

**Leveraging Behavioral Economics-based
Interventions to Improve Medication Adherence**

by

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Abstract

Poor medication adherence to chronic medications can lead to added patient harm and increased costs. Concepts from behavioral economics have guided interventions to help overcome the tendency toward non-adherence with chronic medications. For example, commitment contracts, whereby people either put their reputation on the line (social incentive) or deposit money that they receive back only if they succeed (financial incentive), have substantial conceptual appeal as a method of changing health behavior.

This dissertation assessed the relative effectiveness of behavioral economics-based interventions using financial or social incentives on enhancing medication adherence. A mixed-methods design was implemented. Data collection and analyses were conducted in 2 major phases. Phase I was quantitative and the research design was a longitudinal, randomized, controlled trial comparing the effectiveness of an intervention to improve adherence to antihypertensive or antihyperlipidemic medications that provides incentives in the form of a financially incentivized commitment contract vs. a socially incentivized commitment contract vs. usual care (no commitment contract).

Participants were randomized to one of three groups: usual care (UC), financial incentives (FI), or social incentives (SI). Data collection: 1) electronically measured medication adherence via a Medication Event Monitoring System (MEMS) vial that electronically recorded a date and timestamp upon each vial opening; Daily adherence was measured over a 90-day. The FI group received \$90 upfront, with \$1 deducted each day a dose was missed. The SI group utilized a study website that displayed individual and group medication adherence for participants to see. The UC group were instructed to take their medications as prescribed. 2) Two self-reported questionnaires, baseline and 90-day follow-up, assessed demographics, self-reported adherence (via Medometer¹), socioeconomic status, subjective social status (via MacArthur Scale of Subjective Social Status²), and perspectives of differing incentives.

Phase II was qualitative and was implemented in two parts. Part 1 involved semi-structured interviews and Part 2 utilized focus group discussions to explore and understand to what extent social incentives may be applied to motivate medication adherence and healthful behaviors.

Analysis of phase I, 15 participants were randomized to 1 of 3 groups (UC=6, FI=3, SI=6); 1 dropout and 3 lost to follow-up. The majority were female (57%), white (86%), currently married (57%), retired (50%), and had a combined household income of \$50,000-\$100,000 (57%). Age ranged from 40 to 82 years (mean=59±13). Mean percentage (±SD) of MEMS-measured adherence, measured over 90 days, increased from UC group (77% ± 34%), to SI group (87% ± 20%), to FI group (95% ± 6%), but the

differences were not statistically significant, $F(2,10) = .492, p = .626$. Participant perceptions of the incentives, indicated on baseline survey, suggested that financial incentives were moderately effective and the social incentives (i.e., wanting their family or pharmacist to see they are adherent) were moderately effective.

Analysis of phase II, using thematic analysis, identified four themes among the participants of both focus group sessions: 1) Accountability, 2) Motivation, 3) Barriers and Solutions, and 4) Technology. Many use apps, smartphones, or wearable devices to help them stay on track with health behavior goals. Very few track medication adherence using an app however most disapproved of having social incentive features associated with a medication-taking app. Stating medication-taking behaviors are “private” and sharing this information is “too personal”. Others felt that medication-taking isn’t necessarily a goal or that social features attached to medication-taking aren’t trendy or appealing.

Although the underpowered study limits statistical interpretation the results still provide meaningful insight to applying behavioral economic-interventions to medication adherence. Future research should seek to refine the methodology, namely adopt proactive recruiting strategies thus increasing sample size, prioritize low baseline adherence enrollees, and a diverse population so that the results are generalizable to a larger population. In consideration of the social incentive, a strategic approach should be taken to distinguish the effects of distinct social incentives on medication adherence and other health behaviors.

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Chapter 1 Introduction

Chronic Diseases and Medication Adherence

Topping the list among the most prevalent, costly, and preventable health issues in the United States are chronic diseases. According to the 2012 National Health Interview Survey, nearly half of all US adults (117 million) reported one or more chronic health diseases; approximately 25% of US adults reported multiple chronic diseases.³ Further, a recent Agency for Healthcare and Research Quality (AHRQ) report, assessing 2010 medical expenditure panel survey data, noted the two most prevalent chronic conditions in US adults were hypertension (27%) and hyperlipidemia (22%).⁴ Adhering to prescribed chronic medications is a crucial preventative measure towards abating further complications of chronic diseases. Unfortunately, nonadherence is an epidemic that persists despite numerous attempts to develop lasting interventions. In fact, despite estimations that over 80% of adults in the US are prescribed at least one medication and nearly 30% are prescribed five medications or more,⁵ it is widely known that nearly half of Americans are not faithfully adhering to their prescribed medication regimens.^{6,7} The consequences of poor adherence to treatment of chronic illnesses, such as hypertension and hyperlipidemia, may result in uninhibited disease progression, increased morbidity and mortality, and may ultimately contribute to the leading cause of death in the US: heart disease.

Poor medication adherence can lead to added patient harm and increased costs, especially when there are multiple chronic medications aimed at treating several chronic diseases. This is particularly important for those with cardiovascular disease. For instance, research has shown that nearly 25% of patients who have had an acute myocardial infarction (AMI) do not fill their prescribed medications within a week of discharge⁸ and 20% of AMI patients who do fill discharge medications discontinue use of one or more within one month.⁹ Consequently, those patients who do not fill any discharge medications within 120 days of their AMI have an 80% increased odds of mortality; however those who do fill some of their discharge medications cut their increased odds of death by nearly half.⁸ Adding to the health ramifications, poor adherence leads to added health care costs for both the patient and the provider. As of 2010, over 85% of our healthcare expenditures are targeted at treating patients with one or more chronic diseases.⁴ Specifically, nonadherence with medications aimed at treating hypertension, hyperlipidemia, and diabetes mellitus has been estimated to cost \$290 billion annually in the United States.¹⁰ For instance, Pittman et al¹¹ found approximately one-third of their cohort of patients were nonadherent to statins in the baseline year and that nonadherence was associated with an increased total healthcare cost of \$400 to \$900 per patient and increased likelihood of a cardiovascular disease-related hospitalization in the subsequent 18 months. Upon extrapolating these findings to the general statin-prescribed US population (~24 million), Pittman et al¹¹ estimated a potential savings of \$3 billion dollars annually by increasing statin adherence in the

estimated 8 million nonadherent patients. Similarly, Roebuck et al¹² found adherent hypertensive and dyslipidemic patients paid significantly less, approximately \$4000 and \$1300 respectively, than nonadherent hypertensive and dyslipidemic patients in annual total health care spending. Therefore, it is plausible that consistent adherence to a prescribed medication regimen has the potential to decrease prospective costs and improve patient health outcomes.

Barriers/Facilitators to Medication Adherence

Despite the complexities of behavioral change, carefully designed intervention studies are needed to identify effective strategies that favorably impact nonadherence related disease risk. There are many potential barriers for medication adherence relative to one's internal and external experiences. According to the World Health Organization (WHO), health care providers are an integral part of the following five 'interacting dimensions' of medication adherence: social/economic factors, medical condition-related factors, therapy-related factors, health system-related factors and patient behaviors.¹³ Although barriers and facilitators for medication adherence may be found at any one of the five 'interacting dimensions', this dissertation will focus on patient behaviors that may be influenced by certain cognitive biases that may or may not contribute to adherence. Behavioral economics, an emerging field that integrates the economics of incentives with 'real-world' behavioral insights from psychology,¹⁴ may

provide the context as to how and why leveraging social and economic variables might show meaningful progress towards adopting preventative health behaviors.

