESULTS

The purpose of this study was to determine the effectiveness of counselor-provided Screening, Brief Intervention, and Referral to Treatment for helping people reduce their use of hospitalizations and emergency care and to assess the economic costs of this intervention. Specifically, this study examined three research questions and associated hypotheses:

Research Question 1. For patients with alcohol or illicit drug misuse or disordered use, do patients in inpatient integrated care settings receiving counselor-provided SBIRT experience fewer hospitalizations and emergency department visits compared to patients in the same settings not receiving interventions?

Research Hypothesis 1. Patients with alcohol or illicit drug misuse or disordered use and receiving counselor-provided SBIRT in integrated care settings experience fewer hospitalizations and emergency department visits compared to patients not receiving interventions.

Research Question 2. Do hospitalization and emergency department visit outcomes for patients with alcohol or illicit drug misuse or disordered use and receiving counselor-provided SBIRT differ by substance use type, substance use severity, or inpatient service location?

Research Hypothesis 2. Hospitalization and emergency department visit outcomes for patients with alcohol or illicit drug misuse or disordered use and receiving counselor-provided SBIRT differ by substance use type, substance use severity, and/or inpatient service location.

Research Question 3. Are counselor-provided SBIRT interventions associated with reduced economic costs from the health system perspective?

Research Hypothesis 3. Counselor-provided SBIRT interventions are associated with reduced economic costs from the health system perspective.

The first section of the chapter is a descriptive report of the study sample. The second section describes the data procedures for dataset creation. The third section presents the model selection and statistical analyses conducted to test the research hypotheses. The chapter concludes with a summary.

Study Sample

The study sample consisted of English-speaking adults aged 18 years and older who were admitted to the integrated care inpatient services of Wake Forest Baptist Medical Center between January 2014 and December 2017, were selected for SBIRT intervention, and met criteria for study inclusion. The final sample size was 2,195, with 1,577 patients in the intervention group and 618 in the comparison group, exceeding the a priori power calculation of 366 patients.

The mean age of the overall sample was 44.73; the youngest patient was 18 and the oldest was 93 at date of hospitalization. Males comprised 74% of the sample, consistent with findings that men use alcohol, binge drink, and drink heavily at

appreciably higher rates than women (McHugh, Votaw, Sugarman, & Greenfield, 2015). Persons identifying as White represented 73% of the total, with 22% identifying as Black/African-American and the remaining 5% identifying as American Indian, Asian, Latino/Hispanic and other. In comparison, the racial/ethnic distribution in the urban county containing the medical center, from which one-third of hospitalizations and two-thirds of emergency visits arise, is 59% White, 26% Black/African-American, 13% Hispanic or Latino, and 2% Asian. Of these county residents, 14% speak a language other than English at home (City of Winston-Salem, 2019). Because language translators are not available to the counselors, non-English speaking patients, who were more likely to be Hispanic, Latino, or Asian, were excluded from the study, which skewed the study sample towards other ethnic origins.

Almost half of the sample patients self-identified as single, 29% as married (which could include domestic partnerships and marriages between persons of the same gender), and the remainder of other status, such as having a significant other, being divorced or being widowed. The average hospital patient in the sample was seriously ill, at the 69th percentile on a four-point severity scale from minor to extreme. The mean risk of patient mortality, in contrast, was at the 27th percentile. So, most patients were quite ill but unlikely to die. On the substance use continuum between no use and disordered use, the study sample was at the 60th percentile or between misuse and disordered use, based on clinical disease coding. The percent of patients identified as using alcohol only was 13%, using illicit drugs only was 33%, and using both was 28%. This distribution of substance use type is within a few percentage points of the

distribution in the North Carolina substance use treatment population (SAMHSA, 2017b). In the study sample, 26% of patient cases lacked clinical disease coding for substance use and thus were assigned to the “absence of use” level.

Patients in the study sample were admitted evenly across the four quarters of the year. Two-thirds of patients were admitted to the Trauma service, almost a quarter to the Medicine services, and the remainder to the Burns service. Approximately seven out of ten patients in the sample received counselor-provided SBIRT, with a median intervention time of 40 minutes and average time of 51 minutes. This positive skew is attributable to the tendency of certain patients to be hospitalized for weeks or months, with 6.5% of the sample receiving two or more total hours of SBIRT and related counseling interventions. Table 4 provides the full complement of descriptive statistics by study variable.

Table 4. Description of Study Sample and Associated Variables

Variable	Code	Count	%	Mean	SD	Min	Max
Age				44.73	16.15	18	93
Age		2,195	100%				
Gender				0.26	0.44	0	1
Male*	0	1,622	74%				
Female	1	573	26%				
Ethnicity/ Race				0.33	0.58	0	2
White*	0	1,594	73%				
Black/African-American	1	480	22%				
Other	2	121	5%				
Marital Status				0.72	0.79	0	2
Single*	0	1,077	49%				
Married	1	647	29%				
Other	2	471	21%				
Severity of Illness				1.75	0.83	0	3
Minor*	0	158	7%				
Moderate	1	627	29%				

Variable	Code	Count	%	Mean	SD	Min	Max
Major	2	1,011	46%				
Extreme	3	399	18%				
Risk of Mortality				1.06	0.95	0	3
Minor*	0	741	34%				
Moderate	1	775	35%				
Major	2	485	22%				
Extreme	3	194	9%				
Substance Use Severity				1.41	1.07	0	3
Absence of use*	0	578	26%				
Use	1	548	25%				
Misuse (abuse)	2	647	29%				
Disordered Use (dependence)	3	421	19%				
Substance Use Type				1.62	1.15	0	3
Absence of use*	0	579	26%				
Alcohol	1	282	13%				
Illicit Drugs	2	726	33%				
Alcohol and Illicit Drugs	3	608	28%				
Calendar Quarter of Admission				2.54	1.11	1	4
Jan-Mar*	1	506	23%				
Apr-Jun	2	554	25%				
Jul-Sep	3	570	26%				
Oct-Mar	4	565	26%				
Clinical Service and Location				3.40	1.53	0	6
Burns on unit*	0	223	10%				
Burns off unit	1	25	1%				
Medicine on unit	2	367	17%				
Medicine off unit	3	127	6%				
Trauma on unit	4	941	43%				
Trauma off unit	5	512	23%				
Intervention				0.72	0.45	0	1
No*	0	618	28%				
Yes	1	1,577	72%				
Intervention Time				2.15	1.8	0	6
0 Minutes*	0	618	28%				
15-25 Minutes	1	315	14%				
26-30 Minutes	2	297	14%				
31-45 Minutes	3	359	16%				
46-60 Minutes	4	291	13%				
60+ Minutes	5	315	14%				

* reference level for binary or categorical variables

Data Procedures

The patient dataset was created from 120 individual monthly spreadsheet tabs for all patients meeting inclusion criteria during the investigation time period (January 2014–December 2017). Each monthly spreadsheet was specific to a service and contained patient names and medical record numbers for patients hospitalized and identified for intervention during that month. Also recorded were demographics, clinical data, and detailed records of counselor-assigned categories and counselor activities.

Approximately 4,300 patient cases from the inpatient services were considered for the study. Hand-vetting of each individual patient was needed in order to apply inclusion and exclusion criteria, requiring review of counselor notes and other counselor documentation. Hospitalizations qualifying for study inclusion served as index hospitalizations. About 60 patients had two index hospitalizations eligible for inclusion during the study period. These hospitalizations were handled according to the study plan, with any hospitalization subsequent to another index hospitalization dropped from the dataset. For all patients meeting inclusion criteria, patient names and medical record numbers, admission dates, inpatient clinical service overseeing patient evaluation and management, age, gender, and ethnicity/race were extracted from the spreadsheets. The total intervention time for patients receiving SBIRT interventions greater than 15 minutes also was extracted.

Using medical record numbers and admission dates for the index hospitalizations, additional data were obtained from the data analytics warehouse, a medical center information structure that accumulates data from patient health records along with

economic data from the system's financial records. In the data warehouse, each patient encounter with the health system is identified by a unique 'hospital account record' (HAR) number, and all activity associated with that encounter, such as physician, place of service, dates, charges, and payments, is connected to the HAR. Dates and HARs for hospitalizations and ED visits one year prior to admission and one year subsequent to discharge for the index hospitalization, thus occurring sometime between January 2013 and December 2018, were obtained. For all hospitalizations and ED visits, including the index hospitalizations, clinical disease coding and total costs were extracted. For index hospitalizations, patient marital status, measures of illness severity and risk of mortality, physician clinical service overseeing the medical care, room location at time of discharge, calendar quarter of discharge, and payers (entities responsible for bill payment such as insurance companies or patients) were acquired.

Disease coding was used to assign substance use severity and type for the index hospitalization (see Appendix A for substance use disease coding and classifications of severity and type). Coding was also used to identify hospitalizations and ED visits during the study period that involved substance use, misuse and/or use disorders. Counts of hospitalizations and ED visits and economic costs were summarized separately by encounters with substance use coding and encounters without coding, as well as in total, then added to the patient dataset.

Data validation was performed in Microsoft Excel spreadsheet software and Stata statistical software using data cleaning tools as appropriate. The spreadsheet data was visually inspected for unexpected values and trends using filtering and sorting, with

unusual results reviewed and, if erroneous, repaired. Often, errors were systematic, requiring groups of records to be researched and corrected. Data validity checks were performed for invalid values such as character entries in numerical data; errors were manually corrected by group if possible or individually. Checks for duplicate records were performed and duplications were removed. Both numerical and character data were checked for missing values, with hand-searching of electronic health records and paper records used to complete the dataset. This process was iterated once warehouse data were added to the dataset, with new discrepancies in the data resolved.

Per estimation, over half of counselor spreadsheet cases were missing one or more data elements used as variables in this study, contained improperly formatted data, e.g. text entries where values were needed for the study, or had erroneous data, requiring retrieval of missed and corrected data from individual patient electronic health records and paper documentation or proper formatting. For example, when medical record numbers from the counselor spreadsheets were validated against medical record numbers in the data analytics warehouse, two hundred and twenty-five discrepancies were discovered and repaired, the majority related to the Trauma service. If injured Trauma patients are brought to the emergency department and are unable to be identified immediately, they are assigned temporary medical record numbers. When their identities are known, those with existing medical record numbers are reassigned the correct numbers. This reassignment may not occur until several days after the patients are hospitalized, or even after they are discharged. Counselors often recorded only the temporary numbers, but the data warehouse contains only the reassigned numbers. Each

of these discrepancies had to be resolved by hand-searching the electronic health record system. As another example, data validation revealed that about 5% of the spreadsheet-sourced counseling dates of admission were incorrect, as the dates did not match those in the data warehouse. These errors appeared to be clerical and were repaired via individual electronic record searches. The only data missing from the data warehouse extraction were a few room locations, which were resolved by hand-searching the electronic records.

Following data cleaning, all records included in the dataset were 100% complete without missing data and thus without the need for data imputation. No outliers were removed. A small number of records were excluded from the dataset for one of two reasons: either outcome variables could not be obtained from the data warehouse due to unresolvable medical record number, admission date, or patient name discrepancies; or a key predictor variable, length of counseling session, was not captured by the counselors. Data imputation is not recommended in either circumstance (Long, 2009). Another set of records, estimated at about 165 cases, was expected to be in the Trauma counselor spreadsheets but instead was not tracked for about 18 months. These patients were identified for counseling intervention with unknown or low-risk alcohol use. The Trauma counselors made a procedural decision to stop tracking these patients in January 2016, then reversed it in July 2017. These three types of cases represent study limitations and will be discussed in the final chapter.

Table 5 describes the findings from reviewing cases and applying inclusion and exclusion criteria, resulting in deletion of approximately 2,100 patient cases.

Table 5. Case Review for Inclusion and Exclusion Criteria

Cases	Disposition	Rationale
64	Exclusion from intervention	SBIRT conducted but lasting 1-14 minutes
97	Exclusion from intervention	SBIRT conducted but patient younger than 18 years of age
302	Exclusion from intervention	Counseling provided but SBIRT not conducted
73	Exclusion from intervention	Sessions conducted by peer support specialists (people in recovery certified to provide peer support) but mixed in with counseling data
81	Exclusion from comparison	Declined counseling or left the hospital against medical advice
392	Exclusion from comparison	Ruled out for cognitive issues, medical issues that prevented counseling (e.g. inability to speak), and/or active psychiatric diagnoses; also included non-English-speaking patients
325	Exclusion from intervention or comparison	Classified by counselors as inpatients but classified in hospital medical record as another category, such as “observation patient” or “outpatient in a bed”
57	Exclusion from intervention or comparison	Hospitalizations for patients receiving SBIRT in a prior hospitalization, or comparison hospitalization following another comparison hospitalization by less than one year
425 (estimated)	Duplicate cases	Duplicate hospitalizations in monthly program spreadsheets for patients in hospital across two or more months
86	Missing key predictor of interest*	Time length of counseling interventions(s) not recorded; also affected application of inclusion/exclusion criteria
31	Missing key outcome variables*	Cases unable to be matched with data warehouse using medical record numbers
165 (estimated)	Missing cases from comparison group*	Identified for SBIRT intervention, not counseled, and not recorded in counseling spreadsheets due to a temporary 18-month change in Trauma tracking procedures

*represents study limitations to be addressed in discussion section

Model Selection and Hypothesis Tests

To select appropriate statistical models to test the research hypotheses for this study, the distributions of the targeted outcome cost and count variables were examined. Most values were zero, meaning that most patients did not have hospitalizations or ED visits either prior to or subsequent to their index hospitalizations. The percent of zero values ranged from 63% to 96% for the different types of outcome variables (e.g. with and without substance abuse coding, hospitalization vs. ED visit). This finding was not entirely surprising, given the medical center's place in the health care continuum as a regional trauma center and provider of complex tertiary and quaternary care. Some patients might not return to the medical center for lower-complexity care, which could be found closer to their communities.

To increase usability and relevance of the data by decreasing the prevalence of zero values, the outcome variables were reduced to four outcome measures for combined hospitalization and ED visit encounters: (1) summary count of pre-index encounters, (2) total costs of pre-index encounters, (3) summary count of post-index encounters, and (4) total costs of post-index encounters. The following graphs, Figures 4 and 5, illustrate that zero values were still predominant in the outcome variables and that these variables were widely dispersed from zero to disproportionately high values.

