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# PERCEPTIONS AND EXPERIENCES OF ADOPTING A TECHNOLOGY BASED INTERVENTION FOR ALCOHOL SCREENING AND REFERRAL TO TREATMENT IN PRIMARY CARE

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PERCEPTIONS AND EXPERIENCES OF ADOPTING A TECHNOLOGY BASED  
INTERVENTION FOR ALCOHOL SCREENING AND REFERRAL TO  
TREATMENT IN PRIMARY CARE

A Dissertation Presented

by

SONYA L. LACHANCE

Submitted to the Graduate School of the  
University of Massachusetts Amherst in partial fulfillment  
of the requirements for the degree of

DOCTOR OF PHILOSOPHY

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Nursing

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SONYA L. LACHANCE

Approved as to style and content by:

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Donna Zucker, Chair

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Jeungok Choi, Member

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Jenna Marquard, Member

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Cynthia S. Jacelon, Department Head  
Department Name

## DEDICATION

Christopher Robin stated, “You’re braver than you believe, stronger than you seem, and smarter than you think.” After a lot of time and effort – I have come to believe he is right.

This work is dedicated to several people in my life. My dear and oldest friend Burak Sezen, who taught me about mental toughness and grit to get through life’s intellectual challenges. My sister Sandra, who listened to me late at night. Barry and Lois Sahl who encouraged and supported my efforts through two doctorates. Rich – for all the vacations and fishing trips we missed - this is dedicated to you.

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ABSTRACT

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SEPTEMBER 2020

SONYA L. LACHANCE, B.A. UNIVERSITY OF SOUTHERN MAINE

M.B.A UNIVERSITY OF SOUTHERN NEW HAMPSHIRE

D.N.P UNIVERSITY OF MASSACHUSETTS, AMHERST

Ph.D. UNIVERSITY OF MASSACHUSETTS AMHERST

Directed by: Professor Donna Zucker

Alcohol abuse is a significant concern in the United States. Today in the U.S., 15.1 million adults ages 18 and older, have been identified as having an alcohol use disorder. Alcohol abuse and binge drinking are highest amongst college students. More than 58.0 percent of college students admit to regular binge drinking or heavy alcohol use every month. Left unaddressed, this leads to negative health consequences later in life. The United States Preventive Services Task Force states that there is strong evidence that screening patients in primary care can reduce alcohol use disorder. Though screening, brief intervention, and referral to treatment (SBIRT) in primary care are critical steps towards preventing alcohol use disorder, it is not routinely done. Providers state that they are time-constrained and need processes that will help them carry out screenings. The use of technology integrated with the electronic health record is one way to address the issue. The purpose of this study was to provide an understanding of the health care

provider's perceptions and experiences with technology adoption in alcohol use disorder and clinical SBIRT. The study used an exploratory, descriptive methods approach to gain a comprehensive understanding of what acts as a facilitator or barrier to technology adoption in SBIRT in primary care. The findings show that there is a gap in the understanding of how to integrate behavioral health screenings in the primary care workflow and EHR. Providers want to do SBIRT in clinical care, yet time-constrained visits remain an issue. Providers highlighted the importance of mapping the workflow in advance of practice change and using pilots before undertaking a broader practice change.

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# CHAPTER 1

## INTRODUCTION

### 1.0 Background

Alcohol abuse is a significant concern in the United States (US). Today in the US, 15.1 million adults ages 18 and older, have been identified as having an alcohol use disorder (National Institute of Alcohol Abuse and Alcoholism [NIAAA], 2018). The American Psychiatric Association Diagnostic and Statistical Manual (DSM-5) defines alcohol use disorder (AUD) as the inability to stop or control alcohol use (NIAAA, 2018). Alcohol use disorder is measured by how frequently people “binge” drink. Binge drinking for males is measured through the consumption of 5 or more drinks on one occasion in the past 30 days and four or more drinks for females (NIAAA, 2018; Substance Abuse and Mental Health Services Administration [SAMHSA]n.d.-a)

Alcohol abuse and binge drinking are highest amongst college students. More than 58.0 percent of college students admit to regularly binge drinking or heavy alcohol use every month (SAMHSA, n.d.-b; NIAAA, 2018). Every year 700,000 college students are either injured or assaulted because of alcohol abuse and binge drinking (Center for Disease Control [CDC], 2018).

Additionally, binge drinking increases the risk of alcohol-induced blackouts. Blackouts lead to mental impairment and contribute to alcohol-related injury (Acuff et al., 2019). Approximately 50% of all college students state that they have had a blackout from the overuse of alcohol (Acuff et al., 2019).

Early identification of alcohol abuse is essential. Left unaddressed, it leads to broad health and behavioral consequences later in life (Kendler et al., 2017). People are

more likely to experience economic or psychosocial problems (Grant et al., 2015). The goal of this study will be to test the feasibility and implementation of a technology solution for AUD screening that integrates into the electronic medical record and promotes SBIRT in college students.

## **1.2 Interventions: Alcohol Use Disorder**

Interventions used to identify AUD related risks are focused on the use of screening tools to identify problematic drinking (Spithoff et al., 2017). The U.S. Preventive Services Task Force (USPSTF) states there is high certainty that the benefit to screening patients is substantial and recommends “screening for unhealthy alcohol use in primary care settings in adults 18 years or older, including pregnant women, and providing persons engaged in risky or hazardous drinking with brief behavioral counseling interventions to reduce unhealthy alcohol use” (United States Preventative Task Force, 2018). Both screening tools and brief interventions are vital to addressing AUD risks in clinical care.

One intervention titled “Screening, brief intervention and referral to treatment” (SBIRT) is a process that screens patients for problematic drinking, provides short counseling sessions to help the patient with behavior change, and a potential referral to further treatment (“Alcohol Brief Interventions,” 2017). SBIRT is an integrated approach to the identification of AUD and the delivery of early interventions and treatment. Evidence for the effectiveness of SBIRT for AUD is strong (CDC, 2017b, Rizer & Lusk, 2017). The USPSTF evidence shows that patients who receive screening and treatment as part of their visit have a reduction of alcohol consumption and better health outcomes (United States Preventative Task Force, 2018). However, SBIRT interventions vary

across clinical settings, with only 15.4% providers consistently screening patients, and in many cases, it is not done (Hirschtritt et al. 2018, Muench et al., 2015; Rehm et al., 2016, Rizer & Lusk, 2017).

### **1.3 Intervention Barriers**

The steps for any clinical practice should 1) universally screen all patients; 2) use a validated screening instrument to identify AUD risk; and 3) follow up with a brief intervention and a referral to treatment (SAMHSA, n.d.-b). The two reasons commonly cited for providers inconsistently screening is the lack of behavioral health training and the lack of time (Haskins et al.,2017). The goal of the brief intervention is for providers to discuss with the patient how excessive alcohol use puts them at risk for further health-related issues (SAMHSA, n.d.-b). The basis for all interventions is to combine the use of cognitive-behavioral therapy and motivational interviewing techniques. These techniques blend talk therapy with an empathetic counseling style (SAMHSA, 1999). Providers require training in both SBIRT and behavioral health so that they understand how to ask questions and elicit responses that are foundational to the SBIRT process (Muench et al., 2015).

One key barrier to providing brief intervention is the lack of time. If the provider is to do a brief intervention, they need to be able to spend the additional time giving brief counseling. In general, a brief intervention can last anywhere from 5-30 minutes (SAMHSA, n.d.-b). Because of the time required, in primary care, AUD screening frequently gets overlooked or is often inadequately addressed (Kowalski et al., 2018). Providers frequently complain that patient visits are already time constrained. They spend an average 16.5 minutes per patient visit with the bulk of the visit focused on the

chief complaint of the patient - leaving minimal time to address other problems (e.g., approximately 1 minute per problem) (McDonald, Rodriguez, & Shortell, 2018; Young, Burge, Kumar, Wilson, & Ortiz, 2018). As a result, alcohol screening and interventions do not get addressed or do not get enough attention (Kowalski et al. 2018; Young et al., 2018).

Though most primary care offices use an electronic health record (EHR) (CDC, 2017a), integration of auxiliary screening forms or usability is an additional problem (Muench et al., 2015). Having a streamlined process where all information is easy to add or access is essential to helping increase both the AUD screening and the SBIRT process in primary care (Howe, Adams, Hettinger, & Ratwani, 2018). Technology introduces new processes for both. Finding novel ways to utilize time is critical towards increasing AUD screening and interventions.

#### **1.4 Health Technology – Current Uses**

Health Technology is a broad term that comprises a broad range of technologies used to solve health problems (World Health Organization, n.d.). Mobile devices and electronic medical records or electronic health systems are two common types of technologies used in healthcare. Mobile devices encompass portable devices such as “smart” phones, tablets, and laptops. These mobile devices are small computers that have strong compute capabilities along with a variety of uses that include calling, texting, emailing, internet searching, video, sensors, and mobile applications. Electronic health systems collect and store clinical data on patients (Tai, Wu, & Clark, 2012).

Mobile devices (i.e., smartphones, tablets, laptops) are increasingly being used as clinical tools (Breitenstein, Brager, Ocampo, & Fogg, 2017). In addition to their

telephony capabilities, newer features and functions such as text messaging, access to internet-based health portals, and access to electronic medical records (EHR) are being used by both patients and health care providers (Bottiger et al., 2015). Access to these features results in better communication and better clinical outcomes (Farrell, 2016; Jenkins et al., 2016; Koivunen, Niemi, & Hupli, 2015). Interventions for alcohol use disorder and other medical conditions like asthma, chronic obstructive pulmonary disease, diabetes, and coronary heart disease are associated with lower levels of disease burden (Kumar & Arya, 2015; Nerminathan, Harrison, Phelps, Scott, & Alexander, 2016; Sahoo, Thakkar, & Lee, 2017).

Mobile Health applications is an umbrella term that encompasses a broad range of technologies. They are generally categorized as clinical decision support tools that span a diverse set of health conditions (Rachim, An, Pham, & Wan-Young, 2017; Symer et al., 2017). Some common examples of technologies already being used in practice are text messaging and portals. Short message service (SMS) technology, also called “text messaging,” is one mobile health application commonly used in care. Providers use SMS to send reminders to patients to take their medication or as appointment reminders (Browning, Robert, McGillicuddy, Treiber, Taber, 2016; Crutchfield & Kistle, 2017).

Another commonly used mHealth application is related to collecting or sharing information via a web-based portal. Portals allow patients to sign onto an application using a mobile device to gather or give information. It makes the sharing or collecting of information manageable and has benefits to both the patient and the provider (Bottiger et al., 2015, Kumar et al., 2018). Many health care organizations have patient portals and applications that can be accessed on mobile devices (Fant & Adelman, 2017).

Kiosks are unsupervised computer stations that are integrated into an electronic health record system. They are commonly used in primary care offices to help with a variety of health-care delivery tasks such as checking into the office or filling out health information (Bahadin et al., 2017). In many cases, Kiosks are being used to simplify tasks and take away an administrative overhead to free up staff to focus on higher-value tasks in clinical care (Barlow, 2019). Because of time constraints, mainly, in primary care settings, Kiosks are being used to help with a variety of tasks, including supporting the clinical workflow (Chung et al., 2016). One example where kiosks have helped is in the screening process. Hsieh et al. (2015) implemented a kiosk-facilitated HIV screening program that takes place in an emergency room at the time of registration. The data from the study indicates that kiosk facilitated screening engages patients and increases the likelihood of screening. One reason given for increased patient engagement is that patients may feel the kiosk “de-stigmatizes” the screening (Hsieh et al., 2015).

In addition to kiosk technology, electronic health records (EHR) include many different systems with a range of functionality. The goal is to have an integrated platform that can easily collect clinical information while not disrupting the clinical process (Howe, Adams, Hettinger, & Ratwani, 2018). Clinical interventions utilizing EHR functionality are becoming increasingly common (Tai, Wu, & Clark, 2012). A study conducted by Wu et al. (2016) explored the use of EHR with patients diagnosed with type II diabetes and substance use disorders. Patients with comorbid conditions are frequently treated for comorbid conditions. Wu et al. (2016) explored the use of EHR to determine if the data could identify health risks before they were an issue. Vendors who develop EHR platforms are focused on information capture but not on workflow or general

usability (Ratwani et al, 2015). In many instances, EHR's are hard to use and do not support different workflows.

Both technology and healthcare continue to undergo significant changes. In healthcare, the move towards using technology, triggered by a change in the Health Information Technology for Economic and Clinical Health (HITECH) Act, provided monetary incentives to hospitals and health care professionals who adopted and expanded the use of EHRs (Reisman, 2017). Additionally, healthcare moved away from a fee-for-service (i.e., capitated model) to a value-based system (VBC). In a capitated model, providers are compensated based on the amount of care given, whereas, in a value-based-care model, they are paid on the quality of care provided (NEJM Catalyst, 2017). Consequently, in the new VBC model, health care providers are held accountable for the health outcomes of their patients. The use of technology is a large part of how VBC is delivered and tracked.

Technology use has many benefits to both the patient and the provider, yet the real power in using health technology is its ability to influence a patient's health outcomes. Technologies that are tightly integrated with EHR systems and other healthcare technology software platforms – help influence patient outcomes. Technology and EHR integration give both the patient and the provider a method to collect, monitor, and communicate health information (Wallack, n.d.). With a time-constrained environment and with the VBC model, health technology offers an alternative to delivering patient-centered interventions (Kim et al., 2017).

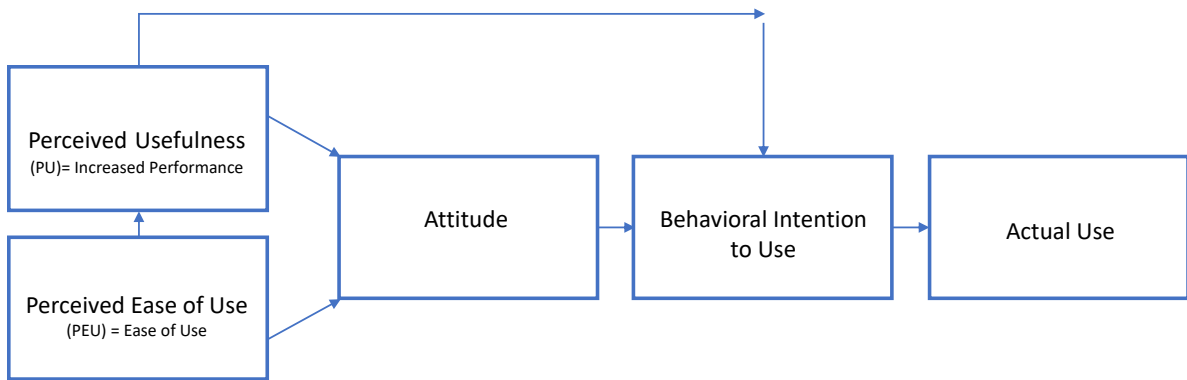
## 1.5 Theoretical Framework

There are many different technology acceptance theories (Taherdoost, 2018). Understanding what drives technology adoption has been studied extensively with limited understanding of what theory better captures technology acceptance or adoption (Kurahashi et al., 2018). However, the ability to predict these two constructs is one common goal of all theories. Several theories have behavioral components for predicting acceptance (Rajković et al., 2018). The premise is that through conscious thought or not, people intrinsically ask and answer the question of how the technology will help them. Two concepts that are pervasive to technology adoption is the concept of usability and increased performance (Kurahashi et al., 2018). Rajković et al. (2018) state that when accepting new technology, people will select the technology that is easiest to use with the most benefit. Some commonly used theories that try and answer these basic questions are the Technology Acceptance Model (TAM) developed by Davis (1989). It explores perceived ease of use and perceived usefulness in technology adoption. This was developed further with a derivation of the TAM2 (Venkatesh & Davis, 2000). The TAM2 introduces social influence and cognitive instrumental processes to identify factors that contribute to technology acceptance. It was later expanded upon by the Unified Theory of Acceptance and Use of Technology (UTAUT) developed by Venkatesh et al. (2003). Both the TAM2 and UTAUT theories have mixed results relating to technology use (Alwahaishi, & Snášel, 2013). Alwahaishi & Snášel (2013) state that the revised theories have so many different variables that it is difficult to use (p. 30).