Behavioral Economics

Research in the field of behavioral economics has identified a number of decision biases, or systematic errors in judgment, that shed light on when and why individuals engage in self-harming behaviors that lead to poor health outcomes.^{15,16} Included among these biases are loss aversion and delay discounting. Loss aversion is the notion that “losses loom larger than gains”. This tendency for individuals to place a higher emotional value on a loss compared to a gain expresses why, for instance, losing \$100 makes people sadder than gaining \$100 makes people happy. People are more sensitive to the prospect of losses than gains, nearly twice as sensitive, and are therefore motivated by the mere risk of losing.^{14,16} Delay discounting refers to the idea that individuals will devalue the future to varying degrees depending on how far into the future rewards are received, and tend to place a higher subjective value on immediate compared to future gains. This tendency to under/overestimate the value of a reward based upon its temporal proximity is also known as present focus bias. To illustrate, when people are offered the choice of receiving \$100 today or \$110 in one month, many opt to be paid today. The subjective value of the smaller, but more immediate reward becomes higher than the larger, delayed reward and this tendency to give more weight to our current state means that the further away the reward is the more its value will be

discounted (or devalued). However, when the offer is pushed into the future, such as receiving \$100 in a year or receiving \$110 in a year and one month, preferences often change and individuals may be more willing to wait the extra month. This is because discounting is non-linear, and its rate is not constant over time.¹⁷ Research has demonstrated that actual behavior follows a more hyperbolic discounting function, where rewards are discounted more steeply in the near future, leveling off as delay to reward increases.¹⁸ In other words, the instant gratification of receiving a smaller albeit “less” valuable reward now outweighs the pursuit of a “more” valuable reward that is to be received in the future. Despite our best intentions and knowing how we discount the future, overcoming temptation as it arises is an extremely difficult task to accomplish. Behaviors to prevent chronic diseases that lead to heart disease lend themselves well to the theory of delay discounting because these conditions are typically asymptomatic and negative health consequences may not be evident for many years. Since the benefits of behavior modification are often delayed (decreased risk of future disease) and the opportunity costs of adopting the behavior are immediate (short-term financial and/or psychological costs, risk of side effects, etc.) the value placed on future health may be particularly influential in the adoption of medication adherence in chronic diseases.

Combating cognitive biases such as loss aversion and delay discounting by leveraging concepts of pre-commitment and reward substitution have the potential to positively influence medication nonadherence. Interventions utilizing pre-commitment,

whereby a freely made decision binds someone to an action further down the road, and reward substitution, which incentivizes people to behave as though they do care about the long-term reward, by creating a more proximal reward as a substitute have been successfully designed to mitigate such cognitive biases.¹⁹⁻²¹ In addition to merely planning ahead, strategies include the use of commitment devices, such as commitment contracts, as a way to alter one's own incentives to make an otherwise meaningless promise reliable (especially if done publicly) by predefined consequences if those promises are not fulfilled. By bringing the risk of loss into the present, such strategies utilizing pre-commitment devices and reward substitution can counteract the tendency to choose smaller rewards now (skipping a dose) in lieu of larger health rewards (no heart disease) down the road. Therefore utilizing commitment contracts, whereby people either put their reputation on the line (social incentive) or deposit money that they receive back only if they succeed (financial incentive), have substantial conceptual appeal as a method of changing health behavior.

Perceived Socioeconomic Status

A relationship has been found that objective socioeconomic status (SES) and health are linked. For instance, on a global scale the relationship between those with lower objective SES and higher incidence and prevalence of health conditions and mortality has been found.^{22,23} However, recent studies have suggested that an individual's subjective or perceived social status, how they identify themselves in the

social hierarchy, may be a better measure of SES at the individual level compared to a comprehensive indicator of SES.²⁴⁻²⁷

Specific Aims

The primary objective of the study is to understand what impact behavioral economics-based interventions have on enhancing medication adherence. This study aims to determine whether commitment devices, such as commitment contracts, can motivate participants to be adherent to their prescribed antihypertensive or antihyperlipidemic medications and which type of incentive (financial or social) is more effective. This will assist in accomplishing my long-term goal of reducing the prevalence of medication nonadherence by developing effective strategies for behavior change that result in enhanced medication taking behaviors among those at risk. The central hypothesis is that using a commitment device will improve medication adherence to antihypertensive and/or antihyperlipidemic pharmacotherapy compared to usual care, and that there is no difference in effectiveness between financial and social incentives. The secondary objectives of the study are to explore factors associated with self-reported adherence, MEMS-measured adherence, perceived social status, preference for incentive type, and satisfaction with incentive received.

Specific Aim 1: To compare the effectiveness of an intervention to improve adherence to antihypertensive or antihyperlipidemic medications that provides incentives in the

form of a financially incentivized commitment contract vs. a socially incentivized commitment contract vs. usual care (no commitment contract).

H1a: Medication adherence rates will be greater in patients using incentivized commitment contracts compared to usual care.

H1b: There will be no significant difference in medication adherence improvement between the two commitment contract groups.

Specific Aim 2: To evaluate the association between participants' subjective social status, self-reported adherence, and MEMS-measured adherence.

H2a: Perceived social status will be associated with self-reported adherence.

H2b: Perceived social status will be associated with MEMS-measured adherence.

Specific Aim 3: To explore factors that are associated with preference for type of incentive and satisfaction with incentive received.

H3a: Preference for type of incentive will be associated with subjective social status, objective social status, other demographics, total number of medications, and number of comorbid disease states.

H3b: Satisfaction with incentive received will be associated with subjective social status, objective social status, other demographics, total number of medications, and number of comorbid disease states.

Significance

Comparing the effectiveness of novel techniques aimed at enhancing medication adherence will improve our understanding of factors influencing adherence, will promote healthy lives, increase well-being, and reduce the burden of chronic illnesses. In addition to enhancing health outcomes, the value of improving medication adherence will be seen as a positive economic impact via the reduction of unnecessary use of healthcare resources. Reductions in hospitalizations and emergency department visits are the catalysts of diminishing health costs associated with improved medication adherence.¹² Understanding such interventions pertaining to the enhancement of medication adherence will not only serve to augment our current strategies but will also contribute to the longevity of a more healthful society. This will then stimulate a shift in current practice with an overarching goal of improving the effectiveness of similar interventions. Grasping the *potential* of such novel interventions is necessary to shed light on what financial/social incentives *can* accomplish. The results of this study will inform future research of the benefits of utilizing concepts from behavioral economics applied to medication adherence. Upon seeing the optimized interventions that produce the most effective results, further research will be generated with a goal of the maximizing the effect size and thus initiating systematic changes. Employers and policy makers may also utilize these findings to inform interventions that incorporate these concepts, positively impacting adherence to chronic medications, thereby reducing overall healthcare costs.

Innovation

Traditional interventions to improve medication adherence have had varied rates of success.^{7,14,15} Despite these modest successes, mediocre adherence neither mitigates the inevitable health risks nor abates the economic burden of unnecessary healthcare costs. As the problem of successfully enhancing medication adherence has yet to be solved, novel approaches through innovative ideas and fresh perspectives are needed to combat this epidemic. The current study is innovative in that it will be the first to evaluate the utility of financially and socially incentivized commitment contracts aimed at improving medication adherence. Despite numerous interventions targeting medication adherence, this is the first study to enact strategies of pre-commitment and loss aversion aimed at circumventing the behavior of poor medication adherence. This study uses an innovative, multifaceted methodology that is designed to leverage two key inherent decision making biases; 1) present focus bias (delay discounting), where we tend to place a higher subjective value on a smaller sooner reward over a larger later reward and 2) loss aversion, placing a higher emotional value on a loss compared to a gain. Utilizing a commitment contract will leverage present focus bias by obligating the participant to project their intended medication taking behaviors into the future; thereby effectively increasing the subjective value of the larger later reward (in this case, a financial or social incentive). In addition, frequent feedback/rewards (weekly adherence emails) serve as reward substitution and make the benefits of adherence more salient. The notion of loss aversion will be inherently challenged upon acceptance

and signing of the commitment contract. The up-front “deposit” of monetary funds or social reputation will loom largely at the forefront of participants minds as failing to successfully adhere will surely result in a loss. Since individuals tend to place greater subjective value on losses compared to gains, incentives to avoid regret can be potent forces in decision-making.²⁸ As this study uses an innovative methodology that leverages [our] inherent cognitive biases the results will provide meaningful insight into approaching effective medication adherence techniques.