Figure 4. Summative Pre and Post Index Hospitalization Counts

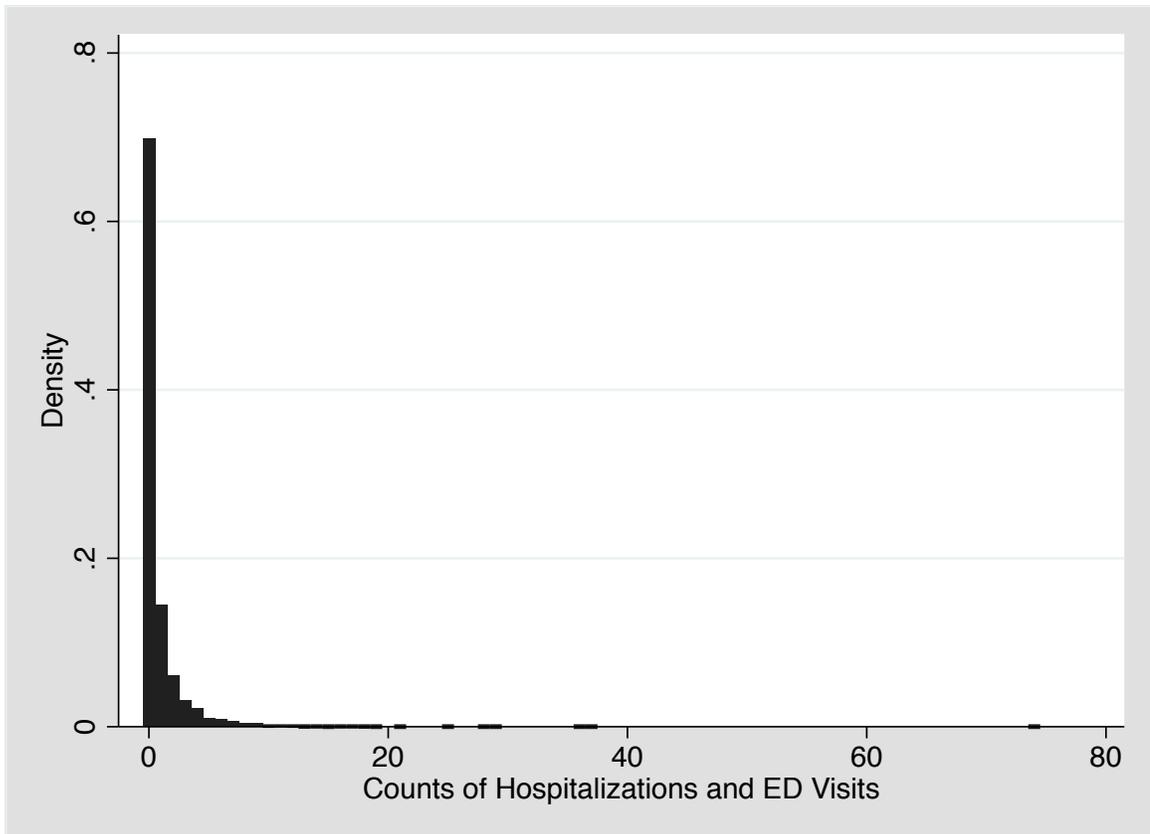
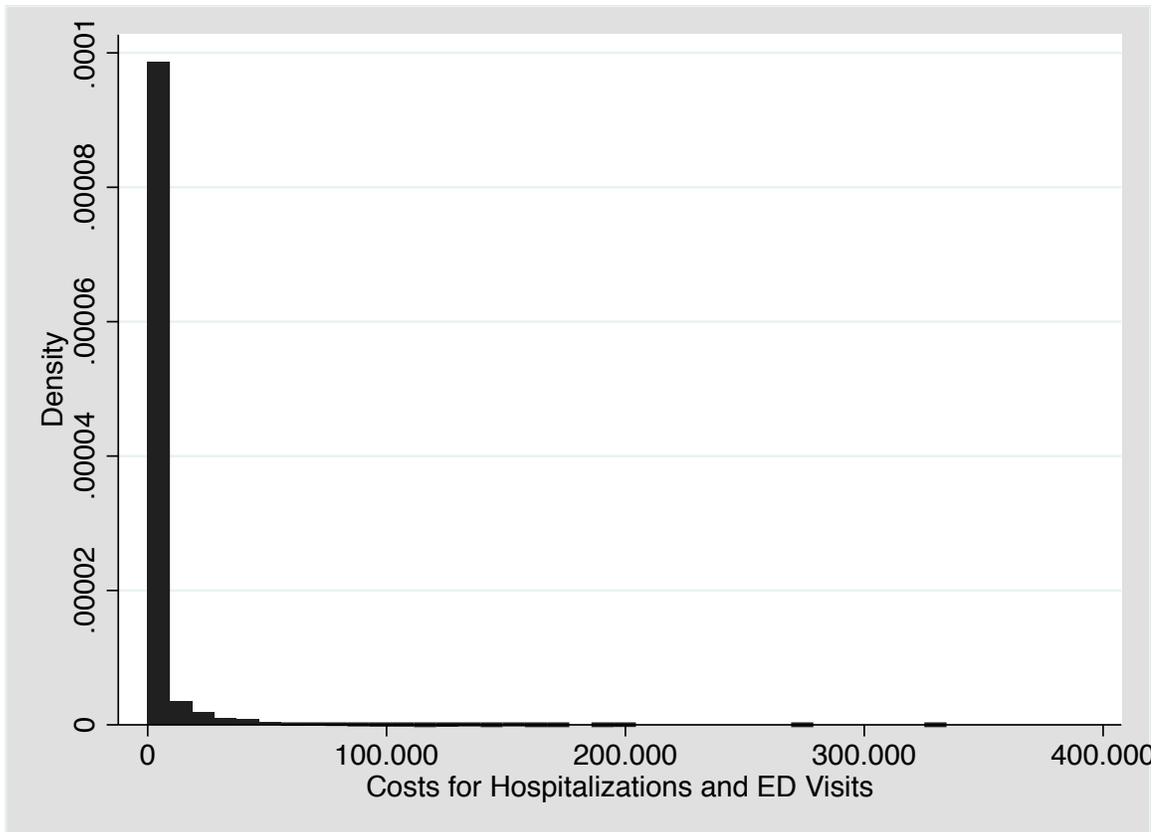


Figure 5. Summative Pre and Post Index Hospitalization Costs



The non-linear and overly wide distributions of the outcome variables and the high prevalence of zero values suggested non-normal distributions of error terms, all of which pointed to selection of generalized linear models to demonstrate association between the outcomes and the predictor variables (Cameron & Trivedi, 2009; Long & Freese, 2014; Raudenbush & Bryk, 2002). Negative binomial models, which add a parameter to account for unrecognized heterogeneity in data, are recommended for overdispersion and excess zero values in count outcome data (Cameron & Trivedi, 2009). Generalized linear models, specified with appropriate distributional and link options, are recommended for non-linear continuous data such as the cost data in this study

(Raudenbush & Bryk, 2002). Because the cost data was extremely positively skewed, generalized linear model options specified were the gamma distribution, which is a positively skewed distribution, and a log link to smooth the distribution (McCue et al., 2008). Due to the violations of linear regression assumptions in the data, both models were at risk of underestimating standard errors, overestimating statistical significance, and therefore increasing the possibility of rejecting null hypotheses when they were true (Type I error) (Long & Freese, 2014). The robust standard errors option mitigates this risk (Long & Freese, 2014), so this option was employed with both models.

As described in the research plan for this study, a differences-in-differences design was applied to demonstrate the association of counselor-provided SBIRT interventions, using both binary and categorical forms, with hospitalization and ED visit counts and costs. This design minimized the effects of unobserved covariates that were stable over time. A binary time period variable, with the pre-index hospitalization year as the first time period and the post-index hospitalization year as the second time period, was added to the predictor variables along with a time-intervention interaction. As delineated in the research plan, propensity scores were created to balance the intervention and comparison groups on observed covariates. The models were as follows:

Propensity Score Model

Purpose: create propensity scores for balancing intervention and comparison groups; the scores are added to the hypothesis-testing models as a covariate

Model: Logistic regression

Equation:

$\ln(P/(1-P))$ of intervention = $\beta_0 + \beta_1$ (age-18) + β_2 (gender) + β_3 (ethnicity) + β_4 (marital status) + β_5 (risk of mortality) + β_6 (severity of illness) + β_7 (insurer) + β_8 (calendar quarter)

Count Outcomes Model

Purpose: to test *Hypothesis 1* that patients receiving counselor-provided SBIRT in integrated care settings experience fewer hospitalizations and emergency department visits compared to patients not receiving interventions and *Hypothesis 2* that hospitalization and emergency department visit outcomes differ by substance use type, substance use severity, and/or inpatient service location.

Model: Negative Binomial Regression with robust standard errors

Equations:

1. $\ln(\text{count}) = \beta_0 + \beta_1$ (intervention as binary) + β_2 (time) + β_3 (intervention x time) + β_4 (substance use type) + β_5 (substance use severity) + β_6 (clinical service) + β_7 (propensity score) + r
2. $\ln(\text{count}) = \beta_0 + \beta_1$ (intervention as categorical) + β_2 (time) + β_3 (intervention x time) + β_4 (substance use type) + β_5 (substance use severity) + β_6 (clinical service) + β_7 (propensity score) + r

Cost Outcomes Model

Purpose: to test *Hypothesis 3* that counselor-provided SBIRT interventions reduce economic costs from the health system perspective

Model: Generalized Linear Model with gamma distribution, log link, and robust standard errors

Equations:

1. $\ln(\text{cost}) = \beta_0 + \beta_1 (\text{intervention as binary}) + \beta_2 (\text{time}) + \beta_3 (\text{intervention x time}) + \beta_4 (\text{substance use type}) + \beta_5 (\text{substance use severity}) + \beta_6 (\text{clinical service}) + \beta_7 (\text{propensity score}) + r$
2. $\ln(\text{cost}) = \beta_0 + \beta_1 (\text{intervention as categorical}) + \beta_2 (\text{time}) + \beta_3 (\text{intervention x time}) + \beta_4 (\text{substance use type}) + \beta_5 (\text{substance use severity}) + \beta_6 (\text{clinical service}) + \beta_7 (\text{propensity score}) + r$

Propensity Scores

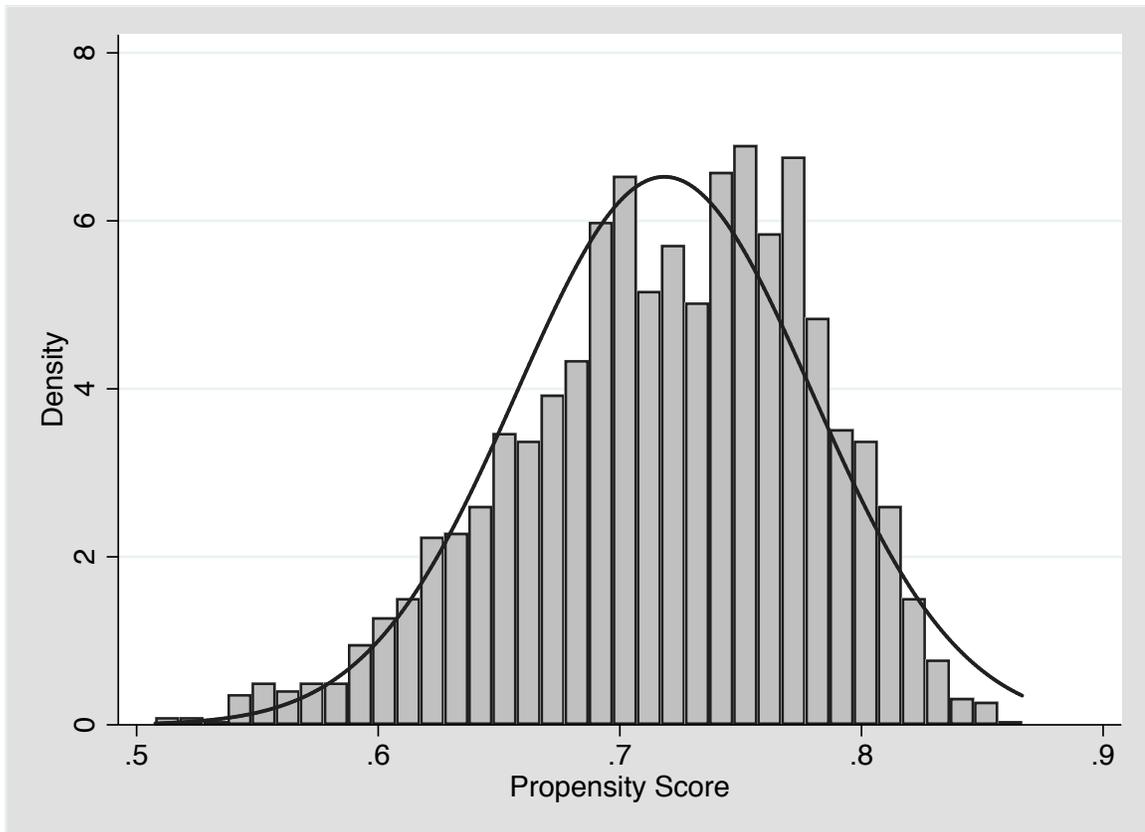
To assess balance, the intervention and comparison groups were tested against the null hypothesis of no difference between groups on observed covariates. Groups were compared on the continuous variable Age with a t-test and on the categorical variables using Chi-square tests. As shown in Table 6, the groups were not significantly different except for payer and calendar quarter, evidence that the groups were well-balanced on most covariates. However, to be conservative about the two significant differences, propensity scores were calculated and used as model covariates. The scores were approximately normally distributed, as shown in Figure 6. They were centered around 0.7, equivalent to the portion of the study sample receiving counselor-provided SBIRT interventions.

Table 6. Test of Propensity Score Covariates

Covariate	Description	Mean Difference	<i>p</i> -value	
Age	Continuous	(0.40)	0.461	
Covariate	Description	df	Pearson Chi-square	<i>p</i> -value
Gender	0=Male 1=Female	1	1.0396	0.308
Ethnicity/ Race	0=White 1=Black/AA 2=Other	2	0.4001	0.819
Marital Status	0=Single 1=Married 2=Other	2	5.4367	0.066
Severity of Illness	0=Minor 1=Moderate 2=Major 3=Extreme	3	4.7827	0.188
Risk of Mortality	0=Minor 1=Moderate 2=Major 3=Extreme	3	2.3172	0.509
Payer	0=Managed Care 1=Medicaid 2=Medicare 3=All Other 4=Self-Pay	4	22.0519	0.000*
Calendar Quarter of Admission	1=Jan-Mar 2=Apr-Jun 3=Jul-Sep 4=Oct-Dec	3	41.9479	0.000*

*significant at $\alpha=.05$

Figure 6. Propensity Score Distribution



Statistical Conclusion Validity

The interpretation of results and discussion offer an expanded view of statistical conclusion validity. Null hypothesis significance testing, a staple of linear regression, is an important indicator of statistical validity, but not the only indicator. Shadish, Cook, and Campbell (2002) caution researchers about strict rejection of results based solely on p -values, particularly when signs of coefficients and effect sizes such as confidence intervals indicate important trends. Coefficient signs and confidence intervals, in combination with p -values, are particularly worthy of consideration for the nonlinear data

used in the study, with its excess zero values, widely dispersed observed and predicted outcomes, and heteroskedastic error terms (Long & Freese, 2014).