The study used the Technology Acceptance Model (TAM) developed by Davis (1989) as a guide. The foundation for the TAM theory stems from Martin Fishbein and Icek Ajzen's (1980) social psychology "Theory of Reasoned Action" (TRA), which states that there are underlying personal views that motivate a person to take specific types of actions (Ajzen & Fishbein, 1980). The TAM states that in addition to the TRA construct, a person's behavior is influenced by their behavioral intention (BI) to perform the behavior which is influenced by the person's attitude (A) and subjective norm (SN) of the behavior (Davis, Bagozzi, & Warshaw, 1989). They propose that when users are presented with new technology, several factors influence their decision about how and when they will use the technology.

The TAM theory explains the relationship between attitudes and behaviors within human action. Davis postulates that two concepts influence technology acceptance and use (Figure 1.). The idea of perceived usefulness (PU) defined as the degree to which a person believes that using a system would enhance job performance and perceived ease of use (PEOU). The PEOU construct is defined as the degree to which a person believes that using a system would be free from effort (i.e., support, training, and low learning curve). Both PU and PEOU influence behavioral intention, which in turn helps with technology adoption (Davis, Bagozzi, & Warshaw, 1989).

Figure 1: Davis' Technology Acceptance Model



Clinical practice change is hard, and the adoption, even with evidence-based practice, takes a long time. This includes technology implementations. Consequently, researchers look for frameworks to help guide change (Gupta, Boland, & Aron, 2017). The TAM theory was used as a framework to guide this study. The fundamental constructs of the TAM concept of ease of use (e.g., usability) and perceived usefulness (e.g., increased performance) are commonly cited as critical attributes to technology adoption (Kurahashi et al., 2018).

The second theory guiding this study is John Kotter's Leading Change (Kotter, 1996). Kotter states that change is one of the most laborious processes that an organization can undertake. Regardless of the type of change, there will be both direct and indirect resistance. Kotter's Leading Change (Kotter, 1996) addresses how organizations should implement change. His theory maintains that change is a process that takes place as a series of steps that need to be continuously reinforced. In many instances, the changes do not last because organizations fail to go back to repeat the steps in the process.

Kotter's theory (2009) states that there are eight stages to organizations affecting change (Figure 2.).

1. Establish a sense of urgency: need to make sure the leaders understand the importance of the change and more importantly the consequences to not changing.
2. Establish a Shared Vision: A group of leaders who have a shared vision and the power to make the change
3. Create a Change Plan: As a group strategy for realizing the vision.
4. Communication: Over communicate the vision and the process for achieving the vision
5. Empowerment: Empower others to act on the vision
6. Create short term wins: Create wins on items that are easy and are visible to others. Recognize and reward people who contribute to the wins.
7. Consolidate Improvements & produce More change: promote the early wins, find employees who can help with the vision.
8. Institutionalize New Approaches: High-light the connection between the new behaviors and the organizational success.

Figure 2. Kotter's 8 step Model of Change



### 1.6 Problem Statement

Excessive alcohol use has long term adverse effects on people. People who drink to excess or binge drink are at higher risk of personal injury and chronic health conditions such as high blood pressure, heart disease, stroke, and digestive problems (CDC, 2018). Early identification is critical to addressing AUD risks. The primary care setting should screen for alcohol use disorders; however, it is not routinely done (Anderson, O'Donnell, & Kaner, 2017). The logical time to gather pre-visit data is when the patient checks into the clinic and is waiting to be seen by the provider. Technology is an efficient and accurate way to collect information. Paper forms are easily misplaced and require manual entry into the EHR. Using technology ensures that the prescreening gets completed and is part of the chart so that it can be actioned as part of the visit.

## **1.7 Purpose, Specific Aims, and Research Questions**

Though technology use has been implemented in many areas of clinical care, there are still many obstacles to adoption; particularly, when it comes to integrating behavioral health screening with existing electronic health record systems (Matthews, 2017). The purpose of this study was to provide an understanding of the health care provider's perceptions and experiences with technology adoption in AUD and clinical SBIRT interventions. By using an exploratory descriptive methods approach, the goal was to gain a comprehensive understanding of what acts as a facilitator of or barrier to technology adoption in SBIRT in primary care.

**Aim 1: Determine if technology use can increase screening, brief intervention, referral to treatment rates for alcohol related risks for college students.**

**Rationale.** The rationale for the feasibility study was based on the belief that given the prevalence of technology use amongst college students and providers, they would be comfortable using technology as part of the clinical process. However, it was unknown whether the technology would help increase AUD screening as part of the check-in or SBIRT process. The two questions are as follows:

**Q1:** How effective is the use of mobile devices to access the health portal help student's complete alcohol screening? Descriptive statistics measured AUDIT/AUDIT- C screening rates for students using mobile technology (e.g., cell phones, tablets, laptops) to access the health portal that is integrated into the EHR system.

**Q2:** How effective is the use of technology to increase provider SBIRT rates? It was measured by the chart review of the clinician's notes.

**Aim 2: Determine if technology use for AUD screening was easy to use, increased performance, and acts as a barrier or facilitator to adoption in clinical care.**

**Rationale.** The overall aim was to determine if providers and staff view the use of technology in the SBIRT process as helping them provide care to patients under time constrained conditions. Using a quantitative and a qualitative survey allowed us to understand what helped or hindered the use of technology as an intervention in the AUD and SBIRT process. It permitted us to gain insight into physical and psychological factors that help with technology adoption in clinical care.

**Q1:** What are providers' perceived usefulness (PU) and perceived ease of use (PEOU) for EHR integration of AUD and SBIRT screening? The PU construct is defined as the degree to which a person believes that using a system would enhance job performance; whereas, the PEOU construct is defined as the degree to which a person believes that using a system would be free from effort (i.e. support, training, and low learning curve). A questionnaire measuring the TAM constructs were given to the providers and staff that participate in the study.

To test PU and PEOU, a questionnaire from Egea, & González, (2011b) was used with the study participants. Doll, Hendrickson, & Xiaodong (1998) did a factor analysis on the TAM constructs. The intent of the questionnaire was to understand if both the providers and staff considered the integration of AUD screening into the EHR was perceived as being useful and easy.

**Q2:** What are practitioners and staff views EHR technology as a facilitator to identifying and treating college students with high AUD risk? This was determined through a qualitative semi-structured interview of both the providers and staff.

Alcohol is one of the most abused substances in the United States. It accounts for 1 in 10 deaths in adults ages 20-64 years. The economic cost is estimated at \$249 billion (CDC, 2018). Early Identification of AUD risk facilitates AUD interventions and treatment. In the United States, 96% of all Americans own a cell phone. It is widely available technology and would be easy to use to identify and treat AUD related risks in primary care. However, despite the prevalence of cell phone use amongst society, adoption in clinical care is still slow. Highlighting the importance of understanding what factors contribute to technology adoption in clinical care. This research study explored the use of Davis' Technology Acceptance Model and Kotter's Theory of Change as a basis for understanding barriers and facilitators to the use of technology adoption in the AUD screening and the SBIRT process.

### **1.8 Dissertation Format**

The dissertation format departed from the traditional five chapters - Introduction, Literature Review, Methods, Results, and Discussion. Instead, the dissertation contains an introductory chapter, three articles about the study, and the study's aims and methods. Chapter one is an introduction. Chapter two is an integrative literature review titled "Technology Use for Alcohol Screening and Referral to Treatment: An Integrative Review Using the Davis' Technology Acceptance Model" Chapter three presents the studies' methods. Chapter four is an article on the results of the study titled "Electronic Alcohol Screening and Brief Intervention & Referral to Treatment for College Students with Increased Alcohol Use Risk," Chapter five discusses the "Implications of Technology Use for SBIRT in Primary Care." References follow each chapter.

**CHAPTER 2**  
**AN INTEGRATIVE REVIEW USING DAVIS' TECHNOLOGY**  
**ACCEPTANCE MODEL (MANUSCRIPT 1)**

**2.0 Background**

Alcohol abuse is a significant concern in the United States (US). Today in the US, 15.1 million adults ages 18 and older, have been identified as having an alcohol use disorder (National Institute of Alcohol Abuse and Alcoholism [NIAAA], 2018a). The American Psychiatric Association Diagnostic and Statistical Manual (DSM-5) defines alcohol use disorder (AUD) as the inability to stop or control alcohol use (NIAAA, 2018a). Alcohol use disorder is measured by how frequently people “binge” drink. Binge drinking for males is measured through the consumption of 5 or more drinks on one occasion in the past 30 days and four or more drinks for females (NIAAA, 2018a; Substance Abuse and Mental Health Services Administration [SAMHSA]2015). Early identification of alcohol abuse is vital to stemming future issues. Left unaddressed AUD leads to broad health and behavioral consequences later in life (Grant et al., 2015; Kendler et al., 2017).

Interventions used to identify AUD related risks are focused on the use of screening tools to identify problematic drinking (Spithoff et al., 2017). The US Preventive Services Task Force (USPSTF) states there is high certainty that the benefit to screening patients is substantial and recommends “screening for unhealthy alcohol use in primary care settings in adults 18 years or older, including pregnant women, and providing persons engaged in risky or hazardous drinking with brief behavioral counseling interventions to reduce

unhealthy alcohol use” (United States Preventative Services Task Force, 2018). Both screening tools and brief interventions are vital to addressing AUD risks in clinical care.

SBIRT is an integrated approach to the identification of AUD and the delivery of early interventions and treatment. Evidence for the effectiveness of SBIRT for AUD is strong (CDC, 2017b, Rizer & Lusk, 2017). The USPSTF evidence shows that patients who receive screening and treatment as part of their visit have a reduction of alcohol consumption and better health outcomes (United States Preventative Task Force, 2018). However, SBIRT interventions vary across clinical settings, with only 15.4% of providers consistently screening patients (Muench et al., 2015; Rizer & Lusk, 2017).

The steps for any practice are to 1) universally screen all patients; 2) use a validated screening instrument to identify AUD risk; 3) follow up with a brief intervention and a referral to treatment (SAMHSA, n.d.-a). The goal of the brief intervention is for providers to discuss with the patient how excessive alcohol use puts them at risk for further health-related issues (SAMHSA, n.d.-b). One of the implementation barriers cited by providers is the lack of time. If the provider is to do a brief intervention, they need to be able to spend the additional time giving brief counseling. In general, a brief intervention can last anywhere from 5-30 minutes (SAMHSA, n.d.-b). Because of the time required, in primary care, AUD screening frequently gets overlooked or is often inadequately addressed (Kowalski et al., 2018). Providers frequently complain that patient visits are already time constrained. They spend an average 16.5 minutes per patient visit with most of the visit focused on the chief complaint of the patient - leaving minimal time to address other problems (e.g. approximately 1 minute per problem) (McDonald, Rodriguez, & Shortell, 2018; Young, Burge, Kumar, Wilson, & Ortiz, 2018).

As a result, alcohol screening and interventions do not get addressed or do not get enough attention (Kowalski et al. 2018; Young et al., 2018).

Though most primary care offices use an electronic health record system (EHR) (CDC, 2017b), integration of auxiliary screening forms and EHR usability is still a problem (Muench et al., 2015). Having a streamlined process where all information is easy to add or access is important to utilizing time and increasing the AUD SBIRT process (Howe, Adams, Hettinger, & Ratwani, 2018). The EHR system is an essential element towards addressing AUD related risk.

## **2.1 Purpose**

The purpose of this integrative review is to better understand the use of EHR systems and technology used in the AUD SBIRT process guided by the TAM theoretical framework. By understanding the factors affecting technology acceptance in health care practices can incorporate these constructs into their implementation process. The Technology Acceptance Model (TAM) developed by Davis (1989) is based on the theoretical work of Martin Fishbein and Icek Ajzen (1967). The "Theory of Reasoned Action" (TRA) is a social psychology theory which states that there are underlying personal views that motivate a person to take specific types of actions (Ajzen & Fishbein, 1980). The TAM builds on the TRA and proposes that not only is a person's behavior influenced by behavioral intention (BI) to perform the behavior but also is influenced by the person's attitude (A) and their perception of the subjective norm (SN) of the behavior (Davis, Bagozzi, & Warshaw, 1989).

Applying this to technology, they suggest that when users are presented with new technology, the TRA constructs influence their decision about how and when they will

use the technology. The TAM theory explains the relationship between attitudes and behaviors within human action as it pertains to accepting technological change. Davis postulates that there are two additional concepts that influence technology acceptance and use (Figure 1.). The first, perceived usefulness (PU), is defined as the degree to which a person believes that using a system would enhance job performance. The second, perceived ease of use (PEOU) is defined as the degree to which a person believes that using a system would be free from effort (i.e., support, training, and low learning curve). Both PU and PEOU constructs influence behavioral intention, which in turn helps with adoption and actual use (Davis, Bagozzi, & Warshaw, 1989).

This integrative review uses the TAM theory to clarify why EHR technology interventions are either successfully incorporated into practice or not. The usability of electronic health records has been studied; however, not in the context of integrating auxiliary AUD SBIRT screening into the EHR. Using the TAM PU and PEOU constructs questionnaire (Egea, & González, 2011a; Egea, & González, 2011b, Egea, & González, 2011c) as a guide for each study, the author mapped the overall outcomes of each study to each construct (See Table 1.). The PU and PEOU constructs are as follows:

#### **Perceived Usefulness of Electronic Health Care Records System Measure**

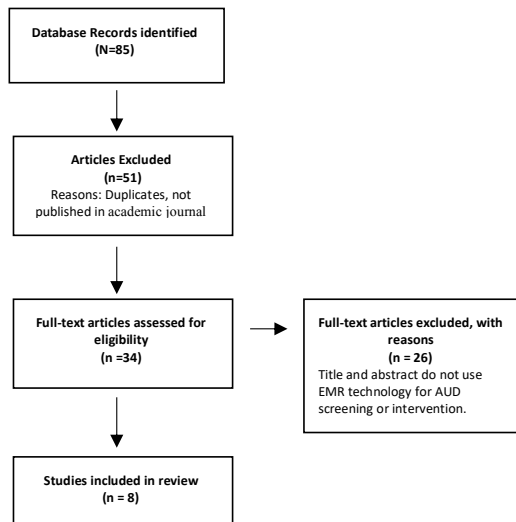
- PU1 Using the EHCR system enhances the effectiveness in the job (e.g., better accuracy and reliability of diagnostic and therapeutic procedures).
- PU2 Using the EHCR system improves the job performance (e.g., greater number of accomplished medical tasks).
- PU3 Using the EHCR system makes it easier to do the job.
- PU4 The EHCR system is useful to the job.

#### **Perceived Ease of Use of Electronic Health Care Records System Measure**

- PEOU1 The interaction with the EHCR system is clear and understandable.
  - PEOU2 Interacting with the EHCR system does not require a lot of mental effort.
  - PEOU3 It is easy to get the EHCR system to do what it needs to do.
- PEOU4 The EHCR system is easy to use.