Despite the upfront costs of financially incentivized commitment contracts, the resultant improvements in adherence can have an overall positive impact on healthcare expenditures that exceeds the cost of incentives. Favorable results will also assist in the identification of further cost-effective interventions that enhance medication adherence and therefore decrease overall healthcare expenditures. Generally speaking, since a key point of this study is to determine how effective *social incentives* are at enhancing nonadherence the resultant cost for these incentives should be minimal if not zero. Therefore, the financial feasibility of this arm of the study is very high whereas the feasibility of obtaining an adequate sample size to consent to the social incentives may be lower. Despite that, the realm of social incentives as applied to health behaviors and medication adherence contains untapped potential that may prove to be very cost-effective. Demonstration of improved effectiveness (and cost-effectiveness) will inform larger scale intervention efforts, thereby improving adherence to chronic medications and reducing the burden of undertreated chronic diseases in society. This information

will enhance our understanding of factors influencing adherence, which will enable a shift in current practice, and ultimately improve the effectiveness of such interventions.

Overview of Methodology

A mixed-methods design was implemented to address the specific aims and test the hypotheses above. Data collection and analyses were conducted in 2 major phases. Phase I was quantitative and the research design was a longitudinal, randomized, controlled trial comparing the effectiveness of an intervention to improve adherence to antihypertensive or antihyperlipidemic medications that provides incentives in the form of a financially incentivized commitment contract vs. a socially incentivized commitment contract vs. usual care (no commitment contract). Participants were randomized to one of three groups. Patients receiving a medication to treat hypertension or hyperlipidemia from a local independent pharmacy, Marble City Health Mart Pharmacy (MCP), were identified using pharmacy records. To measure medication adherence, participant study medication was dispensed into a Medication Event Monitoring System (MEMS) vial that electronically recorded a date and timestamp upon each vial opening. A baseline survey captured the following factors: age, sex, race/ethnicity, income, education, marital status, employment status, insurance status, living arrangements, total number of medications, number of comorbid disease states, self-reported adherence, subjective social status, and preferences for type of incentive. A follow-up survey was implemented to capture the following factors: total number of medications, number of

comorbid disease states, self-reported adherence (via Medometer¹), subjective social status (via MacArthur Scale of Subjective Social Status²), preference for type of incentive, and satisfaction with incentive received. Eligible patients were age 19 and over, able to speak/understand English, currently prescribed a chronic medication for treating hypertension or hyperlipidemia that they received from Marble City Pharmacy, and had access to the Internet as well as an electronic mail account. Individuals were excluded if they did not administer their own medications. Statistical analyses included the following: descriptive statistics to characterize study variables, one-way analysis of variance (ANOVA) to determine differences in MEMS-measured adherence and self-reported adherence across the three study groups, chi-square tests for associations, and Spearman's rank-order correlation coefficients for testing associations between study variables. All statistical analyses were based on a significance level of 0.05.

Phase II was qualitative and implemented to address Specific Aim 3. This aim had 2 parts. Part 1 involved semi-structured interviews with Marble City Pharmacy participants who completed the quantitative study and consented to participate. Interview questions explored their overall experience with the study, perceptions of assigned study group, and general feedback. Part 2 utilized the information learned from the interviews to formulate topic areas and questions for focus group discussions in a separate patient population. Two focus group sessions were conducted to explore how participants conceptualized social incentives, identified associated facilitators and barriers, and understand to what extent they may be applied to motivate healthful

behaviors. Eligible participants were age 19 to 64, able to speak and read English, and received their prescription medications from the Auburn University Employee Pharmacy (AUEP). Qualitative analysis of focus group data was conducted using ATLAS.ti (Scientific Software Development GmbH, Berlin, Germany) qualitative analysis software. Transcripts of both focus group sessions were coded independently by two coders to produce initial codes and an eventual aggregated code list. Thematic analysis was used to determine appropriate themes and Krippendorff's Alpha was calculated to determine inter-coder reliability.

Chapter 2 Literature Review

The previous chapter provided an introduction to the framework of this dissertation and subsequent research aims. This chapter intends to build upon this framework by exploring factors that contribute to understanding the impact behavioral economics-based interventions have on enhancing medication adherence and ultimately health behavior change. These factors include chronic diseases, medication adherence, concepts from behavioral economics such as loss aversion, delay discounting, precommitment, and reward substitution, financial and social incentives, and subjective socioeconomic status. This chapter will consist of five major sections. The first section will discuss the prevalence of chronic diseases (specifically hypertension and hyperlipidemia) and their burden to society in the United States. The second section will delve into medication adherence, the consequence of nonadherence, barriers to and facilitators of adherence, and will conclude with measures of medication adherence. The third section will begin with a brief overview of behavioral economics that will cascade into more detailed accounts of prospect theory, delay discounting, precommitment, and commitment devices. The fourth section will describe financial and social incentives and explore research that has implemented

both. The final section will describe subjective socioeconomic status and the measure that is used to capture it.

Prevalence of Chronic Diseases and Burden to Society

A health condition can be broadly defined as a departure from a state of physical or mental well-being.²⁹ A condition that is chronic in nature typically persists for long durations (e.g., 12 months or more), has a slow progression, requires ongoing medical attention, and/or limits activities of daily living.³⁰ Chronic conditions, or chronic diseases, top the list among the most prevalent, costly, and preventable health issues in the United States. In 2014, according to the Medical Expenditure Panel Survey from AHRQ, 60 percent of all US adults (191 million) reported one or more chronic health conditions; approximately 42% of US adults reported multiple chronic conditions (MCC).³ Treating patients with chronic diseases accounts for approximately 86% of healthcare spending as they often have multifaceted healthcare needs and therefore require more health services than those who do not have chronic diseases.⁴ As the US population continues to age, the number of people with one or more chronic diseases will continue to increase. According to a 2014 report on the health status of the nation, the two most prevalent chronic conditions in US adults were hypertension (32%) and hyperlipidemia (30%).³¹ Hypertension is clinically defined as a repeatedly elevated blood pressure exceeding 140 over 90 mmHg while hyperlipidemia is defined as elevated lipid levels in the blood. Having high blood pressure and elevated levels of blood lipids are two major

controllable risk factors that are directly linked to cardiovascular disease.^{32,33} As both conditions' signs and symptoms are typically silent (asymptomatic), when left unchecked either condition will heavily tax the cardiovascular system and eventually lead to serious health problems (e.g., heart attack or stroke). As a result, the prevalence of multiple chronic diseases increases notably with age as nearly half of people aged 45-64 and 80% of those 65 and older reported to have them.⁴ Further, as costs increase with the number of chronic conditions the cost of caring for complex patients will inevitably strain the budgets of patients and families and health insurance plans. Figure 1 below present data on the use of health care services by patients with multiple chronic conditions, and the costs associated with that care.