Collinearity

In all models testing the intervention, perfect collinearity was detected by the Stata software, with exclusion of the substance use type level denoting both alcohol and illicit drugs from the estimation process. Correlation tables and a cross-tabulation of substance use type against substance use severity suggested that this collinearity was with the disordered level of substance use severity. This suspicion was confirmed by changing the order of covariates in the model. When the type variable was listed before the severity level, the highest level of substance use severity was dropped from the models.

Correlation matrices from the models revealed negative correlations ranging from .5 to .8 between the use and disordered use levels of substance use severity and the illicit drug level of substance use type, suggesting collinearity and thus potential instability in the models. Positive intercorrelation among certain clinical service levels and severity levels was also present. Comparing full and restricted models is a way to determine whether adding potentially collinear variables still improves the model (another way is to examine coefficient patterns for stability; see sections for tests of hypotheses) (Long & Freese, 2014). Post-estimation tests were performed to determine whether the individual covariates should be excluded from the model (see Post-Estimation Tests section); based on test results, all covariates reduced variability in the model and were therefore not excluded.

Logarithmic Transformations

In the statistical output, all outcomes for the models were logs of the predicted outcomes, which are challenging to interpret unless transformations are applied to the coefficients. The coefficients were transformed into meaningful numbers in two ways. For the tests of Hypothesis 1 and Hypothesis 3, coefficients were exponentiated, with the coefficient as the exponent and the natural log e as the base. Subtracting the integer one from the result provides the percentage change in the predicted outcome attributable to a one-unit change in counts (events) or costs (dollars) compared to the reference levels for the intervention variables. For the covariate tests of Hypotheses 2, the incident rate ratio (IRR) option in Stata was employed to obtain predicted changes in counts of hospitalizations and ED visits. All IRR coefficients are positive, with significant IRR coefficients between zero and one predicting reductions in counts compared to the reference level of each covariate.

Tests of Hypotheses 1 and 3

The key variables of interest in the differences-in-differences models for *Hypothesis 1*, the prediction that counselor-provided SBIRT interventions were associated with reduced post-intervention hospitalization and ED counts, were the interactions of the time binary variable with the intervention binary and categorical variables. The estimation procedures resulted in non-significant but negative coefficients and confidence intervals, indicating that the coefficients were trending in the predicted direction; the results are shown in Table 7. The interaction term containing the binary SBIRT intervention variable (intervention vs. no intervention) predicted an average

reduction of 22.4% ($p = .126$, 95% CI (44%), 7.5%). The coefficients for the terms with categorical intervention levels (SBIRT interventions stratified into equivalent quintiles by time) were negative. The coefficient for 60+ minutes predicted an average 36.4% reduction in the outcomes ($p = .06$, 95% CI (60.3%), 1.9%).

The key variables for *Hypothesis 3* regarding reductions in post-intervention economic costs were, again, the interactions of the time binary variable with the intervention binary and categorical variables. The results are shown in Table 7. The estimation procedures resulted in one significant finding supporting *Hypothesis 3*. The interaction containing the binary SBIRT intervention variable (intervention vs. no intervention) was not significant, with a wide confidence interval ($p = .338$, 95% CI (65.8%), 44.6%). The interaction of time period and the categorical intervention variable was significant for counselor interventions of 60+ minutes, predicting 62.3% reductions in the cost outcome variables, on average ($p = .031$, 95% CI (84.4%), (8.7%)).

However, coefficients and confidence intervals for the intervention levels of 26-30 minutes and 31-45 minutes were not stable in the models. The confidence intervals for the cost outcomes were extremely wide and averaging positive (95% CI (57.2%), 252.9% and (48.7%), 195.6% respectively) yet for the corresponding count outcomes for 26-30 minutes and 31-45 minutes were narrower and more negative (95% CI (41.8%), 38.4% and (57.6%), 33.6% respectively). The strength of the negative coefficients for the remaining intervention levels, 15-25 minutes and 46-60 minutes, varied across models. For the cost outcome, interventions of 15-25 minute predicted average reductions of 54.7%, while for the count outcome this prediction was half the size, at

27.5%. The results for 46-60 minutes were similar, predicting 56.4% reductions for the cost outcome yet only 5.4% for the count outcome. The inconsistency in these results is cautionary for interpreting significance at the 60+ minute level. Further analysis is needed to determine the cause of model instability.

Table 7. Results for Hypotheses 1 and 3

Outcome	Variable Type	Intervention Level	Predicted Change	p-value	95% Confidence Interval	
					Min	Max
Count	Binary	Intervention	(22.4%)	.126	(44.0%)	7.5%
Count	Categorical	15-25 minutes	(27.5%)	.163	(53.9%)	13.9%
Count	Categorical	26-30 minutes	(10.3%)	.622	(41.8%)	38.4%
Count	Categorical	31-45 minutes	(24.8%)	.332	(57.6%)	33.6%
Count	Categorical	46-60 minutes	(5.4%)	.815	(40.5%)	50.4%
Count	Categorical	60+ minutes	(36.4%)	.060	(60.3%)	1.9%
Cost	Binary	Intervention	(29.7%)	.338	(65.8%)	44.6%
Cost	Categorical	15-25 minutes	(54.7%)	.220	(87.2%)	60.5%
Cost	Categorical	26-30 minutes	22.9%	.701	(57.2%)	252.9%
Cost	Categorical	31-45 minutes	23.1%	.641	(48.7%)	195.6%
Cost	Categorical	46-60 minutes	(55.6%)	.118	(84.0%)	23.0%
Cost	Categorical	60+ minutes	(62.3%)	.031*	(84.4%)	(8.7%)

*significant at $\alpha=.05$

Given these results, *Hypothesis 1* that patients receiving counselor-provided SBIRT in integrated care settings experience fewer hospitalizations and emergency department visits compared to patients not receiving interventions, is not supported when

evaluated according to coefficient significance. However, the consistent negativity of the coefficients and confidence intervals are promising trends.

Also given these results, *Hypothesis 3* that counselor-provided SBIRT interventions reduce economic costs from the health system perspective is supported by significance testing for interventions exceeding 60 minutes but results must be interpreted with caution due to instability in the remaining coefficients.

Tests of Hypothesis 2

The key variables of interest for *Hypothesis 2*, that hospitalization and emergency department visit outcomes differ by substance use type, substance use severity, or inpatient service location, were the interactions of severity, type, and clinical service individually with the time variable and interactions of these covariates individually with the time variable and the intervention variables. The interaction of the covariates across time tested whether the covariates predicted differences in counts of hospitalizations and ED visits following the index hospitalization. The three-way interaction of covariates, time, and intervention tested whether the intervention was a predictor of these covariate differences over time.

The reference categories for severity and type, coded as 0, were the absence of use. For severity, the remaining categories were coded as 1 for the detection of use, 2 for misuse (equivalent to abuse in clinical disease coding), and 3 for disordered use (equivalent to dependence). For type, the coding was 1 for alcohol, 2 for illicit drugs, and 3 for use of both substances. The reference category for clinical service, coded as 0, was patients hospitalized on the Burn unit, chosen simply by alphabetical order. The

remaining categories were coded as 1 for Burns off-unit patients, 2 for Medicine on-unit, 3 for Medicine off-unit, 4 for Trauma on-unit, and 5 for Trauma off-unit.

Because the outcomes of interest were counts, the negative binomial models were used, with incidence rate ratios as coefficients and confidence intervals to allow interpretability of the outcomes, which were in log form. The results of estimation are in Table 8. The estimation results for the count models were interpretable for every level of these categorical variables except for the Burns off-unit service category. Only 25 patients were in this category, which may explain this exception. The process underlying the negative binomial model is maximum likelihood estimation, with sample sizes exceeding 100 preferred for accurate estimation (Cameron & Trivedi, 2009). All other services exceeded 100 cases.

The estimation results suggest that there are differences in hospitalization and ED visit outcomes for certain levels of substance use severity, substance use type, and clinical service. For interactions of covariate levels with the time period variable, two results were significant, and two trends were notable. The first significant result suggested that people using illicit drugs accessed services at two-thirds the rate prior to their index hospitalizations ($IRR = 0.669, p = .033, 95\% CI .463, .968$). The second significant result suggested that people hospitalized under the care of the Medicine services, and on the Medicine units, were less than half as likely to need subsequent hospital or emergency care compared to the reference category, Burn patients hospitalized on-unit (Medicine on-unit $IRR = 0.455, p = .012, 95\% CI .247, .841$). The same was not evident for Trauma patients. Two trends are worth mentioning. People

using substances, but without misuse or disordered use, as well as Medicine patients hospitalized off unit, may be less likely to access hospital or emergency care following their hospital admissions (Use level $IRR = 0.720$, $p = .103$, 95% CI .485, 1.069; Medicine off-unit $IRR = 0.540$, $p = .071$, 95% CI .277, 1.054).

For the three-way interaction of covariates, time period, and the SBIRT intervention, only one result was significant: the effect for people using alcohol. This level of the substance use type category contained people at all levels of use severity. Those who received SBIRT interventions were about one-fourth as likely to need subsequent hospital or emergency care compared to people not receiving interventions and not using substances, although the moderate confidence interval suggests the incidence rate also may be close to one ($IRR = 0.279$, $p = .038$, 95% CI .084, .932).

Table 8. Results for Hypothesis 2

Incidence Rate Ratios	<i>IRR</i>	<i>p</i>	95% Confidence Interval	
			Min	Max
Covariate x Time Period Interaction				
Severity				
Use	0.72	0.103	0.485	1.069
Misuse	0.894	0.579	0.602	1.373
Disorder	0.635	0.127	0.355	1.138
Type				
Alcohol	0.789	0.418	0.444	1.401
Illicit Drug	0.669	0.033*	0.463	0.968
Both	0.801	0.381	0.489	1.315
Service				
Burns off unit			(Not estimable)	
Medicine on unit	0.455	0.012*	0.247	0.841
Medicine off unit	0.54	0.071	0.277	1.054
Trauma on unit	1.085	0.795	0.584	2.017
Trauma off unit	0.715	0.395	0.33	1.548

Incidence Rate Ratios	IRR	p	95% Confidence Interval	
			Min	Max
Covariate x Time Period x Intervention (binary) Interaction				
Severity				
Use	1.433	0.391	0.63	3.259
Misuse	0.921	0.856	0.38	2.234
Disorder	1.171	0.778	0.391	3.509
Type				
Alcohol	0.279	0.038*	0.084	0.932
Illicit Drug	1.421	0.364	0.666	3.031
Both	1.146	0.785	0.431	3.045
Service				
Burns off unit			(Not estimable)	
Medicine on unit	0.788	0.707	0.227	2.734
Medicine off unit	0.735	0.648	0.196	2.754
Trauma on unit	0.506	0.280	0.147	1.741
Trauma off unit	0.739	0.677	0.178	3.069

*significant at $\alpha=.05$

Given these results, *Hypothesis 2* that hospitalization and emergency department visit outcomes differ by substance use type, substance use severity, and/or inpatient service location is supported by the evidence. Results are significant for alcohol use type and Medicine on-unit clinical service location.

Post-Estimation Testing

Postestimation testing was performed to compare the models used in the study to simpler models, as models with fewer variables are preferable in statistics (Raudenbush & Bryk, 2002). A second reason for comparison was to assess whether potentially collinear covariates should be included. To test whether covariates added significance to the models, the unrestricted models were compared to restricted models. For each negative binomial regression equation, a base model with intervention, time, the

intervention/time interaction, and propensity score was compared to all possible combinations of the severity, type, and service predictor variables and to the unrestricted model using Pseudo- R^2 and Wald's Chi-squared test statistics. Higher values of the Pseudo- R^2 and Wald's tests are preferred (Cameron & Trivedi, 2009). For generalized linear model equations, the base, restricted, and unrestricted models were compared using Akaike's Information Criterion (AIC) and Bayesian Information Criterion (BIC) test statistics, with lower values preferred (Long & Freese, 2014). For all equations, the full unrestricted models were the preferred models. The service variable was particularly influential in increasing R^2 and the Wald's statistic, as well as reducing AIC and BIC. Table 9 provides the comparison results.