## **2.2 Search Methods**

An integrative review was conducted in August 2019 using the five steps outlined by Whitemore & Knafl (2005). The steps in the integrative review, problem identification, literature search, data evaluation, data analysis, and presentation (p.549) were used as a framework to evaluate the current literature. The aim of an integrative review is to review both empirical and theoretical research to gain a comprehensive understanding of the problem (Whitemore & Knafl, 2005, p.546). The review also used the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) as a framework to guide the study selection process (Figure 2). Additionally, Davis' Technology Acceptance Model guided the analysis of the review. Given the limited information about technology acceptance in the AUD SBIRT process, each study was reviewed using PU and PEOU constructs developed by Davis. A search of the following seven electronic databases was conducted: Academic Search Premier, Pubmed, PsycINFO, CINAHL Complete, Social Sciences Citation Index, Science Citation Index, Science Direct, and Academic One File. The search consisted of the following combination of keywords in each database 'electronic medical record' or 'EMR' or 'electronic health record' or 'EHR,' and 'alcohol screening brief intervention and referral to treatment.'



**Figure 3.** Flow chart adapted from PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)

### 2.3 Search Results

The literature search yielded 85 articles pertaining to EHR or technology use in alcohol screening and referral to treatment. Given the paucity of information relating to this topic, the authors did not constrain the search to a specified timeframe. Once exact duplicates were removed, the search yielded 34 articles. The inclusion criteria for the studies included 1) studies that consisted of primary research; (2) published in an academic journal; and (3) investigated EHR technology as a platform to screen or provide interventions to reduce alcohol use in clinical care. The researcher reviewed each remaining article’s title and abstract to establish if they met the inclusion criteria listed above, leaving eight articles. A summary of the articles is presented in Table 2.

A total of eight articles were included in the final analysis (Bachhuber et al., 2016; Burdick, & Kessler, 2017; Ghitza et al., 2013; Gotham et al., 2019; Kaiser, & Karuntzos, 2015; McKenna et al., 2013; Muench et al., 2015; Press et al., 2016.). All studies selected evaluated the use of EHR in the AUD SBIRT process. The studies

employed different types of designs. Three were qualitative analyses, which included a review of data elements required in the EHR to effectively screen patients, and a study that wanted to understand attitudes towards screening (Ghitza et al., 2013; Gotham et al., 2019; Kaiser, & Karuntzos, 2015). There were two quality improvement studies that described studies to improve the screening process (Burdick, & Kessler, 2017; McKenna et al., 2013) and two studies that were a quasi-experimental design that studied systemizing the screening process (Bachhuber et al., 2016; Muench et al., 2015). Lastly, there was one observational study that evaluated the EHR workflow (Press et al., 2016). See the matrix of studies in Table 1.

**Table 1. Summary of Articles: Mapped to PU & PEOU Constructs**

#	First Author-Date	Design/Tech	Purpose	Outcomes	Davis' Technology Acceptance Model (PU & PEOU: +positive, - negative)		
					Perceived Usefulness (Increase performance)	Perceived Ease of Use (Low Effort)	TAM Outcomes
<b>EHR BASED WORKFLOW INTERVENTIONS</b>							
1	Bachhuber 2016	Quasi-experimental Design	Integrate clinical decision support tool into practice using EHR & use nurses to screen. Team approach with no funding.	Screening rates increased.	+ Improves Performance  EHR Useful to Screen	-	<p><b>PU.</b> Almost half patients got screened &amp; half received BI creating a win for process. In line with other study results.</p> <p><b>PEOU.</b> <u>Problems with EHR workflow</u> and identifying which nurses or physicians providing screening, brief interventions (SBI) so unable to determine which providers were good with</p>

							providing SBI and which were not.
2	Burdick 2016	QI	Determine steps to successfully integrate clinical decision support (CDS) in the electronic health record (EHR).	Successfully implemented HER interventions.	+ Improves Performance  EHR Useful to Screen	+  EHR Workflow  Easy to Use	<b>PU.</b> Study successfully implemented an EHR-based screening and intervention in multiple practices. Used PDSA quality improvement process to pilot initial process. <b>PEOU.</b> <u>Implementing clinical decision support tools worked.</u> Study shows that successful implementations require that EHR managers and clinical leaders work closely to develop workflow and content.
3	Ghitza 2013	Qualitative	The goal was to develop consensus on SBIRT info in medical settings in vendor EHR products.	Process started but will continue to evolve as more scientific information is released.	-	+ EHR Workflow	<b>PU.</b> Limited published data addressing SUD screening and assessment in general medical settings. <b>PEOU.</b> As science evolves NIDA expects to continue to define and develop common data element relating to SUD treatment.
4	Gotham 2019	Qualitative	The intent of the study was to gain a nuanced understanding	Different themes around implementing SBIRT into	+ Easier to Screening	-	<b>PU.</b> One primary theme was in using the EHR to Implement SBIRT for

			of knowledge, and attitudes towards substance use in family planning providers.	process – EHR theme was viewed as helping the process.	EHR Useful to Screen		screening. It was viewed as helping. <b>PEOU.</b> There is still a fair amount of work to standardize forms and processes. These need to be in place and the entire process needs buy in from all levels across the practice including administrators.
5	Kaiser 2015	Qualitative	Evaluation of the EHR workflow processes in 21 treatment settings	Workflow processes are changing to ensure better delivery	+  Easier to Screening  EHR Useful to Screen	+  EHR Workflow	<b>PU.</b> Found to successfully implement SBIRT into the workflow there should be little variation over different clinical sites. <b>PEOU.</b> Integration of SBIRT data into the EHR is important for success. Once integrated <u>helps the workflow process.</u>
6	Mckenna 2013	QI	The purpose of the study was to develop and implement a consistent process for alcohol and substance abuse SBIRT	Improved screening rates	+  Improves Performance  EHR Useful to Screen	+  EHR Workflow	<b>PU:</b> Much higher screening rate with EHR automation of workflow. <b>PEOU:</b> Mandatory fields inside EHR made for a better workflow and ensure screening happened.
7	Muench 2015	Quasi-experimental Design	Systemizing the screening and intervention process. Created a documentation flow sheet to	Screening rates increased but not brief interventions	+  Improves Performance	-	<b>PU.</b> Screening rates increased but not interventions. <b>PEOU.</b> <u>Problem with EHR</u>

			record completion of the three-step process in the EHR				<u>workflow</u> . Unable to determine if process had been done or if the data hadn't been entered.
8	Press 2016	Observational	Evaluation of systematizing a paper-based AUD screening process to integration into an EHR. The authors did a series of usability studies.	Usability testing needs to be factored into EHR before implementing change process.	-	+ EHR Workflow	<b>PU.</b> Two rounds of usability testing done. First round was didn't increase usability but informed the second round. The second round had positive results.  <b>PEOU.</b> <u>EHR workflow problems</u> identified in first round of testing. Fixed in subsequent changes.

Perceived usefulness in the AUD SBIRT process is the belief that using an EHR technology helps with the ability to screen and help increase the screening rate. Health care providers need to feel that it easy to use and increases their job performance. Two studies Bachhuber et al. (2016) and Muench et al. (2015), employed a quasi-experimental design to determine if integrating screening into the EHR would help increase the screening rates. Both studies explored using different team members to screen patients. In the Muench et al. (2015) study, the staff did the screening, the medical assistants did the assessment, and the providers did the brief intervention. The study focused on systemizing the process and using a team-based approach. Alternatively, in the Bachhuber et al. (2016) study, the nurses lead the screening and brief intervention and referral to treatment; however, all staff members, including the providers were trained on

the new process and gave feedback on the EHR workflow. The results demonstrated that by systematizing the screening process and using a team-based approach, the screening rates increased. Two prevailing themes in both studies were the importance of ease of use and workflow – both require the input of all staff who are part of the SBIRT process. Additionally, future studies should evaluate the model employed in this study of doing SBIRT as a team, yet with nurses being the primary provider in the process.

Burdick & Kessler (2017), designed a quality improvement (QI) study to assess the workflow of integrating behavioral health screening tools into the EHR versus using a paper process. The study used an iterative procedure for implementing the EHR for screening. It took four iterations over 22 months before the EHR was deemed useful for behavior screening. Once the final changes were completed, the view was positive, and screening rates increased; however, this highlights that technology acceptance is not achieved in one step. It is a series of steps that require input from the people using the system.

In an article by Gotham et al. (2019), the authors designed a qualitative study to explore the knowledge and attitudes of providers. The study intended to gain a nuanced understanding of the provider's attitudes towards substance use. The study used focus groups to try and understand the barriers and facilitators to SBIRT. One of the themes to emerge as part of this review was "Using the EHR to Implement SBIRT." The EHR had behavioral health SBIRT tightly integrated into the EHR workflow. It was viewed as helping the process and promoting better screening rates—emphasizing the point that if the workflow is easy to use, providers are more likely to provide AUD SBIRT, which also by default increases job performance.

Another qualitative study by Kaiser et al. (2015) used semi-structured interviews to identify and understand common themes around the workflow processes across 21 treatment settings. Gaining an understanding of what works across settings is one step towards being able to systematize the process. The theme that emerged from the study, almost unanimously, was the belief that sharing best practices were a key to identifying integration strategies. Several sites had developed good practices (e.g., knowledge sharing, information storage workflow in EHR) that were extensible across practices. One prevailing theme was "ease of use" around workflow notification. Providers wanted the system to notify them when SBIRT is needed - a critical EHR step to increase screening.

The last study was a quality improvement study to implement a mandatory SBIRT process into the EHR and to train nurses and social workers on the embedded EHR process. The mandated process had higher screening rates than the nonmandatory approach. The authors recommended additional training for both nurses and social workers to continue increasing compliance and adoption of the SBIRT process. Additional training would help strengthen the utilization of the SBIRT process.

Perceived ease of use in the AUD SBIRT process is the belief that using an EHR technology will require low effort. The QI study by Burdick & Kessler (2017) embedded the SBIRT process into the EHR. As a result, they had 866 screening encounters through the EHR and found that any screening started in the system was completed. Additionally, using the SBIRT EHR tools changed the clinical process. By systemizing the process, it was two times more likely that SBIRT encounters would happen. Similarly, the QI study done by McKenna et al. (2013) inserted the screening into the EHR and had much better

screening rates in comparison to when it was not tightly integrated (e.g., high-lighting effort). This aligns with the TAM theory that if people perceive that using the EHR system is a low effort (i.e., low learning curve) – people are more likely to adopt the technology.

Ghitza et al. (2013) and Kaiser, & Karuntzos (2015) designed qualitative studies to explore the requirements to screen patients through an EHR. The goal is to have all EHR's using the same data process so that all EHR' have the same ontological perspective regardless of the technology used. This is analogous to using clinical guidelines to determine the disease process – providers follow the same guideline independent of the system used. Both studies demonstrate the understanding that by systemizing the process, time, and effort to treat patients go down. Usability is a crucial factor in adoption. When designing systems, workflow, and effort should be accounted for in the implementation process. Press et al. (2016) designed an observation study exploring the usability of an EHR system for behavioral screening. The study had two rounds of testing. The first round was a comparison between using the EHR and the paper-based process. The EHR was deemed as being “not user friendly.” The second round took the revised electronic version and compared it with the first version to determine usability – with improved results. Clinical workflow is one key element to a high PEOU.

## **2.4 Discussion**

A central theme identified from the reviewed studies related to the workflow process for implementing SBIRT using EHR technology. Workflow relating to behavioral screening in primary care is still not well thought out or implemented. Before

undertaking a practice change, the workflow needs to be mapped out and addressed (e.g., determine the roles of each person in the SBIRT process, determine EHR workflow). Included in this is getting buy-in from everyone who will be part of the process (Bachhuber et al., 2016) and making improvements to the process based on their feedback.

The ability to make changes based on usability feedback was a predominant theme in the literature (Kaiser, & Karuntzos, 2015; McKenna et al., 2013; Press et al., 2016). Ultimately, studies that incorporated the feedback into the workflow had positive results, and the process had better performance (Kaiser, & Karuntzos, 2015; Press et al., 2016)—reaffirming that technology acceptance is related to PU and PEOU which in turn helps with adoption and use (Davis, Bagozzi, & Warshaw, 1989). In all the studies, time constraints are listed as the primary issue for not screening. In a time-constrained environment, ease of use is a critical component of adoption (Bachhuber et al., 2016; Burdick, & Kessler, 2017; McKenna et al., 2013). If the perception is EHR screening takes time, adoption is at risk. Highlighting that the implementation team needs to ensure that the factors that contribute to ease of use are part of the system or are implemented as part of the process.

## **2.5 Limitations**

Limitations of this review include the limited number of research articles pertaining to the topic. There were very few articles that addressed EHR technology as a platform to screen or provide interventions to reduce alcohol use in clinical care thus, making it hard to come to a definitive conclusion. Additionally, although the evidence was a mix of qualitative and quantitative research with different design methodologies,

several of the studies had design flaws relating to poor methodology, data collection, and weak study design.

## **2.6 Conclusion**

This integrative review looked at the factors that account for EHR technology acceptance in the AUD SBIRT process. The outcome of this review highlights the importance of understanding factors that contribute to the barriers to and facilitators of technology adoption. Additionally, the findings show that there is a gap in the understanding of how to integrate behavioral health screenings in the primary care workflow and EHR. Time constrained visits remain an issue. Most visits can only address the critical issue or chief complaint of the patient and frequently overlook other areas that need attention or focus. Having a disconnect between the patient, the provider, and the technology adds to the complexity of the situation. It increases the risk of not identifying AUD risks before they become a problem (Kowalski et al., 2018; Young, Burge, Kumar, Wilson, & Ortiz, 2018).

The goal of technology use in clinical care is to increase efficiency and patient care (Greysen et al., 2018). Because of its ubiquitous use and acceptance by both patients and clinicians, (e.g., email, phone calls, video, and text messages), it is believed that technology helps improve clinical outcomes (Bottiger et al., 2015; Mather, Gale, & Cummings, 2017; Ventola, 2014). All eight studies focused on using EHR's to systemize the screening and intervention process; however, in all studies, either explicitly stated or implied there was a theme around "workflow" barriers (Bachhuber et al., 2016; Burdick, & Kessler, 2017; Ghitza et al., 2013; Gotham et al., 2019; Kaiser, & Karuntzos, 2015; McKenna et al., 2013; Muench et al., 2015; Press et al., 2016.). In the future, more

attention is needed on the workflow process when integrating the SBIRT process into the EHR and clinical care.

## **CHAPTER 3**

### **METHODS**

#### **3.0 Background**

Primary health care has been deemed the best place to provide screening, brief intervention, and referral to treatment for alcohol abuse in college-age students. Non-adherence to the suggested recommendations leads to undiagnosed and untreated alcohol use disorder (AUD). Alcohol abuse increases alcohol-related injury amongst college students. Half of all college students admitted to having a blackout relating to the overuse of alcohol. Evidence from previous studies shows that if left unaddressed, there are health consequences later in life (Kendler et al., 2017). Strong recommendations from both SAMHSA and the USPSTF for AUD screening in primary care stand, yet it is still rarely done (Rehm et al., 2016; Young et al., 2018). A barrier frequently cited by primary care practices is the lack of time and the inability to add additional auxiliary screening to each visit (Muench et al., 2015).

Technology use in clinical care is one way to address the issue. However, technology adoption in health care has been slow, with adoption rates even slower in clinical care (Vest et al., 2019). Understanding what factors help in adoption is fundamental to implementing technology in clinical care. The Technology Acceptance Model (Davis, 1989) suggests that there are two constructs that influence adoption. The concept of perceived usefulness (PU) where by using a system, the person believes it would enhance their job performance. The other concept is perceived ease of use (PEOU), where a person believes that the system would be free from effort (i.e., support,

training, and low learning curve). In turn, both constructs influence behavioral intention, which helps with adoption and actual use (Davis, Bagozzi, & Warshaw, 1989).