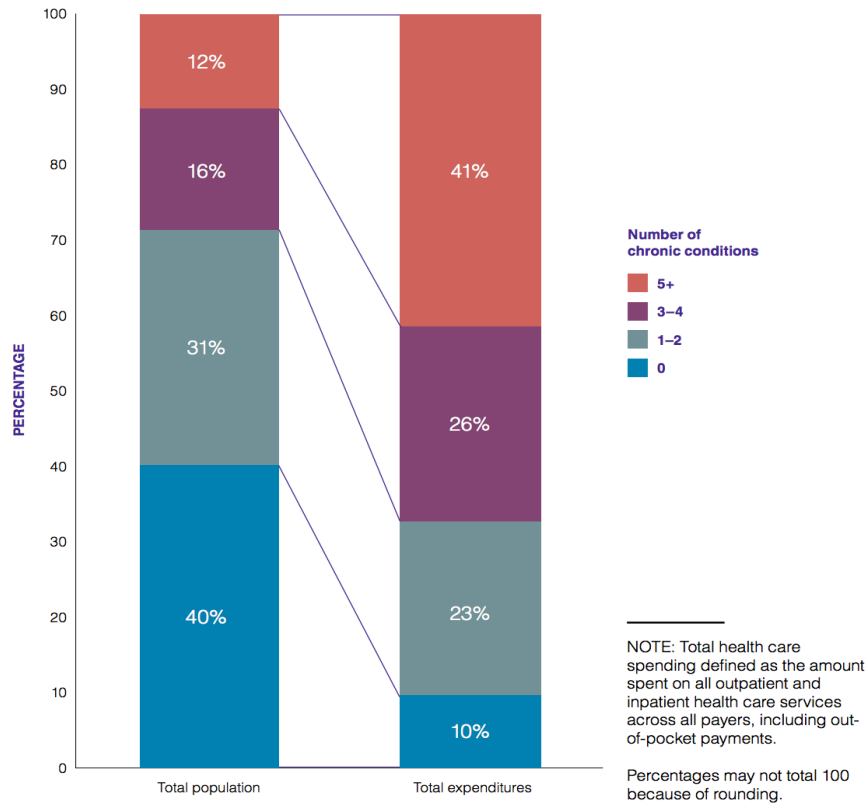


Figure 1. Prevalence and Spending by Number of Chronic Conditions (2014)

The resource allocation for addressing those with multiple chronic conditions is quite disproportionate. Over half of healthcare spending is directed at treating the 20% of people with three or more chronic conditions. To further illustrate, people with one or more chronic conditions account for the majority of healthcare services used including clinician visits (64%), prescriptions (83%), home health visits (88%) and inpatient stays (70%) compared to those who do not have a chronic condition.

Medication Adherence

Adhering to prescribed chronic medications is a crucial preventative measure towards abating further complications of chronic diseases. Unfortunately, nonadherence is an epidemic that persists despite numerous attempts to develop lasting interventions. In fact, despite estimations that over 80% of adults in the US are prescribed at least one medication and nearly 30% are prescribed five medications or more,⁵ it is widely known that nearly half of Americans are not faithfully adhering to their prescribed medication regimens.^{6,7} The consequences of poor adherence to treatment of chronic diseases, such as hypertension and hyperlipidemia, may result in uninhibited disease progression, increased morbidity and mortality, and may ultimately contribute to the leading cause of death in the US: heart disease.

Poor medication adherence can lead to added patient harm and increased costs, especially when there are multiple chronic medications aimed at treating several chronic diseases. For instance, research has shown that nearly 25% of patients who have had an acute myocardial infarction (AMI) do not fill their prescribed medications within a week of discharge⁸ and 20% of AMI patients who do fill discharge medications discontinue use of one or more within one month.⁹ Consequently, those patients who do not fill any discharge medications within 120 days of their AMI have an 80% increased odds of mortality; however those who do fill some of their discharge medications cut their increased odds of death by nearly half.⁸ Further, studies have shown that utilization of statin therapy, the primary treatment for high lipid levels, can lower risk of

major vascular events (defined by coronary death, nonfatal myocardial infarction, or stroke) by 20%.³² Nevertheless, 50% or more of patients discontinue statins within one year of treatment initiation and of those who haven't completely discontinued therapy approximately half are adequately adherent.^{34,35} Previous research has highlighted that nonadherence to statin therapy was associated with a 35% increased relative risk of cardiovascular disease-related hospitalizations¹¹ and a 60% increased relative risk for mortality.³⁶ Adding to the health ramifications, poor adherence leads to added health care costs for both the patient and the provider. As previously mentioned, well over two-thirds of our healthcare expenditures are targeted at treating patients with one or more chronic diseases.⁴ In 2010, the total costs of heart disease and stroke were estimated to be \$315 billion.³⁷ Specifically, nonadherence with medications aimed at treating hypertension, hyperlipidemia, and diabetes mellitus (and subsequently preventing such costly events) has been estimated to cost \$290 billion annually in the United States.¹⁰ For instance, Pittman et al¹¹ found approximately one-third of their cohort of patients were nonadherent to statins in the baseline year and that nonadherence was associated with an increased total healthcare cost of \$400 to \$900 per patient and an increased likelihood of cardiovascular disease-related hospitalization in the subsequent 18 months. Upon extrapolating these findings to the general statin-prescribed US population (~24 million), Pittman et al¹¹ estimated a potential savings of \$3 billion dollars annually by increasing statin adherence in the estimated 8 million nonadherent patients. Similarly, Roebuck et al¹² found adherent hypertensive and hyperlipidemic patients paid

significantly less, approximately \$4000 and \$1300 respectively, than nonadherent hypertensive and hyperlipidemic patients in annual total health care spending. Therefore, it is plausible that consistent adherence to a prescribed medication regimen has the potential to decrease prospective costs and improve patient health outcomes.

Barriers/facilitators to medication adherence

Despite the complexities of behavioral change, carefully designed intervention studies are needed to identify effective strategies that favorably impact nonadherence related disease risk. There are many potential barriers for medication adherence relative to one's internal and external experiences. According to the World Health Organization (WHO), health care providers are an integral part of the following five 'interacting dimensions' of medication adherence: social/economic factors, medical condition-related factors, therapy-related factors, health system-related factors and patient behaviors.¹³ Although barriers and facilitators for medication adherence may be found at any one of the five 'interacting dimensions', this dissertation focused on patient behaviors that may be influenced by certain cognitive biases that may or may not contribute to adherence. Behavioral economics, an emerging field that integrates the economics of incentives with 'real-world' behavioral insights from psychology,¹⁴ may provide the context as to how and why leveraging inherent cognitive biases might show meaningful progress towards adopting preventative health behaviors.

Medication Adherence Measures

Interventions designed to enhance medication adherence need adequate methods of assessing adherence. As it is not yet convenient to directly measure patient adherence, indirect methods that serve as proxy measures of adherence are utilized. Such methods include electronic monitoring of container openings (e.g., Medication Event Monitoring System (MEMS)), pill counts, pharmacy or medical records, pharmacological or biochemical markers, and patient recall. Each method has strengths and limitations, however the most common method for assessing medication adherence behaviors in research and clinical care is via patient self-report.³⁸ There are numerous self-report measures available, ranging from simple questionnaires to complex measures, and are typically characterized by asking participants to recall their medication taking behaviors. For instance, the Medometer¹ (Figure 2) is a novel self-report measuring tool that is a visual analog scale that resembles a speedometer. Patients are asked to self-assess overall adherence by placing a mark at the point that best describes the percentage of total doses taken during the preceding 4 weeks.