Table 9. Comparison of Count and Cost Models

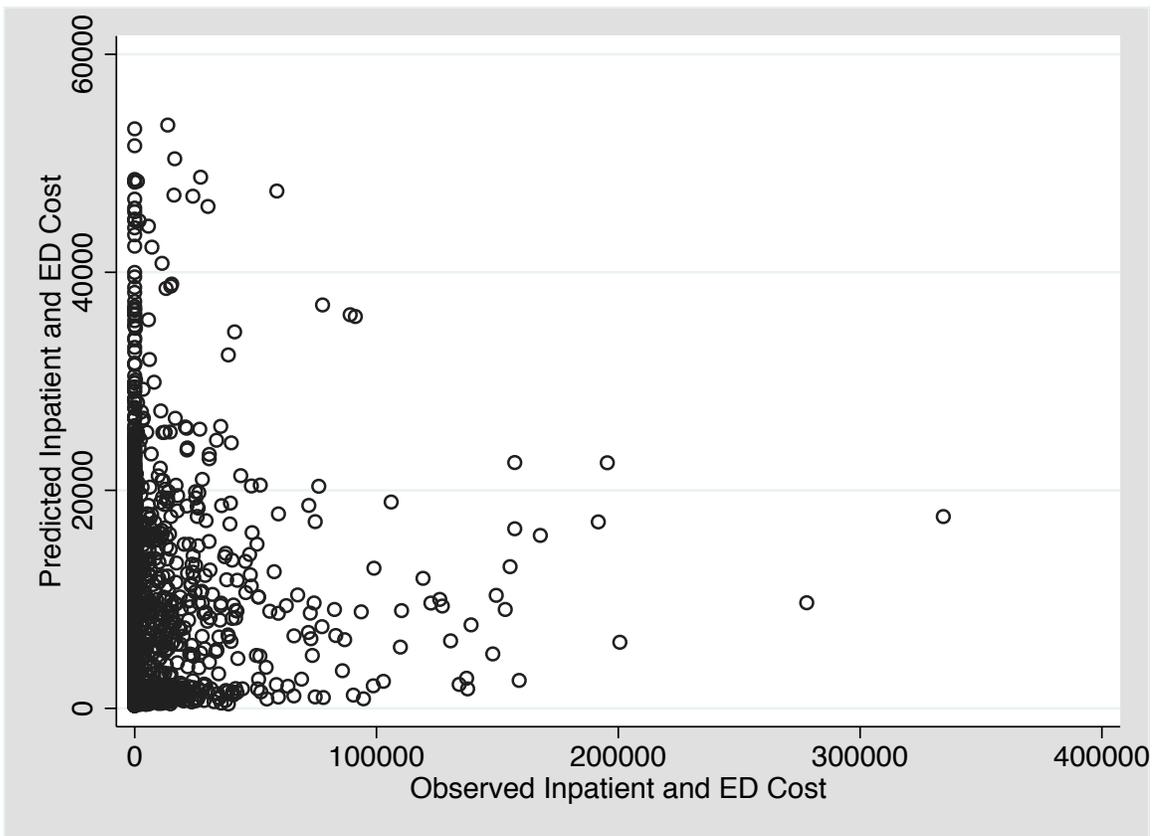
Predictor Variables	Count Outcomes		Cost Outcomes	
	Pseudo R^2	Wald's Chi-squared*	AIC	BIC
Base model	0.003	17.71	18.210	(30,234.97)
+ Severity	0.008	61.36	18.162	(30,215.05)
+ Type	0.009	73.67	18.120	(30,209.10)
+ Service	0.049	491.63	17.154	(29,947.95)
+ Severity, Type	0.010	80.04	18.093	(30,189.03)
+ Severity, Service	0.056	556.48	17.068	(29,888.80)
+ Type, Service	0.056	566.09	17.783	(30,208.66)
Full Model	0.059	582.20	16.994	(29,845.70)

* *significant at $\alpha=.05$ for all models*

As expected, the predicted outcomes were not linear and the error terms for these models were not normally distributed. An example of non-linearity was provided by plotting predicted and observed outcomes for hospitalization and ED visit costs, as in Figure 7. This plot exhibits no pattern of linearity; the non-linear nature of the data is

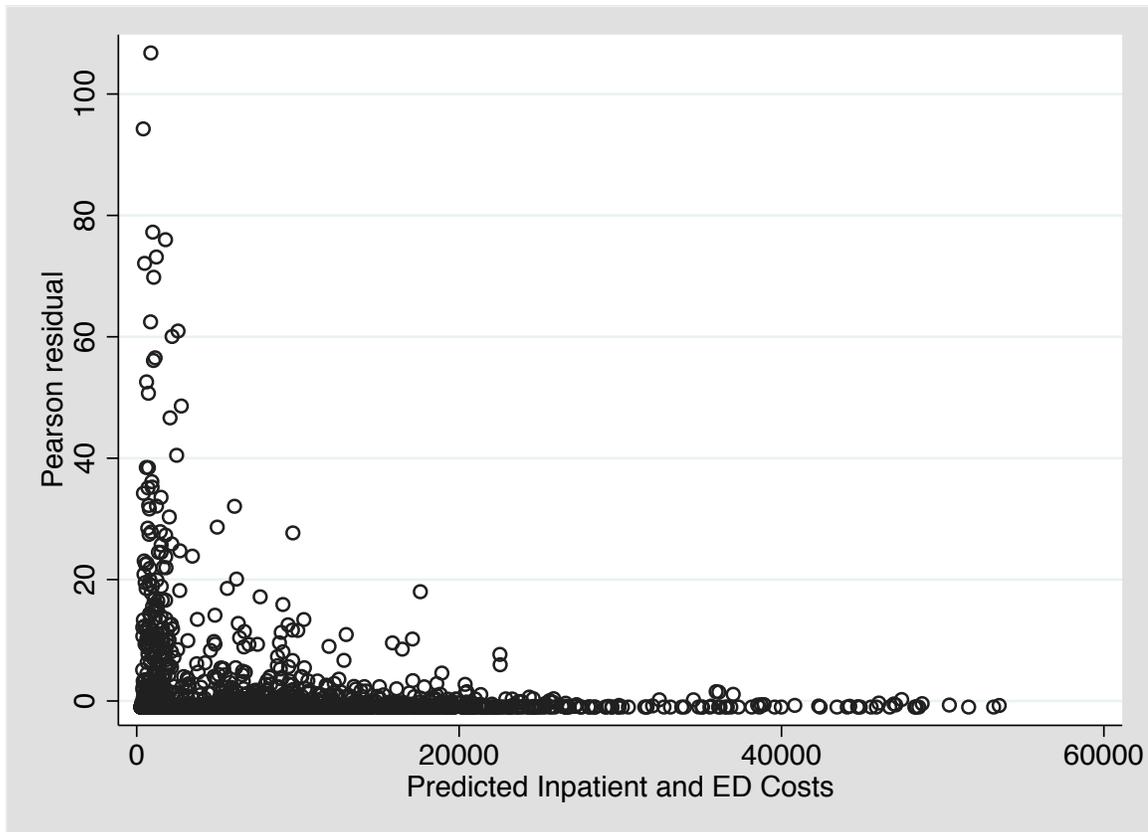
obvious. The plot also reveals the wide dispersion of observed cost outcomes from \$0 to over \$300,000 and the narrower range of predictions from \$0 to about \$50,000. Thus, the error terms were widely dispersed as well.

Figure 7. Predicted vs Observed Outcomes for Costs



An example of non-normality of the error terms is provided by plotting the Pearson residual values (error terms) against the predicted outcomes, as in Figure 8. In a residual plot for normal linear data, no discernible pattern should be visible. Clearly, a strong non-linear pattern of concavity is present in this data. The choice of generalized linear modeling is justified by the non-normality and non-linearity of the outcomes data.

Figure 8. *Pearson Residuals vs Predicted Outcomes for Costs*



Summary

The purpose of this chapter was to present results from data collection and analysis to test three research hypotheses: that counselor-provided SBIRT provided on integrated care units predicted subsequent reductions in hospitalizations and ED visits; that these outcomes differed by substance use severity, substance use type, or inpatient service location; and that counselor-provided SBIRT was associated with reductions in economic costs. The results of this study were not significant for the first hypothesis but did trend in a supportive direction; were significant for the second hypothesis; and supported the third hypothesis with significance, but with caution relative to

inconsistency in the results. In the next and final chapter, these results will be discussed in relation to the current SBIRT and integrated care literature along with their limitations. Implications for counselors and health system leaders will be addressed and suggestions for future research provided.

CHAPTER V

DISCUSSION

This research study examined whether counselor-provided SBIRT in inpatient integrated care settings is an effective treatment intervention for alcohol and illicit drug misuse and disordered use. Effectiveness was established by evaluating the association between interventions and subsequent hospitalizations and emergency department visits. Because counselor-provided SBIRT's usefulness may depend on type (alcohol or illicit drugs), severity of substance use, and setting, this study also examined the associations of these variables with post-intervention hospitalizations and emergency department visits. Given the substantial financial burden of substance misuse and disordered use on health care systems, this study also evaluated whether counselor-provided SBIRT interventions reduce economic costs from the health system perspective.

The first chapter presented the study rationale, statement of the problem, and need for the study, and introduced the research questions. In the second chapter, a review of relevant literature was presented, suggesting that counselor-provided SBIRT in integrated care settings is a promising, innovative intervention for people with misuse or disordered use of alcohol and/or illicit drugs and may help reduce health system burdens from treating the effects of harmful substance use. In the third chapter, the research methodology for examining counselor-provided SBIRT in a specific integrated care setting and population was provided and the research hypotheses stated. The fourth

chapter described the study sample, data procedures, model selection, and statistical analyses conducted to test the research hypotheses.

In this chapter, the results of the study are discussed along with study limitations, relevance to the existing literature, implications, and recommendations for future research. The chapter concludes with summary remarks.

Discussion of Results

The study tested a promising, novel substance use treatment model, counselor-provided SBIRT, that previously had been examined in a single clinical trial (Veatch et al., 2018). This counselor model was tested in an inpatient setting and with a population using alcohol and/or illicit drugs at levels from unknown to severe. Most prior research for inpatients settings and mixed-use populations involved SBIRT provided by medical staff rather than mental health professionals, with inconclusive results or results not supporting efficacy (Mdege & Watson, 2013). The research outcomes of hospitalizations and emergency department visits had been lightly studied in the SBIRT literature, with no evidence that SBIRT by medical staff was associated with changes in these outcomes (Bray et al., 2017; Bray, Cowell, & Hinde, 2011). This study featured a unique time-in-session categorical variable, a valuable approach as SBIRT session times are rarely used in research.

In this context, the study results offer some support, with caution, for counselor-provided SBIRT as an effective treatment model for reducing the utilization and costs of subsequent hospitalizations and ED visits. Increasing the amount of time counselors spend with patients may improve the likelihood of occurrences and costs. Patients who

differ in substance use severity, substance use type, and the physician specialty providing their clinical care may also differ in their likelihood to be re-hospitalized and need emergency care. These collective findings point the way towards important future research.

Discussion of Hypothesis 1

The first hypothesis predicted that counselor-provided SBIRT interventions would be associated with subsequent reductions in numbers of hospitalizations and ED visits. The model explained 6% of the variance in count outcomes based on the pseudo R^2 statistic, which is a notable finding when considering the multitude of factors that affect patient health states, utilization of hospital services, and substance use patterns, and given the high degree of variability in the outcomes data. For context, in nonlinear regression pseudo R^2 values explaining 20% of variance indicate excellent model fit to the data (McFadden, 1977).

Each coefficient of the predictor variables (time-intervention interactions) was non-significant but negative, a promising trend. If these findings are eventually found to be significant and are representative of actual outcomes, the magnitude of savings could be quite large. For the index admissions, the average costs of hospitalization exceeded the average insurance and patient payments per hospitalization by more than \$4,000, which was the health system loss per admission. For the 2,195 patients in the study, a 22% reduction (derived from the coefficient for the intervention variable) in these hospitalizations alone would have saved the health system about \$2,000,000.

Discussion of Hypothesis 2

The second hypothesis predicted that substance use severity, substance use type, and clinical service location would be differentially associated with subsequent hospitalizations and ED visits. Trends in the SBIRT literature indicated that severity led to worse outcomes and that only alcohol misuse was consistently responsive to SBIRT. This hypothesis was tested in two ways – first comparing occurrences before and after index hospitalizations without the impact of SBIRT interventions, then adding interventions to the comparison. In a curious significant result, people using illicit drugs were predicted to access hospital and emergency care services at two-thirds the rate of people not using any substances. A cross-tabulation revealed that a majority of these patients were on the Trauma service, with about half as many under the Medicine service's care. Discovering the drivers of this trend will require more refined analysis of the dataset. In a second significant result, medicine patients hospitalized on-unit were half as likely to seek hospital or emergency care at the teaching hospital following their index admissions compared to Burns patients or Trauma patients. This is another result that bears further investigation. For the three-way interaction of covariates, time period, and the SBIRT intervention, only the intervention for people using alcohol was found to be significant. This finding is consistent with previous research that SBIRT is most effective for alcohol misuse (Jones et al., 2012; Schmidt et al, 2015).

An interesting but non-significant result was that people known to use alcohol or illicit drugs, but not misusing or with disordered use, may be less likely than patients who didn't use substances to be re-hospitalized or visit emergency departments. An

implication was that people not identified as consuming alcohol or drugs were less healthy and thus in greater need of hospital care than people who admitted to using drugs. To address this possibility, severity of illness and risk of mortality were cross-tabulated with substance use severity. No differences in illness level or mortality risk between patients at different substance use severity levels were found, so this question remains open.

Overall, these results support the hypothesis of differential effects on outcomes by substance use type, substance use severity, and clinical service location. However, most of the findings require further analysis to identify drivers of trends and make sense of the data.

Discussion of Hypothesis 3

The third hypothesis predicted that counselor-provided SBIRT interventions would be associated with subsequent reductions in the economic costs of hospitalizations and ED visits. This association may or may not exist, as the findings were not consistent enough to draw a conclusion. The models explained 5.9% of the variance in cost outcomes based on Pseudo R^2 , which is akin to the 6% result for count outcomes and a meaningful result considering how many other conditions promote or restrict patient needs for hospital care. SBIRT intervention times exceeding 60 minutes predicted average reductions in economic costs of 62%. Counselor-provided SBIRT may be most effective when counselors have the opportunity to spend more time with patients developing rapport and trust, both central to the counseling relationship. However, given instability among the other coefficients, this result should be interpreted with caution.

There may be anomalies in the data that were not uncovered during postestimation procedures, so this finding should continue to be explored.

For the third hypothesis, then, the significant finding indicates that counseling time exceeding one hour is associated with substantial cost reductions. However, until inconsistent data features are explored, this result of the cost model should be interpreted with caution.

Discussion Across Hypotheses

Given the significance of several coefficients and the negative direction of other coefficient signs, counselor-provided SBIRT may be associated with reductions in hospitalizations and ED visits and the associated economic costs. The presence of unusual results in the cost models may reflect model instability. As expected, outcomes differed for substance use severity, substance use type, and clinical service location, but understanding these differences will require more work with the data.

Study Limitations

Concerns with statistical conclusion validity, internal validity, construct validity, and external validity threaten this study's results (Shadish et al., 2002). The concerns will be explored in this section, with suggestions for how to mitigate them with further analysis and future research studies.

Statistical Conclusion Validity

Variability in measurement that is not controlled by a statistical model can affect statistical conclusions about the data (Shadish et al., 2002). For this study, the SBIRT interventions themselves are a source of measurement variability. Counselors were at

different levels of training and experience, from new practicum students to PhD counselors with many years of experience. Counselors had considerable leeway in how they conducted the interventions, differing in their interpretations, clinical skills, choice of SBIRT components, and application of SBIRT. Counselors were also supervised by people with differing levels of experience and training, such as masters-level counselors, doctoral students, or PhD faculty members.

To control for these threats to statistical conclusion validity, a counselor-level variable could be added to the model. Such a variable was considered for this study, but due to the substantial additional effort needed to obtain clean and complete data, it was not added. Another option would be to introduce more standardization into the SBIRT process. However, some experts propose that allowing clinicians to tailor interventions to clinical needs may lead to improved outcomes that would be prevented by standardization (Shadish et al., 2002).