Data supports the concept of PU being a critical aspect of technology adoption, particularly in alcohol abuse disorder and SBIRT in clinical care. Though providers academically agree with screening in clinical care, for their behavior to change, they need to believe it will be easy to use and increase the screening rates (e.g., increase their performance). There has been much research done on implementing SBIRT in primary care, but most of it focused on how to integrate the process into the EHR (Bachhuber et al., 2016; Burdick, & Kessler, 2017; Ghitza et al., 2013; Press et al., 2016), the EHR workflow (Kaiser, & Karuntzos, 2015; McKenna et al., 2013; Muench et al., 2015), and the attitudes of providers towards AUD screening (Gotham et al., 2019). What is already known about this subject: 1) Systemizing the EHR process and using a team-based approach helps with adoption, 2) To get to a reliable workflow in many instances requires multiple iterations to work out the problems, and 3) attitudes towards SBIRT and technology use influence adoption.

What this study adds is an understanding of what factors help with technology adoption in AUD and clinical SBIRT interventions framed by the TAM theory. The purpose of this exploratory descriptive study is to describe the perceptions and experiences of using technology in behavioral health screening. By using an exploratory descriptive research approach, the researcher aimed to understand the insights of the study participants and what events or experiences helped them with adoption.

The College of Nursing and the University Health Services (UHS) department partnered to implement a technology intervention to identify AUD risk and increase the

SBIRT rate amongst college students. This partnership started with the University of Massachusetts Amherst College of Nursing, which had a three-year grant from Substance Abuse and Mental Health Services (SAMHSA), to train nursing students and health-care professionals in Screening, Brief Intervention, and Referral to Treatment (SBIRT).

The study consisted of two distinct phases – a feasibility study and a pilot study. Feasibility studies are one way to evaluate practice change before undertaking a more substantial change (Bowen et al., 2009). Once the feasibility study finished, the pilot study started. To gain a comprehensive understanding, in addition to the study's iterations, different methodologies were used in each arm of the study. For the feasibility study, the researcher used a retrospective chart review (RCR) to validate the efficacy of the technology intervention, whereas, for the pilot phase, the study employed an RCR in addition to descriptive survey methods to ascertain which EHR strategies work in clinical practice.

### **3.1 Study Phases**

#### **3.1.1 PHASE 1: Feasibility Study**

The feasibility study focused on implementing a mobile technology screening form via the UHS portal and the SBIRT intervention process in clinical care. The screening form implemented titled "Alcohol Use Disorder Identification Test" (AUDIT-C) is a three-question (short form) questionnaire that measures hazardous alcohol consumption. It is scored on a scale of 0-12. The test uses a 5-category Likert scale that assigns points to each answer selected (e.g. a = 0 points, b = 1 point, c = 2 points, d = 3 points, e = 4 points). A higher score indicates that the person is at risk for AUD. In

women, a score of 3 or more and for males, a score of 4 or greater indicates increased AUD risk (SAMHSA, n.d.-a).

Phase one of the study integrated the AUD screening via the UHS portal with the electronic health record (EHR). When checking into the clinic, registrars request that the student's log in to the portal update or complete demographic or insurance information. In the feasibility study, in addition to demographic information, the registrars requested that all students fill out the AUDIT-C questionnaire using a mobile device (e.g., phone, tablet, laptop computer). Once the questionnaire was completed, it automatically saved into the electronic health record (EHR). If completed, the providers were instructed to add a note in the EHR.

One reason for doing a feasibility study before trying to do a broad implementation was related to the clinic's experience implementing their first EHR. With their first EHR, they spent a considerable amount of time on the implementation of an EHR only to find out after going live that the selected platform was not going to work for the department. They quickly switched to a new, friendlier EHR; however, it impacted people's perceptions of technology. The study participants had some reservations on the use of technology but were amenable to using it to screen college students for risky alcohol use.

#### **3.1.1.1 Study Design**

The study design used a retrospective chart review. The purpose was to examine and evaluate whether technology use helped increase the AUDIT-C and the SBIRT process. The underlying belief was that technology use would be embraced and would help increase SBIRT in clinical care. The secondary objective included working through

implementation challenges and any other unforeseen issues. The research question that we set out to answer as part of the feasibility arm of the study was to determine the following:

**Aim 1: Determine if technology use can increase screening and referral to treatment rates for alcohol-related risks for college students.**

**Rationale.**

The rationale for the feasibility study rests on the belief that given the prevalence of technology use amongst college students and providers, they would be comfortable using technology as part of the clinical process. However, it was unknown whether the technology would help increase AUD screening as part of the check-in or SBIRT process.

Aim 1 strives to answer the following questions:

**Q1:** How effective is the use of mobile devices to access the health portal help student's complete alcohol screening? Descriptive statistics measured AUDIT- C screening rates for students using mobile technology (e.g., cell phones, tablets, laptops) to access the health portal that is integrated into the EHR system.

**Q2:** How effective is the use of technology to increase provider SBIRT rates? It was measured by the chart review of the clinician's notes.

**3.1.1.2 Setting**

The setting was the north clinic at UHS. The UHS center is a general medical practice that consists of different clinical areas that focus on different types of health issues. The clinic chosen for the feasibility study was one of the busiest practices. The providers, nurses, and staff who work at the clinic were asked if they would be willing to participate in the study. The researcher had several meetings with the study participants

to prepare them for the study. The meetings also included working with the technology department and the informatics nurse to work through digitizing the screening process and obtaining reports.

### **3.1.1.3 Subjects**

All patients were assigned to see one of the providers participating in the study. For each screening form, there should have been an SBIRT completed in the patient's chart. Patient charts were identified using the provider's name. Review of charts excluded patients seen multiple times in the span of four weeks; otherwise, all students were considered for the study.

### **3.1.1.4 Subject Recruitment and Compensation**

The eligibility requirement to participate in the feasibility study was restricted to the providers who worked in the designated clinic. The study included a physician, an advanced practice nurse, two registered nurses, and two medical assistants. The two nurses had administrative positions as part of the study (e.g., study champions). There was no compensation to subjects for the feasibility study or the RCR.

### **3.1.1.5 Consent process**

The providers who volunteered to participate consented into the study. To ensure that all aspects of the study were ethical and that human subjects were not psychologically, physically, or socially injured as part of this research study, the Institutional Review Board (IRB) at the University of Massachusetts (UMass), Amherst, reviewed and approved the feasibility study. UMass Amherst follows the ethical standards defined in the Belmont Report. The feasibility study was a retrospective chart review (RCR) that did not collect any personal health information (PHI) such as names,

addresses, identification numbers (HHS, 1998). All charts reviewed were reviewed and stored at the University Health Services (UHS) medical records department. The providers that were part of the feasibility study were consented according to the approved IRB consent forms.

### **3.1.1.6 Procedures**

A retrospective chart review of de-identified patients who filled out the AUDIT-C and providers who completed SBIRT was collected from the EHR between the dates of 1/15/2019 through 04/15/2019. The AUDIT- C results and the provider's notes were collected for this study. The University Health Services department on an average day can see approximately 200 patients. Given this information, the researcher anticipated that there would be several hundred records to review. A retrospective chart review was used to determine if the current implementation process was working. The study gathered preliminary data on whether SBIRT screening with EHR technology increased therapy. It reviewed the following:

1. The number of AUDIT- C forms filled out by students using a mobile device (e.g., phone, tablet, laptop computer). The researcher counted the completed AUDIT-C forms.
2. The number of providers who completed SBIRT with students. The researcher counted the number of notes added to the EHR relating to SBIRT.

### **3.1.1.7 Data Analysis**

The researcher collected descriptive statistics (e.g., counts and frequencies) through a retrospective chart review. The feasibility was implemented for three months in 2019. Theoretically, if the feasibility study worked, it was anticipated there would have been a 1:1 ratio between each AUDIT-C questionnaire and the SBIRT process

completed by the provider. Patients who were assigned to be seen by one of the study providers should have a completed questionnaire and a completed SBIRT note in the chart.

### **3.1.1.8 Data & Safety**

As part of the retrospective chart review, the researcher looked at reports with the AUDIT-C results and the clinician's notes. All data were stored within a locked office in the medical records department or on a password-protected computer with the data maintained on a secure UHS server.

### **3.1.1.9 Discussion**

The RCR revealed that 91 patients filled out the AUDIT-C questionnaire, and 14 patients received SBIRT. The study highlighted two critical issues. First, the wait time between getting checked into the clinic and getting placed in a room was not long enough. When each patient completed checking into the clinic, the registrars instructed them to log in to the patient portal with their mobile device to complete two screening forms, the AUDIT-C, and the DAST. A significant barrier identified by the study participants was the lack of time. The time between checking into the clinic and being seen by the provider was, in some instances, not long enough for the patient to fill out the screening forms using the portal. The three-question AUDIT-C is used to identify alcohol use disorder or risky drinking, such as binge drinking by college students. The DAST is a twenty-eight-item instrument used to identify substance use. The DAST was included so that the study could also capture substance use disorder and address it in the SBIRT process. Logging into the portal and filling out the forms take on average 10 minutes. The time needed by each patient varied, so giving each patient a set amount of

time to complete the questionnaires was not feasible either. The providers were already time-constrained, so adding additional time to the overall visit was not an option. As a result, the SBIRT process, in many instances, was not completed.

The second problem encountered was with the technology workflow. The portal functionality embedded the AUDIT-C results into the patient's chart but not into the current visit. The provider needed to remember to exit the visit screen to find the patient questionnaire results in the chart. Before starting the study, the workflow was discussed with the providers and understood. However, the actual implementation of the process was harder than initially anticipated and did not help the providers do SBIRT with patients. The goal when the study started was to have a tightly integrated process where the screening results captured as part of the check-in process get added to the patient's visit information. Given the time constraints, the process of getting out of the patient's chart to look at the results did not work, and as a result, patients left not getting SBIRT.

The feasibility implemented in one of the busiest areas of the clinic sees patients for any non-specialty medical issue. Given the volume of patients seen daily, finding the time to work through implementation challenges was difficult. The feasibility study revealed that the providers and staff were amenable to the new process yet to work through the problems uncovered in the first part of the study – the study needed to move to a slower clinic and change the technology intervention. The women's health clinic was identified as a better clinic to run the pilot study. The new location would give the patients and providers enough time to complete the screening and the intervention. Technology also changed. The feasibility study had the students use mobile technology to log into the EHR portal. The new process used computer kiosks.

### **3.1.2 PHASE 2: The Pilot Study**

The pilot study incorporated changes identified in the feasibility study. One significant change was that the study moved from the general medicine clinic to the women's clinic at UHS. The clinic sees fewer patients allowing the staff and researchers the time to work through implementation steps. Another change was the technology used. The feasibility pilot study had the students use mobile technology to log into the EHR portal. The new process used kiosk patient self-check-in technology. One key difference between the self-check-in module and the portal is that the information populates directly into the patient visit information.

#### **3.1.2.1 Study Design**

The study design used for the second phase of the study consisted of an RCR and descriptive survey research methods. For the pilot study, given there was more time, the screening form changed from the AUDIT-C to the AUDIT. The AUDIT correctly identifies more at-risk drinking, such as low risk, hazardous, harmful, or dependent drinking. The shorter version is limited to identifying only two categories - low or risky alcohol use, which encompasses the other categories which are useful in time-constrained environments (Barber, Higgins – Biddell, Saunders, Monteiro, n.d.). The AUDIT is a ten-item questionnaire that measures hazardous alcohol consumption. Each question has a score ranging from 0 to 4. It is scored on a scale of 0-20. A higher score indicates that the person is at risk for AUD. An AUDIT score that ranges from 8-15 represents a medium level of alcohol risk; whereas, a score of 16 or greater indicates AUD risk (Barber, Higgins – Biddell, Saunders, Monteiro, n.d.). The AUDIT was designed by the

World Health Organization for use in primary healthcare settings to identify harmful, hazardous or likely dependent drinkers (Seth et al., 2015). Like the first study, an RCR was done to verify if the pilot study was working. The RCR examined the charts of patients who filled out the AUDIT questionnaire and the clinician's notes.

However, the second study's purpose was to understand what factors helped with the adoption of behavioral screening in primary care. Specifically, what were the barriers and facilitators to adoption? What were the providers' views on the use of technology relating to "easy to use" and perceived usefulness (e.g., increased performance)?

The pilot used quantitative and qualitative descriptive research methods. The goal was to describe what contributes or detracts from implementing technology intervention in screening for hazardous alcohol use (Vassar, & Holzmann, 2013). For the quantitative survey, the researcher used a technology acceptance survey adapted from Egea & González, 2011 and Davis et al., 1989. Egea & Gonzalez had changed the technology from what Davis (1989) had measured. The researcher used the same questions as Egea & González but changed the technology wording (e.g., EHR). The survey measures the perceived ease of use and perceived usefulness constructs. It was followed up with semi-structured interviews to address perceptions not addressed as part of the quantitative survey.

The research questions that we set out to answer are as follows: For aim one the feasibility study and the pilot study used the RCR to determine if the technology intervention worked. For aim 2, the study used descriptive methods, which are listed below.

**Aim 1: Determine if technology use can increase screening, brief intervention, referral to treatment rates for alcohol-related risks for college students.**

**Rationale.** The research questions that we set out to answer were the same as the first arm of the study. Both studies used the same questions and methods, yet they used different technologies. The RCR was used to determine if kiosk technology worked. The rationale for using self-check-in kiosk technology was that it integrates directly into the patients' visit information in the EHR. This was a critical flaw in the feasibility study.

There are two questions in aim 1:

**Q1:** How effective is the use of mobile devices to access the health portal help student's complete alcohol screening? Descriptive statistics measured AUDIT screening rates for students using mobile technology (e.g., cell phones, tablets, laptops) to access the health portal that is integrated into the EHR system.

**Q2:** How effective is the use of technology increase provider SBIRT rates? It was measured by the chart review of the clinician's notes.

**Aim 2: Determine if technology use for AUD screening was easy for providers to use, increased work performance, and acted as a barrier or facilitator to adoption in clinical care.**

**Rationale.** Given the prevalence of technology use amongst providers and staff, the overall aim was to determine if the providers view the use of technology in the SBIRT process as helping them provide care to patients under time-constrained conditions.

Using both quantitative and qualitative methods allows for an understanding of what helped or hindered the use of technology as an intervention in the AUD and SBIRT

process. Using both methods permitted us to gain insight into what factors might help with technology adoption in clinical care.

**Q1:** What are providers perceived usefulness (PU) and perceived ease of use (PEOU) for EHR integration of AUD and SBIRT screening? Both the PU and PEOU are components of the Technology Acceptance Model (TAM) created by Davis (1989). The PU construct is defined as the degree to which a person believes that using a system would enhance job performance; whereas, the PEOU construct is defined as the degree to which a person believes that using a system would be free from effort (i.e., support, training, and low learning curve). A questionnaire measuring the TAM constructs was given to the providers and staff who participated in the study.

**Q2:** Do practitioners and staff view EHR technology as a facilitator to identifying and treating college students with high AUD risk? This was measured through a qualitative semi-structured interview of both the providers and staff. Qualitative work uses methods to gain insight or describe a poorly understood phenomenon or problem (Sandelowski, 2010). Qualitative design encompasses several different data collections processes. This study used a semi-structured interview guide with study participants (Kim, Sefcik, & Bradway, 2017; Sandelowski, 2010).

### **3.1.2.2 Setting**

For the second phase, the study moved to the UHS Women's Health Clinic. Because it does not have the same volume of patients, it allowed the researcher and the study participants to work through study steps and issues.

### **3.1.2.3 Subjects**

The sample consisted of the providers and staff (n=6). There were two physicians, two family nurse practitioners, one registered nurse, and one medical assistant. The students who came into the women's health clinic to be seen for a health visit but not a procedure (e.g., IUD insertion) were assigned to one of the providers and instructed to complete the AUDIT and were slated to have SBIRT completed. Patients that were seen multiple times in six weeks would only be screened once in that period.