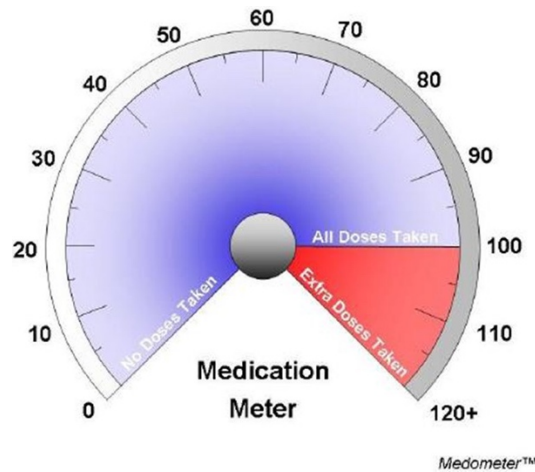


Figure 2. Medometer

Strengths of using self-report measures include non-invasiveness, low cost, low patient burden, and ease of implementation.³⁹ The two major limitations of using self-reported measures include issues of validity and precision.³⁹ Self-report measures are inherently susceptible to patient recall bias (i.e., memory; see “bounded rationality” below) and social desirability bias that may falsely elevate medication adherence assessment. Also contributing to the limitation is the high number of self-report measures that are available for use. The range of these measures differs in wording, formatting, timeframe of recall, how they are administered, and even to what extent they have been validated (if at all).⁴⁰ Despite these limitations, self-report measures are considered the most suitable for clinical practice.⁴¹ However, when conducting research it is prudent to supplement self-report measures with objective measures such as electronic monitoring via MEMS. MEMS indirectly measures medication adherence via an electronically recorded date and timestamp with each medication vial opening.

Assuming that vial openings represent medication intake, MEMS provides a detailed profile of the patient's adherence behavior⁴² and is currently regarded as the gold standard to measure adherence.⁴³ Recent studies assessing the association between self-reported and electronically measured medication adherence have produced conflicting accounts. Studies have shown that self-report has moderate correlation with electronic monitoring⁴⁴⁻⁴⁷, although self-report tends to overestimate adherence levels compared to MEMS^{45,48,49}. Nonetheless, moderate correlations between self-report and electronic monitoring reflect the performance of both adherence measures, and as such, may prove beneficial when used in conjunction.

Behavioral economics

Traditional “neoclassical” economics has been built on an underlying premise that humans always act rationally, maximizing benefits and minimizing costs. Departing from this assumption, behavioral economics posits and considers the implications of the idea that people do not actually make decisions rationally; instead, they tend to act against their own economic self-interest and quite often arbitrarily fluctuate their preferences.⁵⁰ Behavioral economics embraces actual behavior and gets at the essence of how people are predictably irrational⁵¹ by exploring the systematic mechanisms that shape our decision-making processes. Various internal or external factors (e.g., cognitive, social) may bias or influence our choices. Factors such as the timing and/or placement of an option or even the emotional state that a person is currently in may

influence a person to choose, for instance, a healthy snack over an unhealthy snack.⁵²

The field of behavioral economics provides a framework upon which to impact health behavior change. Research in this field has identified several decision biases and systematic errors in decision making that can help shed light on when and why individuals engage in self-harming behaviors that lead to poor health outcomes.¹⁴ It is important to understand the primary reason why we are inherently prone to a range of cognitive biases and this is best illustrated by the term “bounded rationality”.

Coined by the economist and Nobel laureate Herbert Simon, bounded rationality is the notion that decision-makers’ rationality is limited by the information available, their cognitive processing capabilities, and the amount of time available to make a decision.⁵³

As a result we tend to use mental shortcuts to aid in the decision-making process.

These mental shortcuts, typically referred to as heuristics, are used to narrow down choices based on approximate rules of thumb and not strict logic.⁵⁰ Thus people often “satisfice”, a portmanteau of ‘satisfy’ and ‘suffice’, as opposed to optimizing or maximizing a given decision. Although generally helpful, such heuristics can produce costly decision errors that can drive unhealthy behavior by inhibiting adoption of preventive health behaviors.⁵⁴ For instance, people tend to overweight the likelihood of a positive event (e.g., winning the lottery) and underweight the likelihood of a negative event (e.g., heart attack) using a heuristic known as optimism bias. By having a biased belief about the likelihood of an event people “knowingly” engage in risky health behaviors but are overconfident in their own abilities and unrealistically optimistic that

negative health consequences won't occur. Therefore, developing a keen understanding of these systematic biases may contribute to a vast collection of resources for researchers in the realm of health behavior change.

Prospect theory

Current research in the field of behavioral economics has identified a range of cognitive biases that decrease the rate of adoption of preventative health behaviors by patients.^{15,16,54} Included among these biases are loss aversion and delay discounting. Loss aversion is the notion that “losses loom larger than gains” and is an important concept of prospect theory. This tendency for individuals to place a higher value on a loss compared to a gain expresses why, for instance, losing \$100 makes people sadder than gaining \$100 makes people happy. People are more sensitive to the prospect of losses than gains, nearly twice as sensitive, and are therefore motivated by the mere risk of losing.^{14,16} Prospect theory is a behavioral model that shows how people decide between choices that involve risk and uncertainty (e.g., % likelihood of gains or losses) and emphasizes that people evaluate choices on the likely gains and losses associated with outcomes and not the absolute value of the outcomes of these choices.¹⁴ The idea is that value (or a preference) is derived from the *evaluation of changes or differences* rather than from the *evaluation of absolute magnitudes* meaning that our disposition to engage a risk is influenced by the *context* in which choices are presented and not simply by an evaluation of an overall “final state”.¹⁶ In other words, our preferences are

relative to a reference point, “reference-dependent”, and are subject to change if and when that point of reference is changed. The projections of prospect theory model preferences according to a value function (figure 3) that is defined on gains and losses (deviations from the reference point) and is characterized by the following features: 1) concave in the realm of gains, favoring risk aversion; 2) convex in the realm of losses, favoring risk seeking; and 3) steeper for losses than for gains.¹⁶

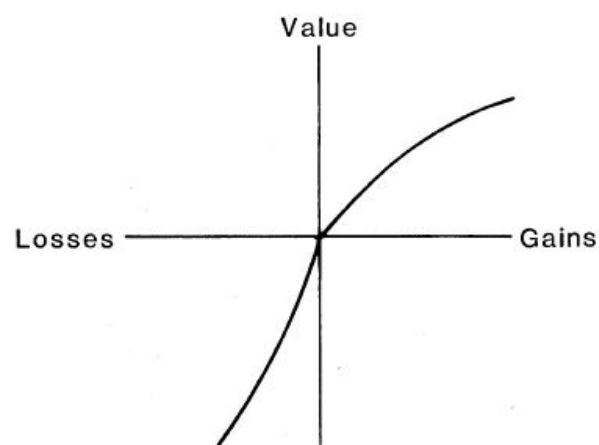


Figure 3. The Value Function of Prospect Theory

Daniel Kahneman, co-developer of prospect theory, further emphasizes that, “Prospect theory embraces the idea that preferences are reference dependent ... the core idea of prospect theory is that the value function is sharply kinked at the reference point and *loss averse* – steeper for losses than for gains by a factor of about 2-2.5”.^{55,56} Therefore we dislike losses more than we like an equivalent gain and so it makes sense that giving something up is more painful than the pleasure we derive from receiving it. In fact

as prospect theory indicates, our willingness to take risks is influenced by the context or *framing* of the choices given, and since we are loss averse we are more willing to take risks in order to avoid a loss; especially in the face of large certain losses. A classic example (as well as an example of framing choices) can be seen in figure 4: that since people are loss-averse they are more willing to take risks in order to avoid a loss.