The known variability in the dataset itself can also threaten the validity of statistical conclusions. Due to excess zeros, several outcome variables were combined, resulting in more heterogeneous data and increasing the chance that important findings could be obscured. For future studies, selecting outcomes with more data available for modeling is recommended. An example would be accumulating all health system costs during the pre-post years instead of just hospitalization and ED visit costs.

Internal Validity

Internal validity is the assurance that a study is designed and conducted such that its inferences are valid, and that other explanations for the outcomes are not equally valid

or more so (Shadish et al., 2002). One of many threats to the internal validity of this study is simply events that may have occurred during the passage of time. Patients may have experienced changes that were unrelated to their substance use and reduced their likelihood of needing hospital care. They might have moved out of the area, sought care closer to their homes for less serious conditions, lost access to transportation, become unable to afford another hospital visit, or become dissatisfied with their care at the hospital in the study and chosen another. A way to partially mitigate this threat would be to expand the study to include hospitalizations and emergency care received at other locations within the health system, many of which are in the surrounding smaller towns. These counts and costs are already available in the data analytics warehouse but require some staff programming time to retrieve them.

A second threat to internal validity involves the cases that could not be added to the study due to critical missing data (outcome variables and key predictors) or because they were not recorded due to procedural decisions. The effects of these missing cases are unknown. As a follow-on to this study, the cases missing critical data could be analyzed using propensity scores and tested against the intervention and comparison groups. The cases first must undergo substantial cleaning, however.

A third threat to internal validity is the use of retrospective data, which precludes a planned and consistent data collection process. Despite the application of extensive data cleaning processes, data errors may yet be present. This limitation was mitigated through variable selection, which relied on the data analytics warehouse instead of counselor-recorded data when possible. The analytics data were derived in part from

hospital billing and were subjected to several levels of system and human checks for verification (M. Matthews, personal communication, September 5, 2018; G. Carter, personal communication, February 7, 2019).

A fourth threat to internal validity involves confounding variables not known or controlled for by the study. The 6% of variance explained by the study, while noteworthy, means that other factors not included in the study may explain additional variance. This study was designed to account for known and unknown covariates that might explain the outcomes. Known covariates were included in the propensity score model, while the differences-in-differences design accounted for covariates that were stable over the two-year time periods before and after index hospitalizations. However, unknown confounding variables might yet predict the outcomes. Examples include prior substance use treatment experiences, family dynamics, or self-efficacy. The randomized controlled trial model is best for controlling this threat to internal validity, but at the cost of being able to generalize processes and results to other settings (Shadish et al., 2002).

Construct Validity

Studies with construct validity are designed so that constructs are well-defined, that the constructs of interest are measured appropriately, and that the constructs explain the outcomes (Shadish et al., 2002). For this study, standardized insurance identifiers and clinical disease coding were used to measure several of the constructs, specifically severity of illness, risk of mortality, substance use severity, and substance use type. Using these standardized measures helped define the constructs more precisely. Standardization also reduced variability in measurement that might have arisen from

using counselor data. However, given that a level of substance use type was dropped from the model for collinearity, there may be overlapping constructs in the model.

Another threat to construct validity is that a critical construct is present but not measured by the model. In this study, an alternative explanatory construct is the therapeutic alliance between the counselor and the patient, which in previous studies in specialty treatment settings predicted reductions in self-reported substance use (Barber et al., 2001; Watts et al., 2018). Another construct that may predict the outcomes but was not measured is readiness to change (DiClemente et al., 2004). Future studies might incorporate measures of these constructs, perhaps by making assessments of these alternatives a standard operating procedure of the SBIRT counseling program.

External Validity

Inferences from a study with external validity can be extended to different populations, settings, treatment models, and outcomes from those in the study (Shadish et al., 2002). There are aspects of this study that threaten external validity. The patient population was served by a unique counseling program employing person-centered SBIRT and integrated with inpatient care teams of the hospital; this treatment program may not be generalizable to other locations. The hospital is located within an academic health system that attracts physician specialties many hospitals do not offer; integrated care settings in less-specialized hospitals may be quite different. To improve external validity, the counseling program could be tested in other hospitals within the health system to assess its portability and make necessary modifications, thus improving its generalizability to other health systems.

Relevance to Existing Literature

This study offers several important contributions to the existing research literature. The results are relevant to the theoretical frameworks guiding this research. The results also offer support for and extensions to prior research in SBIRT and in substance use treatment.

Theoretical Frameworks

The study results are informative for the Addiction Recovery Management ([ARM], White & Kelly, 2011) and Texas Christian University (TCU) Treatment Model (Simpson, 2004) theoretical frameworks. The ARM framework advocates for processes that bring interventions directly to people in their communities rather than waiting for them to reach out for help, and for surrounding people with multidisciplinary teams. The program in this study is such a process, in that it brings needed SBIRT interventions and counseling directly to inpatients who have not requested help, and it surrounds people with integrated care teams. The results of the study support the efficacy of these ARM process goals, assuming that reductions in hospitalizations and ED visits mean that people have been helped towards recovery from substance use. The study results also support Fornili's (2016b) modification of the ARM for SBIRT in integrated care. Fornili recommended that mental health professionals in integrated care settings engage early with substance use and help people who need treatment find it. The counselors in this study identified patients for SBIRT proactively and referred to treatment when warranted. Again, assuming that reductions in health care utilization indicate that people benefitted from SBIRT, the results support Fornili's modification of SBIRT.

The TCU Model describes the patient, program, and treatment factors that are predictive of outcomes. The model factors tested by the present study were patient substance use severity, program setting/location (clinical service), and treatment process (SBIRT). Regarding severity, the TCU Model and Hser et al. (2004) recommend matching severe substance use with increased intensity of services. The patients in this study were above average in severity of illness and of substance use, and the findings suggest that increased intensity of services (60+ minutes of counseling time) may be associated with more positive outcomes. Regarding setting, the TCU model linked program factors such as staff and climate with outcomes (Simpson, 2004). In this study, a program factor, clinical service, was tested against outcomes, with differing effects found among the clinical services. Finally, the TCU Model associates the treatment process itself – interventions, time, the therapeutic relationship, and the like – with outcomes. The treatment process in this study was counselor-provided SBIRT, which was significantly associated with outcomes in certain formats.

Empirical Research Studies

In integrated care settings like the clinical services tested in this study, SBIRT is provided by mental health professionals, the model most akin to counselor-provided SBIRT. Accordingly, this study's results are evaluated against four similar published studies involving SBIRT by mental health professionals. In Barbosa et al. (2017), SBIRT was provided by 'behavioral health specialists,' a job performed by master's level health educators, professional counselors, psychologists, social workers, or substance use counselors. In Gryczynski et al. (2011), SBIRT was provided by 'behavioral health

counselors' who were psychologists, social workers, or substance use counselors. The study by Veach et al. (2018) involved SBIRT by professional counselors and counseling trainees. The SBIRT providers in Watkins et al. (2017) were 'therapists' who were professional counselors or social workers. The present study's data is from the program operated by Veach, so also was generated by professional counselors.

Table 10 presents the characteristics and results for this study and the four comparison studies. In the present study, the mean age of participants was slightly higher than in the compared studies, at 44.73 years. However, the lowest mean age reported was 37.02, so the difference was not large. In all studies, the proportion of males exceeded that of females, from 60% to 82%. This study is near the average at 74% male. The studies varied widely in proportions of White participants, from 31% to 83% and averaging 62%. It seems that the population surrounding each study site dictated the ethnicities of the participant group. For example, the Watkins study took place in an urban Federally Qualified Health Center serving a majority non-White population. Overall, the participants of this study are reasonably similar to participants in the comparison studies.

The settings for the five studies are varied, with two occurring in outpatient clinics, one in outpatient clinics and emergency departments, and two in inpatient units. The two studies on inpatient units are from the same program, however, which limits generalizability of the results of either study to other settings. The studies included participants using alcohol and/or drugs except for Veach et al. (2018). With the exception of the present study, all other studies used six months for the follow-up periods

and participant self-report of use for the outcomes. This study distinguishes itself from others with its one-year follow-up period, as recommended by Gelberg et al. (2015), and the use of health record information in variable measurement and health utilization outcomes (although health record sourcing is not entirely foreign to the SBIRT literature; see Bray et al. (2017) and Bray et al. (2011)). Selecting outcomes other than self-reported usage was suggested by Glass et al. (2017) and Agle et al. (2014). Therefore, this study breaks new ground on several fronts, providing a unique combination of setting, substance, follow-up period and outcomes not found in any comparison study with SBIRT by mental health professionals and not often found in the SBIRT literature.

Across studies with SBIRT by mental health professionals, the results are quite promising for populations not helped by SBIRT when conducted by medical staff. With one exception, the studies included both alcohol and drug use, and all studies accepted participants at any level of substance use severity. All of the comparator studies found significant reductions in self-reported use, and the present study demonstrated significance for reductions in hospital and emergency care.

Table 10. Comparison of Study to Relevant Research

Study	Demographic Means	Setting	Substance	Follow-up	Results
Barbosa et al. (2017)	Age 39.99 Male .61 White .48	Outpatient, ED	Alcohol, illicit drug	Six-month	Significant self-reported reductions in use at follow-up; brief intervention (BI) more cost-effective than brief treatment (BT)

Gryczynski et al. (2011)	Age 37.02 Male .60 White .83	Outpatient	Alcohol, illicit drug	Six-month	Significant self-reported reductions in use at follow-up; BT more effective than BI
Veatch et al. (2018)	Age 37.02 Male .82 White .73	Inpatient	Alcohol	Six-month	Significant self-reported reductions in use at follow-up
Watkins et al. (2017)	Age 42.00 Male .80 White .31	Outpatient	Alcohol, opioids	Six-month	Significant self-reported reductions in use at follow-up; clinics used collaborative care model for treatment (SBIRT-like)
Counselor-provided SBIRT study	Age 44.73 Male .74 White .73	Inpatient	Alcohol, illicit drugs	One year	Significant reductions in hospitalizations and ED visits

Implications for Practice and Research

This study suggests that counselor-provided SBIRT in integrated care settings may be effective for reducing healthcare services utilization and may demonstrate economic benefit as a treatment model for substance misuse and disordered use. The results have implications for the counseling profession, for medical professionals and health systems, and for SBIRT research.

Counselor Practice

SBIRT session times vary considerably for each unique practitioner and patient, from a single brief intervention of five minutes or less to multiple brief treatment sessions totaling several hours (SAMHSA, 2013). Given the study results, longer intervention

times may be associated with greater effectiveness. When counselors have ample time to develop the rapport, trust, and therapeutic alliance at the heart of the counseling relationship, counselor-provided SBIRT may be very helpful for people struggling to control their substance use. Therefore, counseling practitioners should consider how they might lengthen the time they spend conducting SBIRT, focusing on building the counseling relationship throughout the SBIRT process.

The differential effects found by clinical service and substance use type have implications for practice. Patients cared for by different physician specialties appear to have unique health care utilization patterns, most likely due to both patient and program attributes (Simpson, 2004). These reasons for these effects are unknown, but counselors on integrated care teams should consider how their patients may differ from patients of other clinical services and how practice might need to differ as well.

This study found that counselor-provided SBIRT is effective for alcohol use at all levels of severity. This result contradicts the preponderance of findings from previous controlled trials that SBIRT is efficacious for alcohol misuse only (Jonas et al., 2012). Counselors should embrace treatment for patients with all levels of alcohol severity and ensure that alcohol remains a central focus of their SBIRT efforts.

Counselor Education and Leadership

The counseling profession has a long history and substantial collective wisdom regarding treating substance use. Currently, nearly 3,400 members of the American Counseling Association (ACA) identify as addictions and substance abuse specialists, placing this specialty area 7th on a list of 43 such areas (Sites, R. A., personal

communication, February 19, 2019). In contrast, there are no terms on the ACA specialty list remotely related to integrated care. This oversight is evidence that counselor education and leadership has lagged behind educators and leaders in other professions in embracing the integration of mental health professionals into medical settings and in advocating for substance use interventions to those settings. The foremost organization for integrated care professionals is the Collaborative Family Health Association, which is comprised largely of psychologists, social workers, and marriage and family therapists (CFHA, 2019). Integrated care is the primary emphasis of the American Psychological Association's Center for Psychology and Health (American Psychological Association, 2019). The marriage and family therapy profession offers graduate training and post-graduate certification in Medical Family Therapy, training clinicians to work in medical settings (CFHA, 2019). Yet there are no comparative organizations or programs for the counseling profession. Many counseling professionals are working in integrated care settings; it is notable that professional counselors and/or substance abuse counselors were listed in all five studies to date involving SBIRT by mental health professionals. An implication of this study and others is that counselor educators and leaders should harness the profession's substantial expertise in substance use treatment by transferring that expertise to integrated care settings, which is where most people who need help with substance use can be found.

Medical Professionals and Health Systems

When SBIRT is conducted by medical providers, positive outcomes are limited to self-reported alcohol misuse by ambulatory clinic and emergency department patients.

Innovative interventions are imperative for hospitalized inpatients, for more severe alcohol use, and for illicit drug use. Recent movement towards integrating mental health and medical care, with SBIRT conducted by mental health professionals, is extending SBIRT's effectiveness to these populations and settings. This study supports counselor-provided SBIRT as an important new intervention within integrated care and within SBIRT practice.

This study moves beyond outcomes of self-reported use to objective, verifiable health utilization measures. Hospitalizations and emergency department visits are expensive services for health systems and therefore are of great interest to health system leaders. This study's findings suggest significant reductions in these events and their associated costs through counselor-provided SBIRT, particularly for extended session times. This study is among the first to demonstrate health utilization reductions for SBIRT interventions.

These findings should be considered alongside comparative studies of SBIRT by mental health professionals. With the small body of existing literature and confirming research, health system administrators, physicians, and community leaders should become more supportive of integrating counselor-provided SBIRT into inpatient units and other medical settings, particularly if cost savings are convincingly demonstrated.

SBIRT Research

Despite decades of well-designed and executed studies, there remains substantial disagreement among SBIRT researchers regarding its utility, even for alcohol misuse (Glass et al., 2017). Variability in SBIRT delivery further complicates comparison of

findings (Del Boca et al., 2017). This study is both clarifying and muddying for SBIRT research. It clarifies SBIRT utility by suggesting positive outcomes for inpatients, illicit drug use and severe alcohol use. Also clarifying is the use of objective outcomes, obviating criticism from using self-reported outcomes. The real-world data used to generate the outcomes is more generalizable to other real-world settings than data from randomized controlled trials, although internal validity suffers for the same reason.