#### **3.1.2.3.1 Recruitment and Compensation**

The eligibility requirement to participate in the pilot study involved the providers and staff who worked in the designated clinic. The two nurses had administrative positions as part of the study (e.g., study champions). Pilot study participants who completed both the survey and interview received a twenty-dollar gift card to the dining facility at the university.

#### **3.1.2.3.1 Consent Process**

The providers who volunteered to participate in the study gave verbal and written consent to participate in the study. To ensure that all aspects of the study were ethical and that human subjects were not psychologically, physically, or socially injured as part of this research study, the Institutional Review Board (IRB) at the University of Massachusetts (UMass), Amherst, reviewed and approved both the feasibility and pilot studies. UMass Amherst follows the ethical standards defined in the Belmont Report. The pilot study included a retrospective chart review (RCR) that did not collect any personal health information (PHI) such as names, addresses, identification numbers (HHS, 1998). All charts were reviewed and stored at the University Health Services

(UHS) medical records department. The semi-structured interview data was stored on UHS secure servers.

## **3.2 Procedures**

### **3.2.1 Retrospective Chart Review**

A retrospective chart review of de-identified patients who filled out the AUDIT and providers who completed SBIRT was collected from the EHR between the dates of 11/01/2019 and 02/14 /2020. Like the feasibility study, the RCR looked at the number of AUDIT forms filled out by students and the number of providers who completed SBIRT. As part of the pilot study, the following steps were followed:

1. The receptionist checked-in the patient.
2. Once done, they instructed all student patients who have either a 15 minute or 30-minute appointment to go to the kiosks to complete the AUDIT and the DAST forms.
3. The students were instructed to check in to the kiosk by tapping their ID card on the card reader or enter their student id number. Once they tap or check-in, the forms were available to the patient to complete.
4. Once completed, the patient let the medical assistant know that they were ready to be seen by the provider.
5. At that time, the medical assistants opened the form into the intake section of the visit note.
6. Once the patient was in the room, the provider opened the SBIRT template in the "plan" section of the EHR and reviewed the results.

7. The provider entered the score into the template and assessed if the patient was at risk for unhealthy alcohol use will receive brief intervention and referral to treatment if appropriate.
8. Referral to treatment included CHP Basics, CCPH – counseling, or another visit with the provider to discuss in more depth the patients' needs. The providers were given a tear-off pad with patient instructions for referrals (Appendix C).

After the pilot data collection process completed, the project participants were given the TAM survey, and the researcher conducted individual semi-structured interviews with the participants.

### **3.2.2 Technology Acceptance Survey**

An eight-item survey that measures the perceived ease of use (PEOU) and perceived usefulness (PU) constructs of the TAM was administered to the study participants (Appendix 2). The survey uses a 5-category Likert scale that ranges from strongly disagree, disagree, neutral, agree, and strongly agree (Egea & González; 2011). The "Perceived Ease of Use of Electronic Health Care Records System Measure" survey was used to assess four PEOU and four PU responses. To test PU and PEOU, the researcher used a questionnaire from Egea, & González, (2011) that was adapted from Davis (1989). When using a survey, both reliability and validity are essential in determining if the tool will give consistent and valid results. The reliability of a questionnaire is defined as the dependability of the survey results. It answers the question of whether the test question measures the constructs consistently, whereas, validity answers whether the constructs measure what they are intended to measure. Internal consistency is measured through Cronbach's alpha reliability score; Cronbach's

alpha ranged from 0 (e.g., no internal consistency) to 1 (e.g., perfect internal consistency) (Tsang, Royse, & Terkawi, 2017). Generally, Cronbach's alpha of at least 0.70 has been suggested to be adequate (Davis, 1989, pg. 327). In a previous study looking at electronic mail (Davis, 1989) and EHR use with physicians (Egea, & González, 2011a), each study attained Cronbach alpha reliability of .97, and .80, respectively.

Two types of validity are essential when considering the use of a questionnaire: content validity and construct validity. Construct validity measures the concept it is intended to measure (e.g., PU and PEOU). Content validity refers to how well the questions represent what it aimed to assess and operationalize (Tsang, Royse, & Terkawi, 2017). Correlation matrices which are used to determine validity, range from coefficients of small 0.1, moderate 0.3, and large as 0.5 (Tsang, Royse, & Terkawi, 2017). The TAM tool correlations were all significant at the .001 level (Egea, & González, 2011; Davis, 1989).

The study's use of the TAM questionnaire was to assess participants PU and PEOU and better understand their perceptions and experiences of using the EHR in the screening process. The questionnaire was used as a qualitative guide to help direct the semi-structure interview questions.

### **3.2.3 Individual semi-structured interviews**

Participants completed semi-structured interviews. The questions created for the semi-structured interview were not based on the TAM survey. The questions primarily focused on the second aim of the study, understanding and describing barriers and facilitators to technology adoption in primary care. The survey consisted of seven open-ended questions with prompts (e.g., probe more into an area). Two questions focused on

ease of use and performance. The remaining five questions originated from items not covered in the TAM (Appendix 3). The goal was to gain a deeper understanding of the participant's perceptions of technology use in SBIRT. The interviews were scheduled for 30 minutes during the participant's break time. Since they are giving up their break, modest refreshments appropriate to the time of the day were provided to the study participants. The interviews were audio-recorded and transcribed verbatim. Throughout the interview process and following, member checking was employed. It allowed participants to re-confirm their responses or amend them if needed (Yates, & Leggett, 2016).

Trustworthiness is a critical aspect of qualitative research (Rolfe, 2006). To be defined as trustworthy, people need to believe that the data collected is honest and adheres to a specific standard. In qualitative studies, Guba and Lincoln (1989) defined trustworthiness as having four components: credibility, dependability, confirmability, and transferability. From a qualitative perspective, credibility aligns with a quantitative view of internal validity; dependability aligns with reliability; transferability aligns with the concept of external validity; and confirmability is related to objectivity or lack of bias of the researcher (Shenton, 2004). In the context of the study, credibility is one of the most important aspects of a qualitative study (Guba & Lincoln 1989). The purpose of credibility is to increase confidence that the researcher has correctly reported the phenomena being studied. Several methodologies can strengthen credibility. One process for increasing credibility is through member checking. Both Guba and Lincoln state that "member checking" is an essential requirement to increase a study's credibility. One process for member checking is to verify the data's accuracy as part of the interview

process. As part of this study, the researcher employed member checking during the interviews. As part of the interview questions prompts were used and additional questions were asked to probe or elicit additional information. Additionally, the researcher had a prolonged engagement with the UHS department, establishing an understanding of the organization, relationships, and trust between the researcher and participants.

Dependability, closely aligned to credibility, states the same methodology and setting would produce similar results. Guba and Lincoln (1989) state that this can be achieved through using “overlapping methods.” The study used both a quantitative survey and qualitative interviews, thus increasing the dependability of the study by using "overlapping methods" (Shenton, 2004).

Confirmability should take appropriate measures to determine that researchers are not biasing the findings from the data. The researcher will provide an audit trail of the data analysis. It will list each step of data analysis so that others can understand the basis for the decisions made. This helps establish that the research study's findings accurately portray participants' responses. As part of ensuring confirmability, the researcher used a qualitative software that has the transcribed participant interviews. Lastly, transferability is dependent on the detail provided from the interviews with the study participants and whether the data can be generalized to a different setting. The ultimate goal was build a shared meaning in understanding barriers of and facilitators to doing SBIRT in primary care.

### **3.3 Data Analysis**

The researcher collected descriptive statistics (e.g., counts and frequencies) through a retrospective chart review (RCR). To analyze the TAM survey, the researcher put all the results into excel and imported it into NVIVO v. 11.4. For the semi-structured interviews, the responses were recorded and transcribed verbatim. Thematic responses were developed and iterated through as part of each interview. This helped the researcher to develop thematic codes that can also be verified by other peer researchers. To help in this endeavor, NVivo v. 11.4, a qualitative software program was used to code the interviews and identify prevalent themes.

#### **3.3.1 Data & Safety**

As part of the retrospective chart reviews, the researcher only looked at the patient's demographics (i.e., age, gender), the AUDIT / AUDIT- C results, and the clinicians' notes. The risk of losing PHI was low. The researcher only looked at reports that had the patient information listed above. Additionally, data from the surveys were stored within a locked office and on a password-protected computer with the data maintained on a secure UHS server.

## CHAPTER 4

### RESULTS: ELECTRONIC ALCOHOL SCREENING AND BRIEF INTERVENTION FOR COLLEGE STUDENTS (MANUSCRIPT 2)

#### 4.0 Background

Today in the United States, 6.1 % of adults 18 and older have been identified as having alcohol use disorder (AUD) (National Institute of Alcohol Abuse and Alcoholism [NIAAA], 2018a). Alcohol use disorder has a wide range of issues. On a macroeconomic level, the burden of AUD in the United States is billions of dollars annually (NIAAA, 2018a). On an individual basis, AUD left untreated leads to chronic health conditions and psychosocial problems. Early identification is a critical step towards stopping these problems (Grant et al., 2015; Kendler et al., 2017).

The U.S. Preventive Services Task Force (USPSTF) recommends screening for unhealthy alcohol use in primary care (United States Preventative Task Force, 2018). Screening, brief intervention, and referral to treatment (SBIRT) is a process that integrates motivational interviewing with a brief intervention or referral for further treatment (CDC, 2017b). SBIRT interventions vary across clinical settings, with only 15.4% of providers consistently screening patients (Muench et al., 2015; Rizer & Lusk, 2017).

Though most primary care offices use an electronic health record system (EHR) (CDC, 2017b), integration of auxiliary screening forms and EHR usability is still a problem (Muench et al., 2015). Providers commonly cite time-constrained patient visits as a critical barrier to screening patients. If the provider is to do a brief intervention, they need to be able to spend the additional time giving brief counseling. In general, a brief

intervention can last anywhere from 5-30 minutes (SAMHSA, n.d.-b). Because of the time required, in primary care, AUD screening frequently gets overlooked or is often inadequately addressed (Kowalski et al., 2018).

The University of Massachusetts Amherst College of Nursing and the University Health Services (UHS) department partnered to implement a mobile technology solution to identify AUD risk and increase the SBIRT rate amongst college students. The purpose of this descriptive study was to describe the perceptions and experiences of using technology for behavioral health screening in primary care. By using a descriptive research approach, the researcher aimed to understand the insights of the study participants and what events or experiences helped or hindered them with adoption.

#### **4.1 Methods**

The study's objectives were to determine: 1) If technology use increases screening and referral to treatment rates for alcohol-related risks for college students and; 2) If EHR technology use for AUD screening was easy for providers to use, increased work performance, and acted as a barrier or facilitator to adoption in clinical care. Two theoretical models guided the study. The first was Kotter's change improvement framework (8- steps to change). Kotter (1996) states that change is one of the most difficult processes that an organization can undertake. His theory maintains that change is a process that takes place as a series of continuously reinforced steps. What was being asked of the providers and staff was to not only change practice but also to embrace the change process. To help the study participants with the change process, the study leaders undertook the following steps listed in Table 2.

Table 2. Kotter's Change Theory

<b>Steps</b>	<b>Change Procedures</b>
<b>Step 1: Increase Urgency</b>	A sense of urgency started with a SAMHSA SBIRT training grant. The importance of practicing SBIRT recognized at senior levels.
<b>Step 2: Build Guiding Team</b>	Addiction specialist brought into train UHS staff. A study team (champions) was formed and a shared vision created with the department. Additional training and meetings to create vision. Inter-disciplinary team created (staff, nurses, nurse practitioners, and physicians).
<b>Step 3: Develop the Vision</b>	Change vision created and shared by study team with department.
<b>Step 4: Communication for Buy In</b>	Several SBIRT meeting sessions with staff and with communication across the department.
<b>Step 5: Empower Action</b>	Involved staff, technology, and clinicians to come up with a process that works – everyone thinking about how to overcome obstacles and their part in the process.
<b>Step 6: Create Short term Wins</b>	Technology change implemented into portal and integrated into the EHR system. Study kicked off in clinic.
<b>Step 7: Don't Let Up</b>	SBIRT results rolled into the new SBIRT process.
<b>Step 8: Make Change Stick</b>	Study team share the results with the department. Keeps periodically reviewing outcomes.

The second theory used was Davis' (1989) Technology Acceptance Model (TAM). The TAM postulates that a person's behavior is influenced by their intention to perform the behavior but influenced by the person's attitude (Davis, 1989). They suggest that when users are presented with new technology, the person weighs the perceived usefulness (PU) and perceived ease of use (PEOU) of the system. Perceived usefulness is defined as the degree to which a person believes that using a system would enhance their job performance. Perceived ease of use is the degree to which a person believes that using a system would be free from effort (i.e., support, training, and low learning curve). Both PU and PEOU constructs influence behavioral intention, which in turn helps with technology adoption (Davis, Bagozzi, & Warshaw, 1989). See Davis' TAM constructs in Figure 1.

#### **4.2 Design**

The study consisted of two phases – feasibility and a pilot study. Each arm of the study was completed over a three-month period. A feasibility study was done first to examine and evaluate factors that might affect the implementation of a technology health-based intervention. Practice change frequently fails because of resistance to change, workflow difficulties, or other unforeseen issues. Feasibility studies are one way to evaluate practice change before trying to make a widescale change. Additionally, they are one way to evaluate the efficacy of different areas of research. Bowen et al. (2009) highlight eight types of feasibility studies:

1. Acceptability: The study explores how well those in the intervention accept the change.
2. Demand: The study looks at how much the intervention is needed or if it would be used.

3. Implementation: It investigates the issues with implementing a change in clinical care.
4. Practicality: It explores whether the intervention can be implemented.
5. Adaptation: It involves making changes to procedures.
6. Integration: It looks at the level of change required to integrate the change into practice.
7. Expansion: It looks at taking an already implemented intervention and expanding it to a different population or setting.
8. Limited efficacy: It explores an intervention in a limited setting with small samples or shorter periods.

The data that was collected from the feasibility arm of the study was a precursor to inform and guide the pilot study. The goal of the first phase of the study was to explore implementation challenges and make the necessary adaptations before starting the pilot.

The study used a multimethod strategy (Table 3.). It used a retrospective chart review, a survey, and semi-structured interviews. An RCR was conducted in both the feasibility and pilot study to determine if the selected technology was working.

Additionally, framed by the TAM theory, the pilot used descriptive techniques to identify the insights of the study participants and the experiences that helped or hindered them with adoption.

Table 3. Multimethod Strategy

Study Phase: Location	Methods	Steps
<b>Feasibility Study:</b> General Practice Clinic	Retrospective Chart Review completed to determine if technology works.	<ol style="list-style-type: none"> <li>1. Students were instructed to use a mobile device to log into the patient portal (e.g., module of EHR) to complete the AUDIT-C screening form.</li> <li>2. The completed form went into the patient's chart in the EHR, but it did not go into the patient's visit information.</li> <li>3. Providers needed to remember to leave the visit screen and go into the patient's chart to review the results.</li> </ol>
<b>Pilot Study:</b> Women Health Clinic	Retrospective Chart Review - completed to determine if technology works.  Technology Acceptance Survey – Measures PU & PEOU Semi-structured Interview – Gather provider insights	<ol style="list-style-type: none"> <li>1. Students were instructed to log in to the computer kiosks in the clinic waiting room to access the EHR self-check-in module. Once logged in, they would fill out the AUDIT-C screening form.</li> <li>2. The completed form went into the EHR and the patient's visit information.</li> <li>3. Providers stayed in the current patient visit screen, yet they needed to remember to look for the results lower on the screen. There was no reminder for this step.</li> </ol>

### 4.3 Setting

At UHS, there are several clinics. For the feasibility phase, the intervention was deployed in general practice. The general practice clinic sees patients for all types of complaints and is one of the busiest practices at UHS. For the pilot phase, the intervention was deployed in the women's health clinics. It is a slower clinic that only treats women's health issues.