1. Which would you prefer:
 - A) A certain win of \$250, versus
 - B) A 25% chance to win \$1000 and a 75% chance to win nothing?
2. Which would you prefer:
 - C) A certain loss of \$750, versus
 - D) A 75% chance to lose \$1000 and a 25% chance to lose nothing?

Figure 4. Decision problem illustrating loss aversion¹⁷

The basic principle of framing is the passive acceptance of the formula given and the example above illustrates that responses can be different if choices are framed as a gain (1) or a loss (2).⁵⁰ When framed as a gain, most opt for the riskless choice 'A' but upon framing as a loss most will likely switch to the riskier choice 'D' in the second problem. This demonstration of loss aversion shows that people are more sensitive to losses than to gains and therefore opt for riskier choices with the hope of avoiding the pain of losing. In relation to preventative health behaviors this inclination to avoid a loss might be further explained by the temporal nature in which a decision is made.

Delay discounting

Delay discounting refers to the idea that individuals will devalue the future to varying degrees depending on how far into the future rewards are received, and tend to place a higher subjective value on immediate compared to future gains. This tendency to under/overestimate the value of a reward based upon its temporal proximity is also known as present focus bias. To illustrate, when people are offered the choice of receiving \$100 today or \$110 in one month, many opt to be paid today. The subjective value of the smaller, but more immediate reward becomes higher than the larger, delayed reward and this tendency to give more weight to our current state means that the further away the reward is the more its value will be discounted (or devalued). However, when the offer is pushed into the future, such as receiving \$100 in a year or receiving \$110 in a year and one month, preferences often change and individuals may be more willing to wait the extra month. This is because discounting is non-linear, and its rate is not constant over time.¹⁷ Research has demonstrated that actual behavior follows a more hyperbolic discounting function, where rewards are discounted more steeply in the near future, leveling off as delay to reward increases.¹⁸ In other words, the instant gratification of receiving a smaller albeit “less” valuable reward now outweighs the pursuit of a “more” valuable reward that is to be received in the future. For instance, when thinking about engaging in healthy behaviors in the future, people may prefer and actually plan to go for a walk, eat a salad, or take their medications as prescribed. However, when the future becomes the present, people become myopic and instead opt

to watch Netflix, indulge in fast food, or skip their next dose. Perhaps this is partially explained by the perception of the loss of 'not indulging' looming larger than the perceived benefits of exhibiting self-control. Nonetheless and despite our best intentions while knowing the fact that our present focus bias can easily blind our perceived value of the future, overcoming temptation as it arises is an extremely difficult task to accomplish. Fortunately, this systematic error in judgment can be used to encourage healthier choices if, for instance, people are asked to plan ahead and are held accountable.

Studies have demonstrated that by allowing participants to choose the type of snack to be eaten in one week (vs. right now) or by allowing students to choose main course options in advance (vs. while in the lunch line) they choose far more healthier options for their future selves.^{57,58} Additionally, present focus bias can be leveraged by strategically designing interventions that prompt people to make certain choices or provide an immediate small reward for behaviors that generally provide health gains only in the long run. This might be demonstrated through the use of pre-commitments or reward substitution as they are often used as tools to counteract people's lack of willpower to achieve behavior change. Combating cognitive biases such as optimism bias, loss aversion, and delay discounting by leveraging concepts of pre-commitment and reward substitution have the potential to positively influence medication-taking behaviors. Interventions utilizing pre-commitment, whereby a freely made decision binds someone to an action further down the road, and reward substitution, which

incentivizes people to behave as though they do care about the long-term reward, by creating a more proximal reward as a substitute have been successfully designed to mitigate such cognitive biases.¹⁹⁻²¹ In particular, behaviors to prevent chronic conditions that lead to heart disease do well with the theory of delay discounting because these conditions are typically asymptomatic and negative health consequences may not be evident for many years. Since the benefits of behavior modification are often delayed (decreased risk of future disease) and the opportunity costs of adopting the behavior are immediate (short-term financial and/or psychological costs, risk of side effects, etc.) the value placed on future health may be particularly influential in the adoption of medication adherence in chronic diseases.

Commitment Devices

Commitment devices have been frequently applied to control future behavior and achieve positive change. A classic example is the “Save More Tomorrow” program that was developed by Thaler and Benartzi (2004) and is now widely used. The program was designed to enhance savings for retirement by leveraging the status quo bias, the tendency to do nothing and keep things the same, by switching the default to where new employees had to opt out of the savings program. The Save More Tomorrow program also included a commitment device in that employees could choose to divert a share of future pay raises to their retirement accounts.⁵⁹ This program has been hugely successful and among participants saving rates have quadrupled.^{14,59} Further evidence

has shown that invoking methods of precommitment has helped people to save money^{60,61}, meet deadlines such as turning in homework on time⁶², donate to charity⁶³, or even limit consumption of alcohol⁶⁴. In addition to merely planning ahead, strategies include the use of commitment devices, such as commitment contracts, as a way to alter one's own incentives to make an otherwise meaningless promise reliable by predefined consequences (e.g., monetary loss or public failure) if those promises are not fulfilled. Of note and by definition, a contract is a binding agreement between two or more parties that is intended to be enforceable by law.⁶⁵ For all intents and purposes a commitment contract is not intended to be a legally binding contract. Instead it is intended as a means to hold oneself accountable towards a projected behavior while bringing the risk of loss into the present. In addition, the commitment contract will be more effective as the cost of breaking the commitment (or risk of loss) increases and/or if it is made public.⁶⁶ In doing so, strategies of precommitment and reward substitution can be leveraged to counteract the tendency to choose smaller rewards now (e.g., skipping a dose) in lieu of larger health rewards (e.g., no heart disease) down the road. Thus, by compelling someone to push their decision into the future (and holding them accountable via loss aversion) it becomes much easier to display self-control and subsequently reap the benefits of future healthy choices.⁶⁷

Specific to health behavior change, commitment contracts (including deposit contracts) have also been used to positively influence healthful behaviors in the realms of smoking cessation^{20,67}, weightloss^{68,69}, healthy eating²¹, and exercise^{70,71}.

Commitment contracts frequently incorporate financial incentives in the form of deposit contracts to leverage loss aversion. This typically involves participants voluntarily depositing money into accounts that they can access again only if they accomplish their commitment. This particular commitment contract was featured in a recent study by Halpern et al (2015) that was assessing the roles of multiple financial incentives and nudges in promoting smoking cessation via loss aversion and precommitment. In the deposit contract arm of the study smokers were to deposit \$150, which they could get back (plus earn an additional \$650) if they stop smoking. This commitment contract incorporates the optimism bias as those who opt-in might be unrealistically optimistic about achieving their cessation goal (and making some easy money). However, loss aversion is also being leveraged as the risk of losing \$150 may be motivating participants to accomplish their goals. The results of the intervention showed that although the deposit contract was less appealing to those initially assigned to this intervention (~15% of assigned participants agreed to enroll and deposit money vs. 90% of participants assigned to other monetary rewards agreed to enroll), it was shown to be more effective at sustaining cessation than the other intervention of monetary rewards (~50% deposit contract participants showed sustained cessation for 6 months vs. ~17% monetary reward participants).²⁰ Thus incorporating interventions that build upon loss aversion may help mitigate our present focus bias.