However, the study adds complexity to SBIRT research. The counselor-provided SBIRT interventions vary widely in time, the only SBIRT component measured by this study. It is unclear whether single, short SBIRT sessions with patients who are quickly in and out of the hospital should be compared to long, multiple SBIRT sessions for patients with extended stays. The latter are perhaps not truly SBIRT, although there are no standard definitions for what is and what is not SBIRT (Del Boca et al., 2017). Further analysis of this counselor-provided SBIRT dataset might reveal important differences along the time spectrum.

Suggestions for Future Research

Directions for future research are to use the existing study dataset to answer questions raised by the study; to add new data from the health system data warehouse and test hypotheses about it; and to conduct new research based on the findings of this study. Suggestions are sorted into these three areas.

Research Studies Using the Dataset

Two variables available to the dataset from the counseling program records are the training level of the counselor conducting SBIRT and the number of SBIRT sessions

each patient with an intervention received. Incorporating a variable for counselor training would help mitigate the threat to internal validity from variability in how SBIRT was conducted with patients. A variable for number of sessions offers another way to capture the intensity or ‘dose’ of services received. This data is in rough form in the counselor spreadsheets but could be obtained and cleaned for use.

To resolve some of the unexplained findings regarding substance use severity, substance use type and clinical service, new models could employ the existing variables in new ways. Examples include introducing random effects, making models more specific to levels of categorical variables, and selecting a different statistical approach such as a hurdle model design (Long & Freese, 2014).

Research Studies with New Variables

The health system’s data warehouse offers opportunities to incorporate new outcome and predictor variables into regression models. Coding for mental health comorbidities may explain additional variation in the model, as substance use often co-occurs with other mental health conditions. To reduce threats to internal validity from variability, outcome variables with fewer zero values, such as all costs for all encounters during the comparative time periods, could be obtained and tested. Similarly, data could be extracted for all hospitals in the health system, not just the large teaching hospital. A caveat is that a few of these hospitals are relatively new to the system; costs and other data may not be available or as reliable as the cost data from the teaching hospital.

New Research Studies

The most compelling suggestion for new research is to conduct a prospective, randomized, controlled clinical trial using the constructs and variables in this study or modifying the constructs and variables based on expanded dataset analyses. A controlled process with randomization will correct for many of the threats to validity arising from retrospective data that was generated in the course of program operations and not intended for use in research.

New research studies could incorporate constructs not considered in the current study but likely salient for predicting substance use treatment outcomes, such as the therapeutic alliance, level of engagement, self-efficacy, and readiness to change. Examination of these factors may improve construct validity. Confounding variables that may be predict outcomes, such as prior treatment experiences and strength of support networks, could be added to improve internal validity.

Counselor-provided SBIRT could be studied in new settings. As integrated care sites expand and hire more counselors, the opportunity to investigate the unique professional identities of counselors in integrated care will expand as well. The counseling profession should be ready with ideas for research and program evaluation.

A value-added research idea is to develop outcomes studies in partnership with health system transitional care teams. In hospitals, these teams identify inpatients who are intensive users of health system services, then help them after hospital discharge to improve their health conditions, thus reducing their likelihood of hospitalizations and ED visits, among other factors. Given that the patients in this study may also be patients

followed by transitional care teams, there may be a natural synergy between inpatient substance use counseling and transitional care.

Conclusion

The reason for conducting this study was to help people with substance use problems who weren't getting help and to bring much-needed evidence of counselor effectiveness with substance use treatment to the medical community, specifically to health system leaders. This study's findings help set the stage for increased investment in counselor-provided SBIRT as a process, in integrated care, and in counseling positions in those settings. While the conclusions of this study are not definitive, the evidence may be convincing enough (after follow-up analysis) to present to health leaders and to take this research in new directions. Only through evidence can counselors convince medical professionals to support the professional mission of wellness for all. This study is a positive step in that direction.

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APPENDIX A

DISEASE CODING FOR SUBSTANCE USE

Code Legend

Substance Severity

0=remission

1=use

2=misuse (abuse)

3=disordered use (dependence)

Substance Type

0=remission

1=alcohol

2=drug

(3=both, coded in dataset only)

International Compendium of Diseases, Clinical Modification (ICD-CM), Ninth

Version

Code	Categorical Description	Severity	Type
291.00	Alcohol withdrawal delirium	2	1
291.10	Alcohol-induced persisting amnesic disorder	2	1
291.20	Alcohol-induced persisting dementia	2	1
291.30	Alcohol-induced psychotic disorder with hallucinations	2	1
291.40	Idiosyncratic alcohol intoxication	1	1
291.50	Alcohol-induced psychotic disorder with delusions	2	1
291.80	Other specified alcohol-induced mental disorders	2	1
291.81	Alcohol withdrawal	2	1
291.82	Alcohol-induced sleep disorders	2	1
291.89	Other alcohol-induced disorders	2	1
291.90	Unspecified alcohol-induced mental disorders	2	1
292.00	Drug withdrawal	2	2
292.11	Drug-induced psychotic disorder with delusions	2	2
292.12	Drug-induced psychotic disorder with hallucinations	2	2
292.20	Pathological drug intoxication	1	2
292.81	Drug-induced delirium	2	2
292.82	Drug-induced persistent dementia	2	2
292.83	Drug-induced persistent amnesic disorder	2	2
292.84	Drug-induced mood disorder	2	2
292.85	Drug-induced sleep disorders	2	2

Code	Categorical Description	Severity	Type
292.89	Other drug-induced mental disorder	2	2
292.90	Unspecified drug-induced mental disorder	2	2
303.00	Acute alcohol intoxication	1	1
303.01	Acute alcohol intoxication	1	1
303.02	Acute alcohol intoxication	1	1
303.03	Acute alcohol intoxication	1	1
303.90	Other and unspecified alcohol dependence	3	1
303.91	Other and unspecified alcohol dependence	3	1
303.92	Other and unspecified alcohol dependence	3	1
303.93	Other and unspecified alcohol dependence	3	1
304.00	Opioid type dependence	3	2
304.01	Opioid type dependence	3	2
304.02	Opioid type dependence	3	2
304.03	Opioid type dependence	3	2
304.10	Sedatives, hypnotics, or anxiolytic dependence	3	2
304.11	Sedatives, hypnotics, or anxiolytic dependence	3	2
304.12	Sedatives, hypnotics, or anxiolytic dependence	3	2
304.13	Sedatives, hypnotics, or anxiolytic dependence	3	2
304.20	Cocaine dependence	3	2
304.21	Cocaine dependence	3	2
304.22	Cocaine dependence	3	2
304.23	Cocaine dependence	3	2
304.30	Cannabis dependence	3	2
304.31	Cannabis dependence	3	2
304.32	Cannabis dependence	3	2
304.33	Cannabis dependence	3	2
304.40	Amphetamines dependence	3	2
304.41	Amphetamines dependence	3	2
304.42	Amphetamines dependence	3	2
304.43	Amphetamines dependence	3	2
304.50	Hallucinogen dependence	3	2
304.51	Hallucinogen dependence	3	2
304.52	Hallucinogen dependence	3	2
304.53	Hallucinogen dependence	3	2
304.60	Other, specified drug dependence	3	2
304.61	Other, specified drug dependence	3	2
304.62	Other, specified drug dependence	3	2
304.63	Other, specified drug dependence	3	2
304.70	Combinations of opioids with any other	2	2
304.71	Combinations of opioids with any other	2	2
304.72	Combinations of opioids with any other	2	2
304.73	Combinations of opioids with any other	2	2
304.80	Combinations excluding opioids	2	2

Code	Categorical Description	Severity	Type
304.81	Combinations excluding opioids	2	2
304.82	Combinations excluding opioids	2	2
304.83	Combinations excluding opioids	2	2
304.90	Unspecified drug dependence	3	2
304.91	Unspecified drug dependence	3	2
304.92	Unspecified drug dependence	3	2
304.93	Unspecified drug dependence	3	2
305.00	Alcohol abuse	2	1
305.01	Alcohol abuse	2	1
305.02	Alcohol abuse	2	1
305.03	Alcohol abuse	2	1
305.20	Nondependent cannabis abuse	2	2
305.21	Nondependent cannabis abuse	2	2
305.22	Nondependent cannabis abuse	2	2
305.23	Nondependent cannabis abuse	2	2
305.30	Nondependent hallucinogen abuse	2	2
305.31	Nondependent hallucinogen abuse	2	2
305.32	Nondependent hallucinogen abuse	2	2
305.33	Nondependent hallucinogen abuse	2	2
305.40	Nondependent sedative, hypnotic, or anxiolytic abuse	2	2
305.41	Nondependent sedative, hypnotic, or anxiolytic abuse	2	2
305.42	Nondependent sedative, hypnotic, or anxiolytic abuse	2	2
305.43	Nondependent sedative, hypnotic, or anxiolytic abuse	2	2
305.50	Nondependent opioid abuse	2	2
305.51	Nondependent opioid abuse	2	2
305.52	Nondependent opioid abuse	2	2
305.53	Nondependent opioid abuse	2	2
305.60	Nondependent cocaine abuse	2	2
305.61	Nondependent cocaine abuse	2	2
305.62	Nondependent cocaine abuse	2	2
305.63	Nondependent cocaine abuse	2	2
305.70	Nondependent amphetamine abuse	2	2
305.71	Nondependent amphetamine abuse	2	2
305.72	Nondependent amphetamine abuse	2	2
305.73	Nondependent amphetamine abuse	2	2
305.90	Other, mixed or unspecified drug abuse	2	2
305.91	Other, mixed or unspecified drug abuse	2	2
305.92	Other, mixed or unspecified drug abuse	2	2
305.93	Other, mixed or unspecified drug abuse	2	2

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Code	Description	Severity	Type
F10.10	Alcohol abuse, uncomplicated	2	1
F10.11	Alcohol abuse, in remission	0	0
F10.120	Alcohol abuse with intoxication, uncomplicated	2	1
F10.121	Alcohol abuse with intoxication delirium	2	1
F10.129	Alcohol abuse with intoxication, unspecified	2	1
F10.14	Alcohol abuse with alcohol-induced mood disorder	2	1
F10.150	Alcohol abuse with alcohol-induced psychotic disorder with delusions	2	1
F10.151	Alcohol abuse with alcohol-induced psychotic disorder with hallucinations	2	1
F10.159	Alcohol abuse with alcohol-induced psychotic disorder, unspecified	2	1
F10.180	Alcohol abuse with alcohol-induced anxiety disorder	2	1
F10.181	Alcohol abuse with alcohol-induced sexual dysfunction	2	1
F10.182	Alcohol abuse with alcohol-induced sleep disorder	2	1
F10.188	Alcohol abuse with other alcohol-induced disorder	2	1
F10.19	Alcohol abuse with unspecified alcohol-induced disorder	2	1
F10.20	Alcohol dependence, uncomplicated	3	1
F10.21	Alcohol dependence, in remission	0	0
F10.220	Alcohol dependence with intoxication, uncomplicated	3	1
F10.221	Alcohol dependence with intoxication delirium	3	1
F10.229	Alcohol dependence with intoxication, unspecified	3	1
F10.230	Alcohol dependence with withdrawal, uncomplicated	3	1
F10.231	Alcohol dependence with withdrawal delirium	3	1
F10.232	Alcohol dependence with withdrawal with perceptual disturbance	3	1
F10.239	Alcohol dependence with withdrawal, unspecified	3	1
F10.24	Alcohol dependence with alcohol-induced mood disorder	3	1
F10.250	Alcohol dependence with alcohol-induced psychotic disorder with delusions	3	1
F10.251	Alcohol dependence with alcohol-induced psychotic disorder with hallucinations	3	1
F10.259	Alcohol dependence with alcohol-induced psychotic disorder, unspecified	3	1
F10.26	Alcohol dependence with alcohol-induced persisting amnestic disorder	3	1
F10.27	Alcohol dependence with alcohol-induced persisting dementia	3	1

Code	Description	Severity	Type
F10.280	Alcohol dependence with alcohol-induced anxiety disorder	3	1
F10.281	Alcohol dependence with alcohol-induced sexual dysfunction	3	1
F10.282	Alcohol dependence with alcohol-induced sleep disorder	3	1
F10.288	Alcohol dependence with other alcohol-induced disorder	3	1
F10.29	Alcohol dependence with unspecified alcohol-induced disorder	3	1
F10.920	Alcohol use, unspecified with intoxication, uncomplicated	1	1
F10.921	Alcohol use, unspecified with intoxication delirium	1	1
F10.929	Alcohol use, unspecified with intoxication, unspecified	1	1
F10.94	Alcohol use, unspecified with alcohol-induced mood disorder	1	1
F10.950	Alcohol use, unspecified with alcohol-induced psychotic disorder with delusions	1	1
F10.951	Alcohol use, unspecified with alcohol-induced psychotic disorder with hallucinations	1	1
F10.959	Alcohol use, unspecified with alcohol-induced psychotic disorder, unspecified	1	1
F10.96	Alcohol use, unspecified with alcohol-induced persisting amnesic disorder	1	1
F10.97	Alcohol use, unspecified with alcohol-induced persisting dementia	1	1
F10.980	Alcohol use, unspecified with alcohol-induced anxiety disorder	1	1
F10.981	Alcohol use, unspecified with alcohol-induced sexual dysfunction	1	1
F10.982	Alcohol use, unspecified with alcohol-induced sleep disorder	1	1
F10.988	Alcohol use, unspecified with other alcohol-induced disorder	1	1
F10.99	Alcohol use, unspecified with unspecified alcohol-induced disorder	1	1
F11.10	Opioid abuse, uncomplicated	2	2
F11.11	Opioid abuse, in remission	0	0
F11.120	Opioid abuse with intoxication, uncomplicated	2	2
F11.121	Opioid abuse with intoxication delirium	2	2
F11.122	Opioid abuse with intoxication with perceptual disturbance	2	2
F11.129	Opioid abuse with intoxication, unspecified	2	2
F11.14	Opioid abuse with opioid-induced mood disorder	2	2
F11.150	Opioid abuse with opioid-induced psychotic disorder with delusions	2	2