#### **4.4. Participants**

The sample consisted of the providers and staff (n=6). There were two physicians, two family nurse practitioners, one registered nurse, and one medical assistant. All participants were female and had a wide variety of health care experience. They all had familiarity with EHR technology.

#### **4.5 Procedures**

Students who checked into the clinic were instructed to complete the AUDIT-C questionnaire using an EHR technology intervention. The screening form that was implemented titled “Alcohol Use Disorder Identification Test” (AUDIT- C) is a three-question short form questionnaire that measures hazardous alcohol consumption. It is scored on a scale of 0-12. The test uses a 5-category Likert scale that assigns points to each answer selected (e.g. a = 0 points, b = 1 point, c = 2 points, d = 3 points, e = 4 points). A higher score indicates that the person is at risk for AUD. In women a score of 3 or more and for males a score of 4 or greater, indicates increased AUD risk.

(SAMHSA, n.d.-a). The goal of the study was to have the screening form completed while the student was waiting to be seen by the provider. Once the screening forms were filled out, the forms would be accessible via the EHR - enabling the provider to do the SBIRT once the patient was in the exam room.

##### **4.5.1 Feasibility Study Procedures**

As part of the feasibility study registrars requested that the student's log in to the portal to complete the AUDIT-C questionnaire using a mobile device (e.g., phone, tablet, laptop computer). Once the questionnaire was completed, it automatically saved into the electronic health record (EHR). Once the patient was in the room, the providers were

instructed to exit the current visit screen and look for the AUDIT-C results in the patient's chart. They would assess if the patient was at risk for unhealthy alcohol use and complete a brief intervention and referral to treatment if appropriate. Referral to treatment included a university "Center for Health Behaviors Basics" program, counseling, or another visit with the provider to discuss in more depth the patient's needs. The providers were given a tear-off pad with patient instructions for referrals (Appendix C).

#### **4.5.2 Pilot Study Procedures.**

Similarly, the registrars in the women's health clinic instructed all patients who had either a 15 minute or 30-minute appointment to go to one of the computer kiosks to complete the AUDIT forms. The students were instructed to check in to the kiosk by tapping their ID card on the card reader or by entering their student id number directly into the computer sign in screen. Once they tap or check-in, the forms were available to the patient to complete. Once completed, the patient let the medical assistant know that they were ready to be seen by the provider. At that time, the medical assistants opened the form into the intake section of the visit note. Once the patient was in the room, the provider opened the SBIRT template in the "plan" section of the EHR visit and reviewed the results. The provider entered the score into the template and assessed if the patient was at risk for unhealthy alcohol use will receive brief intervention and referral to treatment if appropriate. The referral to treatment process followed the same procedures as the feasibility study.

#### **4.6 Data Collection**

At the end of the pilot, the project participants were given the "Perceived Ease of Use of Electronic Health Care Records System Measure" survey to assess four PEOU and four PU responses. The survey by Egea & González (2011) is an eight-item questionnaire based on Davis' TAM theory. It measures the perceived ease of use (PEOU) and perceived usefulness (PU) constructs of the TAM. Both reliability and validity are essential in determining if the tool will give consistent and valid results. Generally, Cronbach's alpha of at least 0.70 has been suggested to be adequate (Davis, 1989, pg. 327). In a previous study looking at electronic mail (Davis, 1989) and EHR use with physicians (Egea, & González, 2011), each study attained Cronbach alpha reliability of .97, and .80, respectively. Correlation matrices which are used to determine validity, range from coefficients of small 0.1, moderate 0.3, and large as 0.5 (Tsang, Royse, & Terkawi, 2017). The TAM tool correlations were all significant at the .001 level (Egea, & González, 2011; Davis, 1989).

In the pilot, because survey items are not always able to completely capture the assessed concepts, individual semi-structured interviews followed. There were two questions specifically focused on the TAM constructs. The intent of the questions was to gain a richer understanding of what the participants felt helped with ease of use and perceived usefulness. Additionally, the interview intended to identify and gain a deeper understanding of the study participants' insights and the experiences that helped or hindered them with adoption. The themes are presented in Table 4.

Table 4. Main Interview Themes & Sub-themes

Change Approaches
Change Process
Training
Peer to Peer
Barriers to Adoption
Time Constraints & Technical Support
Workflow
Resistance to Technology
Facilitators to Adoption
Pilots
Seamless EHR Integration

#### 4.7 Data Analyses

For both phases of the study, the researcher collected descriptive statistics (e.g., counts & percentages) through a retrospective chart review. Both studies were implemented for three months in 2019 - 2020. Theoretically, if the technology intervention worked, there would be a 1:1 ratio between each AUDIT/AUDIT-C questionnaire and the SBIRT process completed by the provider. Patients who were assigned to be seen by one of the study providers should have a completed questionnaire and a completed SBIRT note in the chart. Semi-structured interviews followed this. The providers and the staff were digitally recorded, and the interviews were transcribed and uploaded into a qualitative analysis software NVivo 11.4. All interviews were coded

paragraph by paragraph. Themes were developed using an inductive approach were the themes evolved from the data.

#### **4.8 Ethics**

To ensure that all aspects of the study were ethical and that human subjects were not psychologically, physically, or socially injured as part of this research study, the Institutional Review Board at the University of Massachusetts Amherst, reviewed and approved the study. All information reviewed were stored at the University Health Services medical records department and on university secured servers. The study participants were consented according to the approved IRB consent forms.

#### **4.9 Results**

##### **4.9.1 Retrospective Chart Review**

The retrospective chart review was used to understand if the technology intervention worked. If the intervention was successful, there would have been a 1:1 ratio for the patients who filled out the AUDIT/AUDIT-C questionnaire and the brief intervention process. In the feasibility study, 91 students completed the screening questionnaire, and 14 interventions were completed. In the pilot study, 96 students completed the screening questionnaire, and 31 brief interventions were completed (Table 5). The percent difference in the screening rate was 4.4%. The main difference between the two phases of the study was the use of kiosks instead of mobile devices.

The brief intervention rate doubled, yet the numbers did not reflect a 1:1 ratio between the screening and brief intervention rates. Out of 23 students whose AUD risk was medium to high, only 52% received a brief intervention (Table 6). Additionally, 17.4% of students whose AUDIT score was eight or greater did not get a brief

intervention at all. The results highlight that the workflow requires more attention. The key difference between the feasibility and pilot study was that the screening results populated directly into the patient's visit making it easier for providers to do the intervention; however, it requires more work.

**Table 5**

**RCR Study Results**

<b>Study</b>	<b>AUDIT Screening</b>	<b>Brief Intervention</b>
<b>Feasibility</b>	91	14
<b>Pilot</b>	96	31

**Table 6**

**SBIRT Rates of Pilot Study**

<b>AUDIT Scores</b>	<b># Patients</b>	<b>% of Patients</b>	<b>Brief Intervention</b>	
			<b>Not Completed</b>	<b>Completed</b>
0	20	21%	20	
1	10	10%	9	1
2	7	7%	6	1
3	11	11%	10	1
4	11	11%	6	5
5	8	8%	4	4

6	6	6%	4	2
7	7	7%	2	5
8	5	5%	2	3
9	2	2%		2
11	1	1%		1
12	8	1%	1	
14	1	1%		1
15	1	1%	1	
16	2	2%		2
18	1	1%		1
20	2	2%		2
	96	100%	65	31

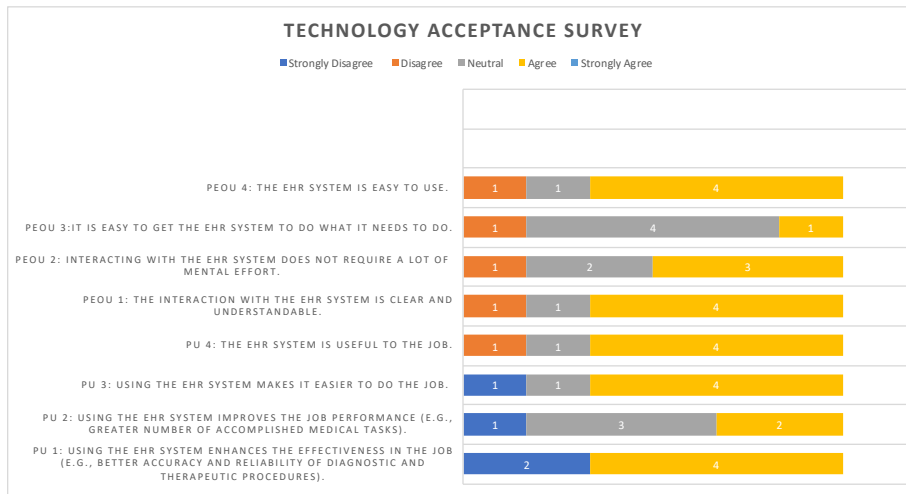
Scores: 8 – 15 = Medium AUD risk, 16 – 20 = High AUD risk

#### 4.9.2 Technology Acceptance Model Survey

The project participants were given the "Perceived Ease of Use of Electronic Health Care Records System Measure" survey to assess four PEOU and four PU responses by Egea & González (2011). Perceived usefulness is the belief that using an EHR technology helps with the provider in the clinical process; whereas, perceived ease of use measures if the providers believe using the EHR increases their performance (e.g. does it help them with job performance). The survey is an eight-item questionnaire that uses a 5-category Likert scale that ranges from strongly disagree, disagree, neutral, agree, and strongly agree (Egea & González; 2011).

The participants were asked to rate each question according to the scale (Figure 5). Four out of the six participants selected agree to five of the eight questions indicating a generally positive attitude towards EHR PEOU and PU. For questions PEOU 2, PEOU 3, and PU 2, the participants chose either a neutral, disagree or strongly disagree category, indicating that EHR PEOU and PU still has technology acceptance problems. No respondents chose strongly agree.

**Figure 5.** Technology Acceptance Survey Results



### 4.9.3 Semi Structured Interviews

The semi-structured interviews, aimed at understanding barriers, facilitators to technology adoption, perceived usefulness, and perceived ease of use were completed with all participants. An inductive approach was used to derive the themes. Inductive analysis allows the data to drive the emerged themes. The themes that emerged highlight the importance of understanding the provider's insights relating to technology adoption in clinical care. The largest theme to emerge, barriers to adoption, relates to the TAM constructs. They highlight that system changes that are easy to implement, and are easy

to use, help people with practice change. The themes and subthemes are described in more detail below.

#### **4.9.3.1 Change Approaches**

Other considerations when implementing change in clinical care are different approaches related to issues in practice change. The participant gave two examples. She explained a bottom-up approach, where changes are implemented in one area, before pushing it out broadly (e.g., use of peer champions). She told a story about a provider trying to implement additional patient exam questions as part of the visit. She wanted all the clinics to add the questions. She explained, that though the questions are evidence based getting providers to buy in to the change was difficult.

Top-down is another approach to change. The leadership decides on the change and pushes it down to the organization. The participant explained that the top-down approach had its challenges too. Under the direction from the leadership team, prior technology solutions were implemented. She stated, "Some of the similarities have to do with the push back." Though practice change was instigated from management, ultimate acceptance was just as complicated. She explained that the frustration levels in both scenarios revolved around practice change. However, in the top-down scenario, although it was successfully implemented and had positive patient feedback, buy-in remains an issue. She ended by saying that change, whether it is bottom-up or top-down, faces challenges, yet she still thinks that peer buy-in is much more critical.

#### **4.9.3.1.2 Training**

The people interviewed as part of the project reported that change was difficult. They shared insights into prior changes undertaken in the clinic. One example they

talked about was their previous EHR. They went through the implementation only to immediately change it out. Two of the providers high-lighted the importance of training. Both providers stated that it is particularly relevant when trying to roll out a new process. Change needs to be reinforced by training. One stated, “I think you need to train, and then train again, and then train again.”

One of the providers mentioned that project teams need to recognize that everyone is at different levels. Like teachers recognizing the different needs of students in a class, training needs to reflect the different needs of the participants. “It is like a class for first through sixth graders ... the first graders are like, I don't know my letters, and the sixth graders are reading chapters in books. Everyone is at such a different level of what they understand.”

#### **4.9.3.1.3 Peer to Peer**

The use of peers is critical in the change process. Peers discussing how they modified their practice resonates with others; particularly, in how it relates to the workflow. The participant, who had gone through several technology changes, explained that the key to any change was to have people with experience act as a change ambassador. She explained, "I think that the first thing is to get those providers to talk to their peers ... here's data. Have them talk about how they implemented it into their workflow and how it changed or didn't change their workflow. If it changed, was it a positive change, or did it cause more work, you know?" Being able to discern if the change was positive is a significant factor towards enabling change, and the obstacles faced. She went on to say, "I think the people to ask are the biggest champions. They

can share it with their peers because that really must be the next step. It is like here is what we did in our clinic. Here is how you could, you know, do it in the other clinics."

#### **4.9.3.2 Barriers to Adoption**

##### **4.9.3.2.1 Time Constraints & Technical Support**

Change by itself is hard, but without adequate technical support and time, it is even harder. One participant said, "I think for us it's a matter of we only really have one person here who gets the EHR ... So, one person can only, you know, do so much. Additionally, it is hard to undertake changes when the patient volume is high, and time is constrained. One participant explained it this way, "I think the biggest issue is just time...I think walk-in would be the ideal place to screen people but the volume is so high that we're just trying to get through the patients as quickly as we can and deal with the problem that they are there for."

Perceived usefulness in the AUD SBIRT process is the idea that the EHR technology is easy to use, and by default, easy to screen patients under time-constrained conditions (Bachhuber et al., 2016; Muench et al., 2015). The participants highlighted the issues with a lack of technical support and time, an indirect way to highlight system complexity.

##### **4.9.3.2.2 Workflow**

During the interviews, the participants tended to focus on issues relating to the EHR workflow, but they also tended to focus on the general issues with the EHR clinical workflow. In two cases, it was the lack of notification and having to remember to look for results "Like remembering to look at the screen is the other part of it. I mean you must get used to it. Try to remember that it is there and that they've done it. I think like

over time, you do it enough, and it will just become part of your second nature or whatever. It's kind of what you do, but I think it's hard to have enough time to do that." Another provider stated "We get a note, as part of patient intake. I have to scroll down to see that they did the AUDIT, so I don't even see it when I'm doing my note." A similar example given by another provider states, "you go back, look and notice like oh shoot, I didn't do it. That's too bad. It happened for every single one yesterday. There was a day, one day, that I for some reason, I had it on my mind and I probably caught three quarters of them."

Workflow impacts usability and perceived usefulness. A couple of the providers stated that the EHR workflow in the clinical process is critical to perceived usefulness. One of the providers stated that by not having the EHR force a specific workflow, it impacts the system's usefulness. She cited a common issue with medication reconciliation, "I have a med on the medication list yet, it doesn't have a problem or a medical reason why they're on it." She suggested that the EHR should force the provider to add a problem to the medication so that the next time the patient comes into the clinic, the medication list will reflect the actual medical reason. Another participant described the EHR as being very basic and not having a unique workflow process. She stated that having the ability to track and follow patients easily is critical to ease of use and increasing performance.

#### **4.9.3.2.3 Resistance to Technology**

One participant compared the EHR to a paper form. "If it was in paper form, it's something that will be physically handed to me, which I can review versus the technology form they don't transfer it over." Another participant when asked if they

considered helping them do their job answered, "I think it moderately hinders and a little bit helps, it slows us down. There is no question." Another participant had a similar response. She had terrible experiences during two EHR implementations, citing EHR's cause disruption to the patient's workflow process and negative consequences to patient care.