Financial and Social Incentives

As demonstrated in prospect theory, people are loss averse and also tend to overestimate small probabilities and underestimate large probabilities. In the realm of incentives these are ideal concepts to leverage towards enhancing preventative health behaviors. Use of financial incentives as an effective intervention has been successfully demonstrated to promote healthful behaviors such as losing weight^{68,69,72}, smoking cessation^{20,73-75}, and adhering to exercise regimens^{71,76,77}.

Effective interventions using financial incentives to encourage medication non-adherence have been successfully demonstrated albeit mostly conducted in antiretroviral⁷⁸⁻⁸⁰ or substance abuse studies^{81,82}. Nonetheless, a systematic review of mostly substance abuse and antiretroviral therapy, assessed interventions utilizing various financial incentives to increasing medication adherence and reported that financial incentives increased medication adherence by an average of 20 percentage points.⁸³ In a recent antihypertensive study, financial incentives in the form of an increasing payout scheme demonstrated a significantly higher pill count adherence compared to the standard care group.⁸⁴ This result is similar to a recent systematic review and meta-analysis of randomized controlled trials assessing the effects of feedback on medication adherence however many interventions incorporated financial incentives. Results found 16 studies demonstrating significant improvements in medication adherence in the intervention groups compared to the control groups.⁸⁵ A few more studies have demonstrated effective interventions using financial incentives in

the form of lottery payouts; thus leveraging unrealistic optimism. One study utilized a lottery-based financial incentive to enhance adherence to an anticoagulant medication and found that participants were more adherent to their medication and showed better anticoagulation outcomes compared to historical controls.⁸⁶ In a larger study using similar methods, statistically significant improvements in overall anticoagulation control or adherence were not found.⁸⁷ However, the financial incentive did significantly improve control for a subset of participants who had poor anticoagulation control prior to study initiation. The implication is that the creation of an incentive system offering some sort of frequent reward for daily adherence may be an appropriate approach to enhance adherence. Nonetheless, such pecuniary systems must consider whether they are a long-term sustainable solution, since several studies have found that past non-preventative health behaviors have returned upon removal of the financial incentives.⁸⁸⁻⁹⁰

Recent work in the realm of behavior change has begun to directly compare the efficacy of social incentives versus financial incentives in adopting specific behaviors. For example, Ashraf et al. (2012) found that social incentives in the form of peer recognition are more effective than financial incentives at inducing effort in a pro-social task in Zambia⁹¹, and Bandiera et al. (2010) reported evidence that business firms may utilize social incentives as a substitute for financial incentives to enhance employees works efforts⁹². People are inherently driven by social norms and social comparisons and therefore incentives that focus on groups may be more effective than incentives that focus on individuals.⁹³⁻⁹⁵ Perceptions of social norms may strongly influence

people's behavior because they take their cues from what others do and use these observations as a reference point from which to compare their own behaviors.⁶⁶ Reframing people's perceptions of social norms can be an easy way of addressing and changing health behaviors.⁹⁶ For example, a study on the role of peer effects on obesity found evidence that the spread of obesity can come through social ties. The results indicated that the risk of a participant becoming obese increased by nearly 60% if a friend became obese in a given timeframe.⁹⁷ This implies that the behavior of others may reframe perceptions of social norms about a given behavior and therefore serve as a reference point for social comparison. For instance, a recent study demonstrated that social comparison feedback encouraged participants to walk more steps per day than did individual feedback.⁹⁸ Upon evaluation of this normative feedback (e.g., how one's behavior compares to the community), an individual may code the information of 'doing worse than peers' as a loss or 'doing better than peers' as a gain.⁹⁸ Consequently, as individuals are naturally loss averse they are inherently motivated to improve behavior when they learn that they are doing worse than their peers.⁹⁹

Socioeconomic Status (SES) and Subjective Social Status (SSS)

Collecting demographic characteristics (e.g., age, sex, race) and measures of objective socioeconomic status (e.g., income, education) are staples of research that provide a means of characterizing a sample and exploring relevant associations. In particular, a relationship has been found that objective SES and health are linked. For

instance, on a global scale the relationship between those with lower objective SES and higher incidence and prevalence of health conditions and mortality has been found.^{22,23} However, recent studies have suggested that an individual's subjective social status (i.e., subjective SES), how they identify themselves in the social hierarchy, may be a better measure of SES at the individual level compared to a comprehensive indicator of SES.²⁴⁻²⁷

The MacArthur Network on SES and Health developed a measure of subjective social status (SSS) in an attempt to map out where an individual identifies himself or herself on the social ladder while also considering multiple dimensions of SES and social position. The MacArthur Scale of Subjective Social Status² is a validated^{100,101} visual analog scale (see figures 5 & 6) and was developed to capture a general sense of social status across the traditional SES indicators. It is a picture of a ten-rung ladder that is meant to represent a "social ladder" and asks participants to mark to which rung they feel they belong. Two versions of the visual analog scale are available. One is the national (or 'US') ladder (Figure 5) and is thought to be more closely linked to objective SES indicators. The other is the community ladder and is thought to be more closely linked to perceived social standing in one's community (Figure 6). The national ladder asks individuals to rate where they stand in relation to the US population and may be used to make comparisons between objective SES and subjective SES. The community ladder is linked to community standing and may provide insight into less affluent communities where individuals may not identify with "high" objective SES measures

(e.g., income or education) but instead may hold high standing within their social network of local community (e.g., religious or social groups, family). The overarching idea presented by Adler et al. (2000) is that as individuals evaluate their own social standing in the community they consider things such as past experiences, family history and resources, future opportunities, and psychological factors that affect current and future health endeavors as opposed to simply how many resources one may have (e.g. income).²⁵ Just like in prospect theory, where our preferences are reference-dependent and value is derived from the *evaluation of changes* (relative social status) rather than from the *evaluation of absolute magnitudes* (overall income, education), the context in which an individual perceives social status matters. Therefore subjective SES is more than simply how many resources one may have, but instead it includes how much one believes one has relative to others.²⁶ Recent studies have demonstrated that individual's perceived social status can be more consistently and strongly related to overall health compared to objective SES. For example, compared to objective SES, subjective SES was shown to be a better predictor of health status and decline in health status over time in middle-aged adults²⁴, cardiovascular disease in a sample of White women²⁵, and low medication adherence in African Americans.²⁶ Therefore, evaluating subjective SES may provide valuable insight on patient health behaviors like medication adherence.

Think of this ladder as representing where people stand in the United States.

At the **top** of the ladder are the people who are the best off – those who have the most money, the most education and the most respected jobs. At the **bottom** are the people who are the worst off – who have the least money, least education, and the least respected jobs or no job. The higher up you are on this ladder, the closer you are to the people at the very top; the lower you are, the closer you are to the people at the very bottom.

Where would you place yourself on this ladder?

Please place a large “X” on the rung where you think you stand at this time in your life, relative to other people in the United States.



Figure 5. The MacArthur Scale of Subjective Social Status: National Ladder

Think of this ladder as representing where people stand in their communities.

People define community in different ways; please define it in whatever way is most meaningful to you. At the **top** of the ladder are the people who have the highest standing in their community. At the **bottom** are the people who have the lowest standing in their community.

Where would you place yourself on this ladder?

Please place a large "X" on the rung where you think you stand at this time in your life, relative to other people in your community.



Figure 6. The MacArthur Scale of Subjective Social Status: Community Ladder

Chapter 3 Methods

This chapter describes in detail the methods used to address the specific aims of this study. Included are descriptions of the research design, participant recruitment, and procedures for data collection and analysis. The specific aims of this dissertation are to: 1) compare the effectiveness of an intervention to improve adherence to antihypertensive or antihyperlipidemic medications that provides incentives in the form of a financially incentivized commitment contract vs. a socially incentivized commitment contract vs. usual care (no commitment contract), 2) evaluate the association between participants' subjective social status, self-reported adherence, and MEMS-measured adherence, and 3) explore factors that are associated with preference for type of incentive and satisfaction with incentive received. The specific research questions and study hypotheses are provided in the following sections.