Code	Description	Severity	Type
F11.151	Opioid abuse with opioid-induced psychotic disorder with hallucinations	2	2
F11.159	Opioid abuse with opioid-induced psychotic disorder, unspecified	2	2
F11.181	Opioid abuse with opioid-induced sexual dysfunction	2	2
F11.182	Opioid abuse with opioid-induced sleep disorder	2	2
F11.188	Opioid abuse with other opioid-induced disorder	2	2
F11.19	Opioid abuse with unspecified opioid-induced disorder	2	2
F11.20	Opioid dependence, uncomplicated	3	2
F11.21	Opioid dependence, in remission	0	0
F11.220	Opioid dependence with intoxication, uncomplicated	3	2
F11.221	Opioid dependence with intoxication delirium	3	2
F11.222	Opioid dependence with intoxication with perceptual disturbance	3	2
F11.229	Opioid dependence with intoxication, unspecified	3	2
F11.23	Opioid dependence with withdrawal	3	2
F11.24	Opioid dependence with opioid-induced mood disorder	3	2
F11.250	Opioid dependence with opioid-induced psychotic disorder with delusions	3	2
F11.251	Opioid dependence with opioid-induced psychotic disorder with hallucinations	3	2
F11.259	Opioid dependence with opioid-induced psychotic disorder, unspecified	3	2
F11.281	Opioid dependence with opioid-induced sexual dysfunction	3	2
F11.282	Opioid dependence with opioid-induced sleep disorder	3	2
F11.288	Opioid dependence with other opioid-induced disorder	3	2
F11.29	Opioid dependence with unspecified opioid-induced disorder	3	2
F11.90	Opioid use, unspecified, uncomplicated	1	2
F11.920	Opioid use, unspecified with intoxication, uncomplicated	1	2
F11.921	Opioid use, unspecified with intoxication delirium	1	2
F11.922	Opioid use, unspecified with intoxication with perceptual disturbance	1	2
F11.929	Opioid use, unspecified with intoxication, unspecified	1	2
F11.93	Opioid use, unspecified with withdrawal	1	2
F11.94	Opioid use, unspecified with opioid-induced mood disorder	1	2
F11.950	Opioid use, unspecified with opioid-induced psychotic disorder with delusions	1	2
F11.951	Opioid use, unspecified with opioid-induced psychotic disorder with hallucinations	1	2

Code	Description	Severity	Type
F11.959	Opioid use, unspecified with opioid-induced psychotic disorder, unspecified	1	2
F11.981	Opioid use, unspecified with opioid-induced sexual dysfunction	1	2
F11.982	Opioid use, unspecified with opioid-induced sleep disorder	1	2
F11.988	Opioid use, unspecified with other opioid-induced disorder	1	2
F11.99	Opioid use, unspecified with unspecified opioid-induced disorder	1	2
F12.10	Cannabis abuse, uncomplicated	2	2
F12.11	Cannabis abuse, in remission	0	0
F12.120	Cannabis abuse with intoxication, uncomplicated	2	2
F12.121	Cannabis abuse with intoxication delirium	2	2
F12.122	Cannabis abuse with intoxication with perceptual disturbance	2	2
F12.129	Cannabis abuse with intoxication, unspecified	2	2
F12.150	Cannabis abuse with psychotic disorder with delusions	2	2
F12.151	Cannabis abuse with psychotic disorder with hallucinations	2	2
F12.159	Cannabis abuse with psychotic disorder, unspecified	2	2
F12.180	Cannabis abuse with cannabis-induced anxiety disorder	2	2
F12.188	Cannabis abuse with other cannabis-induced disorder	2	2
F12.19	Cannabis abuse with unspecified cannabis-induced disorder	2	2
F12.20	Cannabis dependence, uncomplicated	3	2
F12.21	Cannabis dependence, in remission	0	0
F12.220	Cannabis dependence with intoxication, uncomplicated	3	2
F12.221	Cannabis dependence with intoxication delirium	3	2
F12.222	Cannabis dependence with intoxication with perceptual disturbance	3	2
F12.229	Cannabis dependence with intoxication, unspecified	3	2
F12.23	Cannabis dependence with withdrawal	3	2
F12.250	Cannabis dependence with psychotic disorder with delusions	3	2
F12.251	Cannabis dependence with psychotic disorder with hallucinations	3	2
F12.259	Cannabis dependence with psychotic disorder, unspecified	3	2
F12.280	Cannabis dependence with cannabis-induced anxiety disorder	3	2
F12.288	Cannabis dependence with other cannabis-induced disorder	3	2
F12.29	Cannabis dependence with unspecified cannabis-induced disorder	3	2

Code	Description	Severity	Type
F12.90	Cannabis use, unspecified, uncomplicated	1	2
F12.920	Cannabis use, unspecified with intoxication, uncomplicated	1	2
F12.921	Cannabis use, unspecified with intoxication delirium	1	2
F12.922	Cannabis use, unspecified with intoxication with perceptual disturbance	1	2
F12.929	Cannabis use, unspecified with intoxication, unspecified	1	2
F12.93	Cannabis use, unspecified with withdrawal	1	2
F12.950	Cannabis use, unspecified with psychotic disorder with delusions	1	2
F12.951	Cannabis use, unspecified with psychotic disorder with hallucinations	1	2
F12.959	Cannabis use, unspecified with psychotic disorder, unspecified	1	2
F12.980	Cannabis use, unspecified with anxiety disorder	1	2
F12.988	Cannabis use, unspecified with other cannabis-induced disorder	1	2
F12.99	Cannabis use, unspecified with unspecified cannabis-induced disorder	1	2
F13.10	Sedative, hypnotic or anxiolytic abuse, uncomplicated	2	2
F13.11	Sedative, hypnotic or anxiolytic abuse, in remission	0	0
F13.120	Sedative, hypnotic or anxiolytic abuse with intoxication, uncomplicated	2	2
F13.121	Sedative, hypnotic or anxiolytic abuse with intoxication delirium	2	2
F13.129	Sedative, hypnotic or anxiolytic abuse with intoxication, unspecified	2	2
F13.14	Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced mood disorder	2	2
F13.150	Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced psychotic disorder, with delusions	2	2
F13.151	Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced psychotic disorder, with hallucinations	2	2
F13.159	Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced psychotic disorder, unspecified	2	2
F13.180	Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced anxiety disorder	2	2
F13.181	Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced sexual dysfunction	2	2

Code	Description	Severity	Type
F13.182	Sedative, hypnotic or anxiolytic abuse with sedative, hypnotic or anxiolytic-induced sleep disorder	2	2
F13.188	Sedative, hypnotic or anxiolytic abuse with other sedative, hypnotic or anxiolytic-induced disorder	2	2
F13.19	Sedative, hypnotic or anxiolytic abuse with unspecified sedative, hypnotic or anxiolytic-induced disorder	2	2
F13.20	Sedative, hypnotic or anxiolytic dependence, uncomplicated	3	2
F13.21	Sedative, hypnotic or anxiolytic dependence, in remission	0	0
F13.220	Sedative, hypnotic or anxiolytic dependence with intoxication, uncomplicated	3	2
F13.221	Sedative, hypnotic or anxiolytic dependence with intoxication delirium	3	2
F13.229	Sedative, hypnotic or anxiolytic dependence with intoxication, unspecified	3	2
F13.230	Sedative, hypnotic or anxiolytic dependence with withdrawal, uncomplicated	3	2
F13.231	Sedative, hypnotic or anxiolytic dependence with withdrawal delirium	3	2
F13.232	Sedative, hypnotic or anxiolytic dependence with withdrawal with perceptual disturbance	3	2
F13.239	Sedative, hypnotic or anxiolytic dependence with withdrawal, unspecified	3	2
F13.24	Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced mood disorder	3	2
F13.250	Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced psychotic disorder, with delusions	3	2
F13.251	Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced psychotic disorder, with hallucinations	3	2
F13.259	Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced psychotic disorder, unspecified	3	2
F13.26	Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced persisting amnesic disorder	3	2
F13.27	Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced persisting dementia	3	2
F13.280	Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced anxiety	3	2
F13.281	Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced sexual disorder	3	2

Code	Description	Severity	Type
F13.282	Sedative, hypnotic or anxiolytic dependence with sedative, hypnotic or anxiolytic-induced sleep disorder	3	2
F13.288	Sedative, hypnotic or anxiolytic dependence with other sedative, hypnotic or anxiolytic-induced disorder	3	2
F13.29	Sedative, hypnotic or anxiolytic dependence with unspecified sedative, hypnotic or anxiolytic-induced disorder	3	2
F13.90	Sedative, hypnotic, or anxiolytic use, unspecified, uncomplicated	1	2
F13.920	Sedative, hypnotic or anxiolytic use, unspecified with intoxication, uncomplicated	1	2
F13.921	Sedative, hypnotic or anxiolytic use, unspecified with intoxication delirium	1	2
F13.929	Sedative, hypnotic or anxiolytic use, unspecified with intoxication, unspecified	1	2
F13.930	Sedative, hypnotic or anxiolytic use, unspecified with withdrawal, uncomplicated	1	2
F13.931	Sedative, hypnotic or anxiolytic use, unspecified with withdrawal delirium	1	2
F13.932	Sedative, hypnotic or anxiolytic use, unspecified with withdrawal with perceptual disturbances	1	2
F13.939	Sedative, hypnotic or anxiolytic use, unspecified with withdrawal, unspecified	1	2
F13.94	Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-induced mood disorder	1	2
F13.950	Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-induced psychotic disorder	1	2
F13.951	Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-induced psychotic disorder, with delusions	1	2
F13.959	Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-induced psychotic disorder, with hallucinations	1	2
F13.96	Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-induced persisting amnesic disorder	1	2
F13.97	Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-induced persisting dementia	1	2
F13.980	Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-induced anxiety disorder	1	2

Code	Description	Severity	Type
F13.981	Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-induced sexual dysfunction	1	2
F13.982	Sedative, hypnotic or anxiolytic use, unspecified with sedative, hypnotic or anxiolytic-induced sleep disorder	1	2
F13.988	Sedative, hypnotic or anxiolytic use, unspecified with other sedative, hypnotic or anxiolytic-induced disorder	1	2
F13.99	Sedative, hypnotic or anxiolytic use, unspecified with unspecified sedative, hypnotic or anxiolytic-induced disorder	1	2
F14.10	Cocaine abuse, uncomplicated	2	2
F14.11	Cocaine abuse, in remission	0	0
F14.120	Cocaine abuse with intoxication, uncomplicated	2	2
F14.121	Cocaine abuse with intoxication with delirium	2	2
F14.122	Cocaine abuse with intoxication with perceptual disturbance	2	2
F14.129	Cocaine abuse with intoxication, unspecified	2	2
F14.14	Cocaine abuse with cocaine-induced mood disorder	2	2
F14.150	Cocaine abuse with cocaine-induced psychotic disorder with delusions	2	2
F14.151	Cocaine abuse with cocaine-induced psychotic disorder with hallucinations	2	2
F14.159	Cocaine abuse with cocaine-induced psychotic disorder, unspecified	2	2
F14.180	Cocaine abuse with cocaine-induced anxiety disorder	2	2
F14.181	Cocaine abuse with cocaine-induced sexual dysfunction	2	2
F14.182	Cocaine abuse with cocaine-induced sleep disorder	2	2
F14.188	Cocaine abuse with other cocaine-induced disorder	2	2
F14.19	Cocaine abuse with unspecified cocaine-induced disorder	2	2
F14.20	Cocaine dependence, uncomplicated	3	2
F14.21	Cocaine dependence, in remission	0	0
F14.220	Cocaine dependence with intoxication, uncomplicated	3	2
F14.221	Cocaine dependence with intoxication delirium	3	2
F14.222	Cocaine dependence with intoxication with perceptual disturbance	3	2
F14.229	Cocaine dependence with intoxication, unspecified	3	2
F14.23	Cocaine dependence with withdrawal	3	2
F14.24	Cocaine dependence with cocaine-induced mood disorder	3	2
F14.250	Cocaine dependence with cocaine-induced psychotic disorder with delusions	3	2
F14.251	Cocaine dependence with cocaine-induced psychotic disorder with hallucinations	3	2

Code	Description	Severity	Type
F14.259	Cocaine dependence with cocaine-induced psychotic disorder, unspecified	3	2
F14.280	Cocaine dependence with cocaine-induced anxiety disorder	3	2
F14.281	Cocaine dependence with cocaine-induced sexual dysfunction	3	2
F14.282	Cocaine dependence with cocaine-induced sleep disorder	3	2
F14.288	Cocaine dependence with other cocaine-induced disorder	3	2
F14.29	Cocaine dependence with unspecified cocaine-induced disorder	3	2
F14.90	Cocaine use, unspecified, uncomplicated	1	2
F14.920	Cocaine use, unspecified with intoxication, uncomplicated	1	2
F14.921	Cocaine use, unspecified with intoxication delirium	1	2
F14.922	Cocaine use, unspecified with intoxication with perceptual disturbance	1	2
F14.929	Cocaine use, unspecified with intoxication, unspecified	1	2
F14.94	Cocaine use, unspecified with cocaine-induced mood disorder	1	2
F14.950	Cocaine use, unspecified with cocaine-induced psychotic disorder with delusions	1	2
F14.951	Cocaine use, unspecified with cocaine-induced psychotic disorder with hallucinations	1	2
F14.959	Cocaine use, unspecified with cocaine-induced psychotic disorder, unspecified	1	2
F14.980	Cocaine use, unspecified with cocaine-induced anxiety disorder	1	2
F14.981	Cocaine use, unspecified with cocaine-induced sexual dysfunction	1	2
F14.982	Cocaine use, unspecified with cocaine-induced sleep disorder	1	2
F14.988	Cocaine use, unspecified with other cocaine-induced disorder	1	2
F14.99	Cocaine use, unspecified with unspecified cocaine-induced disorder	1	2
F15.10	Other stimulant abuse, uncomplicated	2	2
F15.11	Other stimulant abuse, in remission	0	0
F15.120	Other stimulant abuse with intoxication, uncomplicated	2	2
F15.121	Other stimulant abuse with intoxication delirium	2	2
F15.122	Other stimulant abuse with intoxication with perceptual disturbance	2	2
F15.129	Other stimulant abuse with intoxication, unspecified	2	2