#### **4.9.3.3 Facilitators to Adoption**

##### **4.9.3.3.1 Pilot Studies**

The participants interviewed in this study believed that the screening process would take additional time and cause the clinic to get behind in their daily schedule. In one of the pre-meetings, the participants had shared their concerns in maintaining daily schedules. During the interview, a couple of participants raised the topic. One participant commented, "I think the pilots are super important because then staff can report out and say it didn't add to our workload, and we thought it was going to impact what we did, but it didn't do that."

##### **4.9.3.3.2 Seamless EHR Integration**

The participants who viewed EHR's as facilitating their work had a favorable view of how it integrated into their workflow. Prior EHR experiences impact current EHR views. One provider had worked at a health center that had a difficult EHR. She responded, "You know, I found the EHR here to be seamless and easy. At my other practice ... getting results was not very seamless. One thing I like about here, it is all in the same place. You get your imaging from the same place; It's a tight integration. So, it is much easier here." Another provider stated, "yeah, I think the EHR is helpful. I like having access to see the patient's records or being able to, for example, like if they're in

the hospital, being able to log into the hospital portal and see everything. It makes things more seamless."

#### **4.10 Discussion**

Both feasibility and pilot studies are essential in testing the methodology before broad implementation. Both types of studies help address potential implementation problems beforehand. In addition to working through the technical issues, the studies also explore the practicality of the proposed solution. It answers the questions about whether it would work, and the steps required to amend the process before undertaking the final implementation. These are basic methods to engage in before undertaking evidence-based practice change. Adaptation strategies identified in advance of large-scale change - save time and money.

The expected outcome of the feasibility portion of the study was that the use of technology to screen for AUD would increase SBIRT in clinical care. The outcome of the study shows that unless the technology is easy to use and tightly integrated into the EHR, the change will not be adopted. If each practitioner is allocated 15 minutes for a patient visit, addressing this issue within the allotted time frame is a real challenge and is a barrier to adoption.

#### **4.11 Strengths & Limitations**

The multi-strategy methodology was a strength of the study. It helped the researchers to identify problematic technological interventions early in the implementation process. The advantage of using this strategy include; the ability to address design challenges, organizational viewpoints, and resistance to change problems, while at the same time searching for innovative ways to identify and increase AUD SBIRT in primary care. By

using descriptive multimethod strategies, the researcher identified new ways to approach established ideas and EHR solutions, particularly as it relates to behavioral health screening in primary care.

The study has several limitations. The study carried out with a small group of individuals, were all female. It does not reflect a male viewpoint, so we were unable to offer a gendered comparison. This is an area for future research. Additionally, the study was done in a university healthcare setting, and while we were able to gain insights, the study findings are not generalizable to all primary care practices. Future work could explore different healthcare settings. A different health care setting may determine whether inherent bureaucracy based on the environment is a factor in technology adoption in clinical care. Lastly, future research should explore the workflow as part of the study. Understanding how workflow helps or hinders behavioral health screening in primary care is understudied. Given how dominant mental health issues are in society, primary care is a great place to help identify and address issues.

#### **4.12 Conclusion**

The purpose of this study was to provide an understanding of the health care provider's perceptions and experiences with technology adoption in AUD and clinical SBIRT interventions. Results from the study confirm previous research: resistance to technology change, EHR workflow, and time constraints - remain unsolved issues. These findings suggest that more work is needed to systematically address each of these issues in primary care for the adoption of AUD SBIRT to be successful.

**CHAPTER 5 – DISCUSSION:**  
**IMPLICATIONS OF TECHNOLOGY USE FOR SBIRT IN PRIMARY CARE**  
**(MANUSCRIPT 3)**

**5.0 Background**

Technology is a broad term that encompasses a range of technologies. In health care, we talk about technology use primarily with the electronic health record in mind. Some people argue that it is one of the most critical types of technology in a health care setting. However, it is just one of many technological advances to impact clinical care. Mobile devices and auxiliary technologies such as web-based portals have an essential role to play as well. A mobile device is a term that refers to computers that can be transported and used in any location. They have a wide range of uses that encompass functionality such as calling, texting, emailing, internet searching, video, sensors, and mobile applications (Tai, Wu, & Clark, 2012).

In the United States, 14.4 million adults ages 18 and older were diagnosed with alcohol use disorder (SAMHSA, 2017). Almost 10% of college students ages 18-22, reported heavy alcohol use within thirty days (SAMHSA, 2017). Screening and brief interventions are critical to stemming future AUD related issues. Technology is one way to increase screening in primary care. Though technology use, implemented in many areas of clinical care, is touted as being useful, there are still many obstacles to adoption. Particularly, when it comes to integrating behavioral health screening with existing electronic medical record systems (Matthews, 2017).

The purpose of this study was to provide an understanding of the health care provider's perceptions and experiences with technology adoption in AUD and clinical

SBIRT interventions. By using a descriptive methods approach, the goal is to gain a comprehensive understanding of what acts as a facilitator of or barriers to technology adoption. This article includes a discussion of the findings and the related literature. The study attempted to answer the following research questions: (a) Determine if technology use can increase screening, brief intervention, referral to treatment rates for alcohol-related risks for college students, and (b) Determine if technology use for AUD screening was easy to use, increased performance, and acts as a barrier or facilitator to adoption in clinical care.

## **5.1 Methods**

This study used a multimethod strategy to help understand what factors help in technology adoption in clinical care. The study consisted of two distinct phases – feasibility and a pilot study. One standard definition of feasibility and pilot studies suggest that feasibility studies occur earlier in the research process, whereas, pilot studies are a miniature version of the more extensive study (Eldridge et al., 2016). The feasibility study evaluated practice change before the pilot study. It answered questions relating to the pilot study's viability. For both the feasibility and pilot study, a retrospective chart review validated the efficacy of the technology intervention. Additionally, the pilot study employed descriptive survey methods to ascertain which EHR experiences and perceptions providers viewed as helping the SBIRT process in primary care.

### **5.1.1 Study Setting & Participants**

All data were collected at the University of Massachusetts, Amherst Health Services department (UHS). The UHS department, comprised of several clinics, treats approximately 31,000 students a year. They use an electronic health record (EHR) system called Mediat. This is their second EHR; the first was implemented and almost immediately changed to the current platform. Like other EHR's, it records auxiliary test results (e.g., lab test, x-ray, immunizations) and patient visit information. Additionally, it has self-check-in and portal technologies. The study consisted of two phases: a feasibility and a pilot study. The first was in general medicine – one of the busiest clinics, whereas, the second was in the women's health clinic. It is a slower clinic that only treats women's health issues.

The researcher used direct recruitment methods (e.g., participants were asked) with the UHS health care team to gain study participation. Interest in participating stemmed from a lengthy partnership between the University of Massachusetts Amherst College of Nursing and the University Health Services (UHS) department to train healthcare providers in SBIRT. The sample consisted of female providers and staff (n=6). The participants, consisting of two physicians, two family nurse practitioners, one registered nurse, and one medical assistant, had a wide variety of health care and EHR experience.

### **5.2 Data Collection**

The researcher gathered data for each phase of the project over three months between January 2019 and February 2020. To ensure that all aspects of the study were ethical and that human subjects were not psychologically, physically, or socially injured

as part of this research study, the Institutional Review Board at the University of Massachusetts Amherst, reviewed and approved the study. The study participants consented according to the approved IRB consent forms.

The Technology Acceptance Survey and semi-structured interviews (N=6) were conducted to gather participants' perceptions and experiences with EHR technology and SBIRT in clinical care. All data and were digitally recorded and transcribed verbatim. All information reviewed was stored on university secured servers.

### **5.3 Data Analysis**

For both phases of the study, the researcher collected descriptive statistics (e.g., counts & percentages) through a retrospective chart review to determine if the technology intervention worked. Theoretically, there should be a 1:1 ratio between each AUDIT questionnaire and the SBIRT process completed by the provider. Additionally, each participant was given a Technology Acceptance Survey to determine their perceptions on the perceived ease of use (e.g., low effort) and perceived usefulness (e.g., increased performance) of the EHR platform. The survey is an eight-item questionnaire that uses a 5-category Likert scale that ranges from strongly disagree, disagree, neutral, agree, and strongly agree (Egea & González; 2011). Semi-structured interviews followed the TAM survey. The providers and the staff were digitally recorded, and the interviews were transcribed and uploaded into a qualitative analysis software NVivo 11.4. All interviews were coded paragraph by paragraph.

### **5.4 Summary of Findings**

The participant's technological outlook, based in part, on past experiences highlights a discomfort with change and disruptive technologies. However, it also highlighted

through the "Technology Acceptance Survey" the participant's thoughts towards the EHR's perceived ease of use and perceived usefulness. Provider's views were overall positive towards the effort it takes to use the EHR and the view that it helps them to do their job. Additionally, the themes that emerged from the participants interviewed for this study reflect their diverse experiences and perceptions with change and technology use in clinical care. They are covered in more detail below.

## **5.5 Discussion**

Undertaking alcohol use disorder SBIRT in primary care is critically important to stemming future alcohol problems. However, providers argue that they have difficulties getting through the patient visit in the allotted time. We suggest in this study that by using EHR technology, providers should be able to do more in the same amount of time. One technology, commonly used in practice, yet underutilized is the EHR. People's perceptions and experiences around "ease of use" and "usefulness" of the system vary. To understand what factors, help or hinder adoption and exploit the use of technology, we need to understand clinician's views. The information reported in this paper represents these views. The study used a multi-method strategy to capture information relating to technology use, technology acceptance; especially, perceived ease of use and perceived usefulness, and provider's overall perceptions and experiences.

### **5.5.1 Retrospective Chart Review**

One of the primary objectives of the study was to determine if technology use can increase "screening, brief intervention, referral to treatment" rates for alcohol-related risks for college students. We found that by using a retrospective chart review (RCR), we could determine if students were completing the AUDIT screening and if providers

were doing SBIRT in clinical care. The feasibility results of the RCR uncovered that 91 students completed the AUDIT questionnaire, and providers completed 14 SBIRT. The results uncovered issues with the EHR technology and the overall workflow. In the pilot study, 96 students completed the screening questionnaire, and 31 interventions were completed. For the pilot study, the providers' intervention rate doubled. The primary difference between the two phases of the study was as follows: (Table 7.)

Table 7. Study Details

Study Phase: Location	Steps
<p><b>Feasibility Study:</b> General Practice Clinic</p>	<ol style="list-style-type: none"> <li>1. Students were instructed to use a mobile device to log into the patient portal (e.g., module of EHR) to complete the AUDIT-C screening form.</li> <li>2. The completed form went into the patient's chart in the EHR, but it did not go into the patient's visit information.</li> <li>3. Providers needed to remember to leave the visit screen and go into the patient's chart to review the results.</li> </ol>
<p><b>Pilot Study:</b> Women Health Clinic</p>	<ol style="list-style-type: none"> <li>1. Students were instructed to log in to the computer kiosks in the clinic waiting room to access the EHR self-check-in module. Once logged in, they would fill out the AUDIT-C screening form.</li> <li>2. The completed form went into the EHR and the patient's visit information.</li> <li>3. Providers stayed in the current patient visit screen, yet they needed to remember to look for the results lower on the screen. There was no reminder for this step.</li> </ol>

Overall, the results captured as part of the RCR met the expectations of the study. We had posited that both students and providers would use technology to complete the AUD SBIRT process. The RCR was used to ascertain whether the technology intervention was working. In the feasibility study, it highlighted critical flaws with both the EHR technology and workflow and gave us information for the pilot study. By using an RCR, we could ascertain whether the technology intervention was working. The use of RCR is a widely used methodology in research. Retrospective chart reviews are an excellent method to use in pre-studies, which are a pared-back version of the full research study and are commonly used to assess a study's design and methodology before rolling out widely (Vassar & Holzmann, 2013).

### **5.5.2 Technology Acceptance Survey**

The objective of using the Technology Acceptance Survey was to determine if technology use for AUD screening was easy to use and increased performance in clinical care. The survey, which measures the provider's perceptions of the perceived ease of use (e.g., low effort) and perceived usefulness (e.g., increased performance) of the EHR platform, is overall viewed positively. However, for three of the questions, respondents did not select agree or strongly agree, indicating EHR acceptance issues in any areas. The results from the semi-structured interviews further reinforced this viewpoint.

Participants did not view the EHR system as improving their job performance (e.g., a higher number of accomplished medical tasks). One of the providers described how difficult it was to do a follow up on a patient that another provider had previously

seen. It would require her to scroll through the notes to determine what the patient was seen for previously. In the interim, wasting the assigned time and forgetting to do SBIRT with the patient. Similarly, providers indicated that interacting with the EHR system required much mental effort. The provider focused on the chief complaint of the patient, would need to remember to look for the patient's AUDIT results to do SBIRT. There was nothing to flag them to look at the results – requiring them to use mental effort under time-constrained conditions.

Finally, the respondents did not think it was easy to get the EHR system to do what it needs to do. In one example, the participant suggested that a paper chart was far more convenient, a provider only had to check the box, whereas, in the EHR, it required extra clicks to get to the same point. These findings suggest that more work is required in making the EHR usable before implementing a practice change. Customizing the EHR and reducing cognitive effort is crucial to adoption. The issue with EHR usability is not a new problem. Poor EHR usability has been well studied and remains a prevalent issue with EHR adoption by health care providers (Kaipio et al., 2020; Ratwani, Fairbanks, Hettinger, & Benda, 2015).

### **5.5.3 Semi-Structured Interviews**

The qualitative semi structured interview work was done to determine if technology use for AUD screening acts as a barrier or facilitator to adoption in clinical care. Several themes and sub-themes emerged from the interviews.

#### **5.5.3.1 Change**

A prevalent theme that emerged was difficulty with change. The interviews indicate that participants are uncomfortable with change instigated either ‘top-down,’

where change is initiated from senior leadership or ‘bottom-up,’ where change comes from peers. Regardless of who initiates the change, the outcome may be different, but the support of the change is not. Both types of change initiation are met with resistance. Kotter’s *Leading Change* (1996) states that organizations commonly show resistance.

Change regardless of whether it is ‘top-down’ or ‘bottom-up’ is hard for people. The key to change, creating urgency amongst colleagues, is to help them identify with why the change is essential (Burden, 2016). The study participants identified two change subthemes that help with change: training and peer champions. Recursive training, training that keeps happening, was highlighted as a method to help people embrace change. Participants felt that extensive recursive training helped by continuously raising awareness. The use of peer champions also helps people to accept change. This theme is consistent with other change research (Young, 2018). By peer champions disseminating change information, they can influence others by sharing their experiences and by collaborating on practice change (Young, 2018).

### **5.5.3.2 Barriers & Facilitators to Adoption**

Barriers and facilitators to technology adoption is a prevalent theme in the literature. Commonly cited as barriers are time constraints, workflow, technical support, and resistance to technology change (Bachhuber et al., 2016; Burdick, & Kessler, 2017; Ghitza et al., 2013; Gotham et al., 2019; Kaiser, & Karuntzos, 2015; McKenna et al., 2013; Muench et al., 2015; Press et al., 2016). These themes align with the subthemes that emerged in the semi-structured interviews.

Time constraints and workflow were predominant themes for resisting change in primary care. Studies show that providers, on average, have 16.5 minutes to spend with a

patient (McDonald, Rodriguez, & Shortell, 2018; Young, Burge, Kumar, Wilson, & Ortiz, 2018). Therefore, any technology intervention introduced into practice needs takes this under consideration. Mapping the workflow in advance to understand the effects of the change is a crucial first step. During the interviews, the participants focused on issues relating to the EHR workflow and its impact on patient care. For example, participants stated that having to remember to look for results without a reminder or an alerting mechanism is not realistic. This highlights the importance of mapping the workflow in advance of implementing a workflow change. It is one strategy for detecting problems early.