Code	Description	Severity	Type
F15.14	Other stimulant abuse with stimulant-induced mood disorder	2	2
F15.150	Other stimulant abuse with stimulant-induced psychotic disorder with delusions	2	2
F15.151	Other stimulant abuse with stimulant-induced psychotic disorder with hallucinations	2	2
F15.159	Other stimulant abuse with stimulant-induced psychotic disorder, unspecified	2	2
F15.180	Other stimulant abuse with stimulant-induced anxiety disorder	2	2
F15.181	Other stimulant abuse with stimulant-induced sexual dysfunction	2	2
F15.182	Other stimulant abuse with stimulant-induced sleep disorder	2	2
F15.188	Other stimulant abuse with other stimulant-induced disorder	2	2
F15.19	Other stimulant abuse with unspecified stimulant-induced disorder	2	2
F15.20	Other stimulant dependence, uncomplicated	3	2
F15.21	Other stimulant dependence, in remission	0	0
F15.220	Other stimulant dependence with intoxication, uncomplicated	3	2
F15.221	Other stimulant dependence with intoxication delirium	3	2
F15.222	Other stimulant dependence with intoxication with perceptual disturbance	3	2
F15.229	Other stimulant dependence with intoxication, unspecified	3	2
F15.23	Other stimulant dependence with withdrawal	3	2
F15.24	Other stimulant dependence with stimulant-induced mood disorder	3	2
F15.250	Other stimulant dependence with stimulant-induced psychotic disorder with delusions	3	2
F15.251	Other stimulant dependence with stimulant-induced psychotic disorder with hallucinations	3	2
F15.259	Other stimulant dependence with stimulant-induced psychotic disorder, unspecified	3	2
F15.280	Other stimulant dependence with stimulant-induced anxiety disorder	3	2
F15.281	Other stimulant dependence with stimulant-induced sexual dysfunction	3	2
F15.282	Other stimulant dependence with stimulant-induced sleep disorder	3	2
F15.288	Other stimulant dependence with other stimulant-induced disorder	3	2

Code	Description	Severity	Type
F15.29	Other stimulant dependence with unspecified stimulant-induced disorder	3	2
F15.90	Other stimulant use, unspecified, uncomplicated	1	2
F15.920	Other stimulant use, unspecified with intoxication, uncomplicated	1	2
F15.921	Other stimulant use, unspecified with intoxication delirium	1	2
F15.922	Other stimulant use, unspecified with intoxication with perceptual disturbance	1	2
F15.929	Other stimulant use, unspecified with intoxication, unspecified	1	2
F15.93	Other stimulant use, unspecified with withdrawal	1	2
F15.94	Other stimulant use, unspecified with stimulant-induced mood disorder	1	2
F15.950	Other stimulant use, unspecified with stimulant-induced psychotic disorder with delusions	1	2
F15.951	Other stimulant use, unspecified with stimulant-induced psychotic disorder with hallucinations	1	2
F15.959	Other stimulant use, unspecified with stimulant-induced psychotic disorder, unspecified	1	2
F15.980	Other stimulant use, unspecified with stimulant-induced anxiety disorder	1	2
F15.981	Other stimulant use, unspecified with stimulant-induced sexual dysfunction	1	2
F15.982	Other stimulant use, unspecified with stimulant-induced sleep disorder	1	2
F15.988	Other stimulant use, unspecified with other stimulant-induced disorder	1	2
F15.99	Other stimulant use, unspecified with unspecified stimulant-induced disorder	1	2
F16.10	Hallucinogen abuse, uncomplicated	2	2
F16.11	Hallucinogen abuse, in remission	0	0
F16.120	Hallucinogen abuse with intoxication, uncomplicated	2	2
F16.121	Hallucinogen abuse with intoxication with delirium	2	2
F16.122	Hallucinogen abuse with intoxication with perceptual disturbance	2	2
F16.129	Hallucinogen abuse with intoxication, unspecified	2	2
F16.14	Hallucinogen abuse with hallucinogen-induced mood disorder	2	2
F16.150	Hallucinogen abuse with hallucinogen-induced psychotic disorder with delusions	2	2
F16.151	Hallucinogen abuse with hallucinogen-induced psychotic disorder with hallucinations	2	2

Code	Description	Severity	Type
F16.159	Hallucinogen abuse with hallucinogen-induced psychotic disorder, unspecified	2	2
F16.180	Hallucinogen abuse with hallucinogen-induced anxiety disorder	2	2
F16.183	Hallucinogen abuse with hallucinogen persisting perception disorder (flashbacks)	2	2
F16.188	Hallucinogen abuse with other hallucinogen-induced disorder	2	2
F16.19	Hallucinogen abuse with unspecified hallucinogen-induced disorder	2	2
F16.20	Hallucinogen dependence, uncomplicated	3	2
F16.21	Hallucinogen dependence, in remission	0	0
F16.220	Hallucinogen dependence with intoxication, uncomplicated	3	2
F16.221	Hallucinogen dependence with intoxication with delirium	3	2
F16.229	Hallucinogen dependence with intoxication, unspecified	3	2
F16.24	Hallucinogen dependence with hallucinogen-induced mood disorder	3	2
F16.250	Hallucinogen dependence with hallucinogen-induced psychotic disorder with delusions	3	2
F16.251	Hallucinogen dependence with hallucinogen-induced psychotic disorder with hallucinations	3	2
F16.259	Hallucinogen dependence with hallucinogen-induced psychotic disorder, unspecified	3	2
F16.280	Hallucinogen dependence with hallucinogen-induced anxiety disorder	3	2
F16.283	Hallucinogen dependence with hallucinogen persisting perception disorder (flashbacks)	3	2
F16.288	Hallucinogen dependence with other hallucinogen-induced disorder	3	2
F16.29	Hallucinogen dependence with unspecified hallucinogen-induced disorder	3	2
F16.90	Hallucinogen use, unspecified, uncomplicated	1	2
F16.920	Hallucinogen use, unspecified with intoxication, uncomplicated	1	2
F16.921	Hallucinogen use, unspecified with intoxication with delirium	1	2
F16.929	Hallucinogen use, unspecified with intoxication, unspecified	1	2
F16.94	Hallucinogen use, unspecified with hallucinogen-induced mood disorder	1	2
F16.950	Hallucinogen use, unspecified with hallucinogen-induced psychotic disorder with delusions	1	2

Code	Description	Severity	Type
F16.951	Hallucinogen use, unspecified with hallucinogen-induced psychotic disorder with hallucinations	1	2
F16.959	Hallucinogen use, unspecified with hallucinogen-induced psychotic disorder, unspecified	1	2
F16.980	Hallucinogen use, unspecified with hallucinogen-induced anxiety disorder	1	2
F16.983	Hallucinogen use, unspecified with hallucinogen persisting perception disorder (flashbacks)	1	2
F16.988	Hallucinogen use, unspecified with other hallucinogen-induced disorder	1	2
F16.99	Hallucinogen use, unspecified with unspecified hallucinogen-induced disorder	1	2
F18.10	Inhalant abuse, uncomplicated	2	2
F18.11	Inhalant abuse, in remission	0	0
F18.120	Inhalant abuse with intoxication, uncomplicated	2	2
F18.121	Inhalant abuse with intoxication delirium	2	2
F18.129	Inhalant abuse with intoxication, unspecified	2	2
F18.14	Inhalant abuse with inhalant-induced mood disorder	2	2
F18.150	Inhalant abuse with inhalant-induced psychotic disorder with delusions	2	2
F18.151	Inhalant abuse with inhalant-induced psychotic disorder with hallucinations	2	2
F18.159	Inhalant abuse with inhalant-induced psychotic disorder, unspecified	2	2
F18.17	Inhalant abuse with inhalant-induced dementia	2	2
F18.180	Inhalant abuse with inhalant-induced anxiety disorder	2	2
F18.188	Inhalant abuse with other inhalant-induced disorder	2	2
F18.19	Inhalant abuse with unspecified inhalant-induced disorder	2	2
F18.20	Inhalant dependence, uncomplicated	3	2
F18.21	Inhalant dependence, in remission	0	0
F18.220	Inhalant dependence with intoxication, uncomplicated	3	2
F18.221	Inhalant dependence with intoxication delirium	3	2
F18.229	Inhalant dependence with intoxication, unspecified	3	2
F18.24	Inhalant dependence with inhalant-induced mood disorder	3	2
F18.250	Inhalant dependence with inhalant-induced psychotic disorder with delusions	3	2
F18.251	Inhalant dependence with inhalant-induced psychotic disorder with hallucinations	3	2
F18.259	Inhalant dependence with inhalant-induced psychotic disorder, unspecified	3	2
F18.27	Inhalant dependence with inhalant-induced dementia	3	2

Code	Description	Severity	Type
F18.280	Inhalant dependence with inhalant-induced anxiety disorder	3	2
F18.288	Inhalant dependence with other inhalant-induced disorder	3	2
F18.29	Inhalant dependence with unspecified inhalant-induced disorder	3	2
F18.90	Inhalant use, unspecified, uncomplicated	1	2
F18.920	Inhalant use, unspecified with intoxication, uncomplicated	1	2
F18.921	Inhalant use, unspecified with intoxication with delirium	1	2
F18.929	Inhalant use, unspecified with intoxication, unspecified	1	2
F18.94	Inhalant use, unspecified with inhalant-induced mood disorder	1	2
F18.950	Inhalant use, unspecified with inhalant-induced psychotic disorder with delusions	1	2
F18.951	Inhalant use, unspecified with inhalant-induced psychotic disorder with hallucinations	1	2
F18.959	Inhalant use, unspecified with inhalant-induced psychotic disorder, unspecified	1	2
F18.97	Inhalant use, unspecified with inhalant-induced persisting dementia	1	2
F18.980	Inhalant use, unspecified with inhalant-induced anxiety disorder	1	2
F18.988	Inhalant use, unspecified with other inhalant-induced disorder	1	2
F18.99	Inhalant use, unspecified with unspecified inhalant-induced disorder	1	2
F19.10	Other psychoactive substance abuse, uncomplicated	2	2
F19.11	Other psychoactive substance abuse, in remission	0	0
F19.120	Other psychoactive substance abuse with intoxication, uncomplicated	2	2
F19.121	Other psychoactive substance abuse with intoxication delirium	2	2
F19.122	Other psychoactive substance abuse with intoxication with perceptual disturbances	2	2
F19.129	Other psychoactive substance abuse with intoxication, unspecified	2	2
F19.14	Other psychoactive substance abuse with psychoactive substance-induced mood disorder	2	2
F19.150	Other psychoactive substance abuse with psychoactive substance-induced psychotic disorder with del	2	2
F19.151	Other psychoactive substance abuse with psychoactive substance-induced psychotic disorder with hal	2	2
F19.159	Other psychoactive substance abuse with psychoactive substance-induced psychotic disorder, unspeci	2	2

Code	Description	Severity	Type
F19.16	Other psychoactive substance abuse with psychoactive substance-induced persisting amnestic disorder	2	2
F19.17	Other psychoactive substance abuse with psychoactive substance-induced persisting dementia	2	2
F19.180	Other psychoactive substance abuse with psychoactive substance-induced anxiety disorder	2	2
F19.181	Other psychoactive substance abuse with psychoactive substance-induced sexual dysfunction	2	2
F19.182	Other psychoactive substance abuse with psychoactive substance-induced sleep disorder	2	2
F19.188	Other psychoactive substance abuse with other psychoactive substance-induced disorder	2	2
F19.19	Other psychoactive substance abuse with unspecified psychoactive substance-induced disorder	2	2
F19.20	Other psychoactive substance dependence, uncomplicated	3	2
F19.21	Other psychoactive substance dependence, in remission	0	0
F19.220	Other psychoactive substance dependence with intoxication, uncomplicated	3	2
F19.221	Other psychoactive substance dependence with intoxication delirium	3	2
F19.222	Other psychoactive substance dependence with intoxication with perceptual disturbance	3	2
F19.229	Other psychoactive substance dependence with intoxication, unspecified	3	2
F19.230	Other psychoactive substance dependence with withdrawal, uncomplicated	3	2
F19.231	Other psychoactive substance dependence with withdrawal delirium	3	2
F19.232	Other psychoactive substance dependence with withdrawal with perceptual disturbance	3	2
F19.239	Other psychoactive substance dependence with withdrawal, unspecified	3	2
F19.24	Other psychoactive substance dependence with psychoactive substance-induced mood disorder	3	2
F19.250	Other psychoactive substance dependence with psychoactive substance-induced psychotic disorder with	3	2
F19.251	Other psychoactive substance dependence with psychoactive substance-induced psychotic disorder with	3	2
F19.259	Other psychoactive substance dependence with psychoactive substance-induced psychotic disorder, unspecified	3	2
F19.26	Other psychoactive substance dependence with psychoactive substance-induced persisting amnestic disorder	3	2

Code	Description	Severity	Type
F19.27	Other psychoactive substance dependence with psychoactive substance-induced persisting dementia	3	2
F19.280	Other psychoactive substance dependence with psychoactive substance-induced anxiety disorder	3	2
F19.281	Other psychoactive substance dependence with psychoactive substance-induced sexual dysfunction	3	2
F19.282	Other psychoactive substance dependence with psychoactive substance-induced sleep disorder	3	2
F19.288	Other psychoactive substance dependence with other psychoactive substance-induced disorder	3	2
F19.29	Other psychoactive substance dependence with unspecified psychoactive substance-induced disorder	3	2
F19.90	Other psychoactive substance use, unspecified, uncomplicated	1	2
F19.920	Other psychoactive substance use, unspecified with intoxication, uncomplicated	1	2
F19.921	Other psychoactive substance use, unspecified with intoxication with delirium	1	2
F19.922	Other psychoactive substance use, unspecified with intoxication with perceptual disturbance	1	2
F19.929	Other psychoactive substance use, unspecified with intoxication, unspecified	1	2
F19.930	Other psychoactive substance use, unspecified with withdrawal, uncomplicated	1	2
F19.931	Other psychoactive substance use, unspecified with withdrawal delirium	1	2
F19.932	Other psychoactive substance use, unspecified with withdrawal with perceptual disturbance	1	2
F19.939	Other psychoactive substance use, unspecified with withdrawal, unspecified	1	2
F19.94	Other psychoactive substance use, unspecified with psychoactive substance-induced mood disorder	1	2
F19.950	Other psychoactive substance use, unspecified with psychoactive substance-induced psychotic disorder	1	2
F19.951	Other psychoactive substance use, unspecified with psychoactive substance-induced psychotic disorder	1	2
F19.959	Other psychoactive substance use, unspecified with psychoactive substance-induced psychotic disorder	1	2
F19.96	Other psychoactive substance use, unspecified with psychoactive substance-induced persisting amnesia	1	2
F19.97	Other psychoactive substance use, unspecified with psychoactive substance-induced persisting dementia	1	2

Code	Description	Severity	Type
F19.980	Other psychoactive substance use, unspecified with psychoactive substance-induced anxiety disorder	1	2
F19.981	Other psychoactive substance use, unspecified with psychoactive substance-induced sexual dysfunction	1	2
F19.982	Other psychoactive substance use, unspecified with psychoactive substance-induced sleep disorder	1	2
F19.988	Other psychoactive substance use, unspecified with other psychoactive substance-induced disorder	1	2
F19.99	Other psychoactive substance use, unspecified with unspecified psychoactive substance-induced disorder	1	2