Research shows that to implement change, there needs to be adequate team support. Different approaches can be taken to address this issue. One approach is by creating implementation teams that focus on supporting the people undertaking the change (Muench et al., 2015). In the Muench et al. (2015) study, the staff did the screening, the medical assistants did the assessment, and the providers did the brief intervention. The study focused on systemizing the process and using a team-based approach with positive results. One area that needs to be strengthened is information technology support. In addition to the healthcare team, information technologist needs to be a predominate part of the team. In the case of this study, IT was a component of the team but only on a part-time basis. In the future, more research is needed to determine the best strategy for including fulltime IT resources as part of the project team and study technological outcomes.

In terms of facilitators to adoption, the participants interviewed felt that the use of feasibility and pilot studies helped with practice change. Before implementing the AUD

SBIRT process, the participants believed the screening process would take additional time, causing patient visits to fall behind. The feasibility study showed otherwise. The use of pre-studies (e.g., feasibility and pilot studies) was viewed as a facilitator to change. There is some evidence supporting the use of feasibility and pilot studies to facilitate larger-scale implementation change (Eldridge et al., 2018; Press et al., 2016).

Seamless EHR integration is the most critical component of adoption.

Participant's views of EHR facilitating change were dependent on the integration of their current workflow (Gotham et al. 2019). An example given was the ability to see both the past and present history of the patient – inclusive of auxiliary screenings (e.g., lab, x-ray results). Burdick & Kessler (2017), designed a study to assess the workflow of integrating behavioral health screening tools into the EHR. After several iterations, the workflow was tightly integrated into the process and increased screening rates. Similarly, a study by Kaiser et al. (2015) identified workflows that are a low effort have better change outcomes, highlighting the time spent on integrating the workflow process into the EHR is essential.

## **5.6 Limitations**

The study was done at a university health center. It reflects the views of the institute. Educational institutions are required to do research, as part of that process, they have inherent bureaucracy (Bark & Bell, 2018). It is reasonable to expect that other primary care practices may not have to follow the same level of administrative processes; as a result, providers may be more predisposed to change. Essentially, the "change" culture may be different. Because of this, the study findings may not be generalizable to all primary care practices. This is an area for future research.

Additionally, the study does not reflect a male viewpoint. The participants in the study were all females. Gaining a gendered viewpoint is essential to understanding if the perceptions and experiences of men are different from females. Practice change and technology use strategies may require different approaches to encompass different gendered viewpoints. Lastly, future research should explore the behavioral health workflow as part of the study. Understanding how workflow helps or hinders behavioral health screening in primary care is understudied. Given how dominant behavioral health issues are in society, primary care is a great place to help identify and address these problems.

### **5.7 Implications of the Findings for Practice**

The findings from this study further validate the role EHR usability plays in the adoption of practice change. Electronic health record implementation specifications and usability problems remain unaddressed issues ("Minnesota: HITAC task force", 2019). Recent research suggests that both issues strongly influence the healthcare professional's use of EHR's (Kaipio et al., 2020; Ratwani et al., 2018). Many EHR's can be configured to address part, if not all, of a new workflow. It requires additional time and technology expertise. However, given the expanding role of primary care in behavioral health screenings and interdisciplinary practice affiliations – addressing these issues is vitally important. Before undertaking practice change, these factors should be considered and, if possible, addressed early in the process. Electronic health record systems that can be customized to fit the new process is an essential first step towards the adoption of practice change.

The use of a change process has practical implications for practice change. Using a conceptual change framework that has "buy-in" from all practice participants is an essential first step. As part of this process, explicitly mapping out the proposed change before implementing the change is critical to adoption. Additionally, soliciting feedback early in the process, can help influence and alter how people think about a proposed change. It requires a shared vision. Efforts that overlook this step and assume that everyone is amenable to the proposed change may find unintentional opposition and, as a result, implementation failure. Preemptively addressing issues and garnering support are crucial factors to success (Kotter, 1996).

If we want healthcare providers to use EHR systems, workflow analysis needs to be conducted beforehand. Both "ease of use" (e.g., low effort) and "perceived usefulness" (e.g., increased performance) need to be factored into the workflow. Deconstructing the workflow to determine the tasks and time required to support a new process is critical to adoption (Booth et al., 2017). Understanding screen layouts and workflow sequences should be undertaken early in the implementation process so that everyone understands the workflow before it gets implemented. One way to achieve a detailed understanding is by using a multi-strategy implementation approach to assess and map the workflow process. The use of feasibility and pilot studies are good ways to assess and address issues before broad implementation.

### **5.8 Recommendations for Further Research**

Future studies should explore the use of nurses to provide SBIRT. Nursing curricula teach nurses to view the patient holistically. Holistic care is a model of caring which recognizes that the patient has biological, psychosocial, and spiritual needs

(Henderson, 2002). Nursing education is distinct and unique from medicine, which views care predominantly from a science-based paradigm. Nursing schools recognize the importance of training nurses and have started to add it to their curricula and should be an area of nursing focus (Burmester, Ahluwalia, Ploutz-Snyder, & Strobbe, 2019). Studies show that nursing is vital in this role (Bachhuber et al., 2016; Keen, Thoele, & Newhouse, 2020). In the study done by Bachhuber et al., (2016), nursing staff lead the screening and brief intervention and referral to treatment in primary care. They used the time when the patient was getting their vital signs taken to do SBIRT. The results demonstrated that nurses have a critical role to play in the SBIRT process, which encompasses a team-based approach. Similarly, a study that was done by Keen, Thoele, & Newhouse, (2020), nurses are well prepared to lead the implementation of SBIRT.

Nurses have a significant role to play in training and education. One of the themes raised as part of this research was the idea of intensive recursive training and education (e.g., train and train again) when undertaking practice change. One of the primary responsibilities in nursing is in patient education. It dominates the nursing domain, and it pervades all primary care work (Bergh, Friberg, Persson, & Dahlborg-Lyckhage, 2015). Changing practice in a primary care setting, mainly adding SBIRT, requires a lot of training and education. Future research should study nurses in this role and their ability to advocate for practice change and related education.

## **5.9 Conclusion**

The findings from this study give a broad understanding of the provider's experiences and perceptions that act as barriers to and facilitators of technology adoption in a primary care setting. It highlights that there is still much work to do in implementing

technology into clinical practice. This is particularly important in AUD SBIRT screening in primary care. By using technology and making it much more intuitive and user-friendly to providers, we can increase the efficiency and accessibility of patient information in time-constrained environments. Given the increased behavioral health problems, finding ways to screen in primary care is crucial to early identification and treatment. Future studies should continue to explore the use of technology interventions for behavioral screening in primary care and the use of nurses in this process. Additionally, training highlighted as a critical aspect of adoption should be completed as pre-intervention in the next study.

## APPENDICES

### APPENDIX A

#### AUDIT-C OVERVIEW

The AUDIT-C is a 3-item alcohol screen that can help identify persons who are hazardous drinkers or have active alcohol use disorders (including alcohol abuse or dependence). The AUDIT-C is a modified version of the 10 question AUDIT instrument.

#### **Clinical Utility**

The AUDIT-C is a brief alcohol screen that reliably identifies patients who are hazardous drinkers or have active alcohol use disorders.

#### **Scoring**

The AUDIT-C is scored on a scale of 0-12.

Each AUDIT-C question has 5 answer choices. Points allotted are: a = 0 points, b = 1 point, c = 2 points, d = 3 points, e = 4 points

**In men**, a score of 4 or more is considered positive, optimal for identifying hazardous drinking or active alcohol use disorders.

**In women**, a score of 3 or more is considered positive (same as above).

However, when the points are all from Question #1 alone (#2 & #3 are zero), it can be assumed that the patient is drinking below recommended limits and it is suggested that the

provider review the patient's alcohol intake over the past few months to confirm accuracy. Generally, the higher the score, the more likely it is that the patient's drinking is affecting his

or her safety.

### **Psychometric Properties**

For identifying patients with heavy/hazardous drinking and/or Active-DSM alcohol abuse or dependence

#### **Men<sup>1</sup>**

3.  $\geq 3$  Sens: 0.95 / Spec. 0.60

4.  $\geq 4$  Sens: 0.86 / Spec. 0.72

#### **Women<sup>2</sup>**

Sens: 0.66 / Spec. 0.94 Sens: 0.48 / Spec. 0.99

For identifying patients with active alcohol abuse or dependence

$\geq 3$  Sens: 0.90 / Spec. 0.45 Sens: 0.80 / Spec. 0.87  $\geq 4$  Sens: 0.79 / Spec. 0.56 Sens: 0.67 / Spec. 0.94

1. Bush K, Kivlahan DR, McDonell MB, et al. The AUDIT Alcohol Consumption Questions (AUDIT-C): An effective brief screening test for problem drinking. Arch Internal Med. 1998 (3): 1789-1795.

2. Bradley KA, Bush KR, Epler AJ, et al. Two brief alcohol-screening tests from the Alcohol Use Disorders Identification Test (AUDIT): Validation in a female veterans' affairs patient population. Arch Internal Med Vol 163, April 2003: 821-829.

3. Frequently Asked Questions guide to using the AUDIT-C can be found via the website: [www.oqp.med.va.gov/general/uploads/FAQ%20AUDIT-C](http://www.oqp.med.va.gov/general/uploads/FAQ%20AUDIT-C)

## **STABLE RESOURCE TOOLKIT**

### **AUDIT-C Questionnaire**

Patient Name \_\_\_\_\_ Date of Visit \_\_\_\_\_

**1. How often do you have a drink containing alcohol?**

- a. Never
- b. Monthly or less
- c. 2-4 times a month
- d. 2-3 times a week
- e. 4 or more times a week

**2. How many standard drinks containing alcohol do you have on a typical day?**

- a. 1 or 2
- b. 3 or 4
- c. 5 or 6
- d. 7 to 9
- e. 10 or more

**3. How often do you have six or more drinks on one occasion?**

- a. Never
- b. Less than monthly c. Monthly
- d. Weekly
- e. Daily or almost daily

AUDIT-C is available for use in the public domain.

Substance Abuse and Mental Health Services Administration. (n.d.-a) Screening Tools.  
Audit-C Overview. Retrieved from  
[https://www.integration.samhsa.gov/images/res/tool\\_auditc.pdf](https://www.integration.samhsa.gov/images/res/tool_auditc.pdf)

## APPENDIX B

### AUDIT OVERVIEW

<b>The Alcohol Use Disorders Identification Test: Self-Report Version</b>						
<p>PATIENT: Because alcohol use can affect your health and can interfere with certain medications and treatments, it is important that we ask some questions about your use of alcohol. Your answers will remain confidential so please be honest. Place an X in one box that best describes your answer to each question.</p>						
Questions	0	1	2	3	4	
1. How often do you have a drink containing alcohol?	Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week	
2. How many drinks containing alcohol do you have on a typical day when you are drinking?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more	
3. How often do you have six or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
4. How often during the last year have you found that you were not able to stop drinking once you had started?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
5. How often during the last year have you failed to do what was normally expected of you because of drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
7. How often during the last year have you had a feeling of guilt or remorse after drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
8. How often during the last year have you been unable to remember what happened the night before because of your drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily	
9. Have you or someone else been injured because of your drinking?	No		Yes, but not in the last year		Yes, during the last year	
10. Has a relative, friend, doctor, or other health care worker been concerned about your drinking or suggested you cut down?	No		Yes, but not in the last year		Yes, during the last year	
					<b>Total</b>	

Barber, T., Higgins – Biddell, J., Saunders, J., Monteiro, M. (n.d.). The Alcohol Use Disorders. Identification Test Guidelines for Use in Primary Care. Retrieved from [https://www.integration.samhsa.gov/clinical-practice/sbirt/AUDIT\\_Manual\\_2.pdf](https://www.integration.samhsa.gov/clinical-practice/sbirt/AUDIT_Manual_2.pdf)

Each of the questions has a set of responses ranging from 0 to 4. When added up, the AUDIT scores in the range of 8-15 represent a medium level (e.g., hazardous or harmful drinking) of alcohol problems; whereas, scores of 16 and above represented a high level of alcohol problems (e.g., dependent). The higher the total score on the AUDIT, the greater the sensitivity in finding persons with alcohol dependence (p.20).

## APPENDIX C

### SEMI-STRUCTURED INTERVIEW GUIDE

#### Research Topic

- Adoption of Technology in AUD & SBIRT as part of Patient Care – barriers and facilitators.

#### Interviewer Instructions

Start off with the purpose for the interview and ask if they have any questions. Have them start with telling what they do at the clinic or their area of expertise.

Start off with easier type of questions then move on to higher level questions.

Semi- structured Interview Questions:

1. **Have there been past efforts to use technology to increase clinical practice?**
  - a. Prompts: What do you think about technology use in the patient care process?
2. **How has the organization historically made practice changes? Do you mean was there a structure (committee) in place for making change?**
  - a. Prompts: Can you give an example of how your organization made a practice change in the past? Your role, if any?
3. **What technologies or functionality do you use every day in practice?**
  - a. Prompts: What is the value you get from using them? Do they help you in communication? Save time? What would you do if you didn't have them?
4. **What are the facilitators to technology use?**
  - a. Prompts: What do you think are facilitators to adopting technology use? Are you an early adopter of most technology (keep the questions both aimed at facilitation)?

**5. What are barriers to technology use?**

a. **Prompt:** What do you think are facilitators to adopting technology use? Are you an early adopter of most technology (keep the questions both aimed at facilitation)?

**6. What technology used in clinical practice is easy to use?**

a. Prompts: How do you think it helps? What can be done to increase the use in healthcare?

**7. What are your thoughts relating to technology use and patient outcomes?**

a. Prompts: Does it increase performance? Do you wait until it has been out for a while? This question might ask if they used an evaluation of any new technology adoption.

## APPENDIX D

### TECHNOLOGY ACCEPTANCE QUESTIONNAIRE

Question	Strongly Disagree 1	Disagree 2	Neutral 3	Agree 4	Strongly Agree 5
Using the EHR system enhances the effectiveness in the job (e.g., better accuracy and reliability of diagnostic and therapeutic procedures).					
Using the EHR system improves the job performance (e.g., greater number of accomplished medical tasks).					
Using the EHR system makes it easier to do the job.					
The EHR system is useful to the job.					
The interaction with the EHR system is clear and understandable.					
Interacting with the EHR system does not require a lot of mental effort.					
It is easy to get the EHR system to do what it needs to do.					
The EHR system is easy to use.					

Survey material was used with permission of the author for noncommercial research and educational purposes.

Egea, J. M. O., & González, M. V. R. (2011). Perceived Ease of Use of Electronic Health Care Records System Measure [Database record]. Retrieved from PsycTESTS.

doi: <https://dx.doi.org/10.1037/t12862-000>

**APPENDIX E**  
**REFERRAL SHEET**

**UMASS  
AMHERST**

UNIVERSITY HEALTH SERVICES  
(413) 577-5000 • [www.umass.edu/uhs](http://www.umass.edu/uhs)

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**Referrals**

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- Return to talk more with **your provider** on:  
\_\_\_\_\_
- **Visit BASICS** and explore your substance use in a nonjudgmental environment – Call 577-5071 for an appointment – referrals are free!
- In Recovery and looking for support? Call **Collegiate Recovery Communities** at 577-5188
- **Talk with a counselor:** call: Center for Counseling and Psychological Health (CCPH) at 577-2337
- **Try a group** at CCPH:  
<https://www.umass.edu/counseling/groups-and-workshops> call 577-2337 to register

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