Research Questions and Study Hypotheses

The underlying goal of this dissertation was to understand what impact behavioral economics-based interventions have on enhancing medication adherence. The primary objective aimed to determine whether commitment devices, such as commitment contracts, can motivate participants to be adherent to their prescribed

antihypertensive or antihyperlipidemic medications and which type of incentive (financial or social) is more effective. The secondary objectives aimed to explore factors associated with self-reported adherence, MEMS-measured adherence, perceived social status, preference for incentive type, and satisfaction with incentive received in an effort to better understand influential factors and provide meaningful insight into approaching effective health behavior change interventions. The next two sections list the specific research questions and study hypotheses.

Research Questions

RQ1: To what extent will an incentivized commitment contract increase medication adherence rates compared to usual care?

RQ2: Which incentive structure, financial or social, will show greater medication adherence improvement?

RQ3: What is the relationship between subjective social status, self-reported adherence, and MEMS-measured adherence?

RQ4: What is the relationship between preference for type of incentive and other factors such as subjective social status, objective social status, demographic variables, total number of medications, and number of comorbid disease states?

RQ5: What is the relationship between satisfaction with incentive received and other factors such as subjective social status, objective social status, demographic variables, total number of medications, and number of comorbid disease states?

RQ6: What are the perceptions of social incentives for healthful behaviors (such as medication adherence) and what interventions are perceived as most relevant and useful?

Study Hypotheses

H1: Medication adherence rates will be greater in patients using incentivized commitment contracts compared to usual care.

H2: There will be no significant difference in medication adherence improvement between the two commitment contract groups.

H3a: Perceived social status will be associated with self-reported adherence.

H3b: Perceived social status will be associated with MEMS-measured adherence.

H4: Preference for type of incentive will be associated with subjective social status, objective social status, other demographics, total number of medications, and number of comorbid disease states.

H5: Satisfaction with incentive received will be associated with subjective social status, objective social status, other demographics, total number of medications, and number of comorbid disease states.

Overview of Study Design

A mixed-methods design was implemented to address the research questions and test the hypotheses above. Data collection and analyses were conducted in 2 major phases.

Phase I: Quantitative Study

A longitudinal, randomized, controlled trial comparing the effectiveness of an intervention to improve adherence to antihypertensive or antihyperlipidemic medications that provides incentives in the form of a financially incentivized commitment contract vs. a socially incentivized commitment contract vs. usual care (no commitment contract), was utilized to test the research questions and hypotheses derived for this study. As an overview, patients receiving a medication to treat hypertension or hyperlipidemia from a local independent pharmacy, Marble City Health Mart Pharmacy (MCP), were identified using pharmacy records. To measure medication adherence, participants study medications were dispensed into a Medication Event Monitoring System (MEMS) vial that electronically recorded a date and timestamp upon each vial opening. A baseline survey captured the following factors: age, sex, race/ethnicity, income, education, marital status, employment status, insurance status, living arrangements, total number of medications, number of comorbid disease states, self-reported adherence (via Medometer), subjective social status (via the MacArthur Scale of Subjective Social Status – a 10-item VAS), and preferences for type of incentive. A follow-up survey was implemented to capture the following factors: total number of medications, number of comorbid disease states, self-reported adherence, subjective social status (via MacArthur Scale of Subjective Social Status), preference for type of incentive, and satisfaction with incentive received. The phase I research protocol was approved by the university's Institutional Review Board (IRB).

Target Population and Research Site

Marble City Health Mart Pharmacy, a local independent pharmacy, was utilized as the primary research site. Located in the state of Alabama, MCP serves a diverse population in a rural county that has a total population of approximately 81,000 (15% over the age of 65, 35% minority, and 27% with income below the poverty level). MCP is a progressive pharmacy that provides a wide range of pharmacy services, including pharmaceutical compounding, home infusion pharmacy, biometric screening, medication therapy management evaluations, medication monitoring services, medication dispensing, and free medication delivery. The pharmacy is staffed by full-time pharmacists, lead technicians, supporting technicians, fourth year pharmacy students, cashiers, and delivery drivers. MCP serves approximately 6000 patients and fills an average of 425 prescriptions per day. The pharmacists, students, and technicians at Marble City Pharmacy pledged their support for patient recruitment, consent, enrollment, and data collection.

Participants

The sampling frame consisted of patients who received their medications from Marble City Pharmacy, were currently prescribed a chronic medication for hypertension or for hyperlipidemia, and were due for a refill during the recruitment period. Inclusion criteria consisted of age 18 and over, able to speak/read/understand English, able to self-administer medications, and access to an e-mail account and a computer or a tablet computer (containing a USB port) with Internet access.

Recruitment

A waiver for preliminary activities for research was approved by the IRB so the PI could view contact information to adequately recruit participants. A list of all MCP patients who were currently prescribed a chronic medication aimed at combating hypertension or hyperlipidemia was utilized to select potential participants for recruitment. The list was generated using pharmacy records and Rx30, MCP's pharmacy management system software, where 'chronic medications' were defined using the following drug classes: to treat hypertension - angiotensin-converting enzymes (ACE) Inhibitors, angiotensin II receptor blockers (ARBs), calcium channel blockers (CCBs), thiazide diuretics, beta blockers, renin inhibitors, aldosterone receptor antagonists, peripheral vasodilators, and alpha-2 agonists; to treat hyperlipidemia – HMG-CoA reductase inhibitors (statins), fibric acid derivatives, niacin, bile acid sequestrants, and cholesterol absorption inhibitors. Using this criterion, a report was generated listing patients with refills due in the upcoming 3 months. Patients who were under the age of 18 were removed. Duplications involving patients receiving multiple eligible study medications were removed. Once the final list was generated, patient recruitment was accomplished using multiple methods of contact including mailed letters, phone calls, emails, social media, and active recruiting at the point of care. A rolling recruitment was utilized over a three-month period. Initially, 1036 recruitment letters were addressed, stamped, and mailed to patients inviting them to participate in the study. In addition, recruitment flyers were posted on MCP's Facebook account and

displayed inside the pharmacy. Active recruiting at the point of care was utilized by attaching recruitment flyers to prescription bags of eligible medications and verbally engaging eligible patients upon subsequent refill pick-up. Upon expressed interest in joining the study, potential participants were screened using inclusion criteria parameters, informed of the purpose of the study, and scheduled an individual enrollment and training session with the principal investigator.

Power analysis

To determine the appropriate sample size for this study a power analysis was conducted. Power is the probability that a statistical test will accurately reject the null hypothesis and thus detect an effect of a given magnitude if it truly exists. The power of a study is determined by several factors including the statistical test utilized, sample size, alpha level, and effect size. This study utilized t-tests and analysis of variance statistical tests. The alpha level, also known as the significance level or type I error rate, is the probability of rejecting the null hypothesis when it is true. For this study, an alpha level of 0.05 was used to determine statistical significance of statistical tests.¹⁰² As the power of a test is the probability of accurately rejecting the null hypothesis, the beta level, also known as the type II error rate, is the probability of falsely accepting the null hypothesis. Power is $1 - \beta$ and is traditionally set at a level of 0.80.¹⁰²

The effect size is the magnitude of the treatment effect or a measure of the distance between the null and alternative hypothesis. Typically, an effect size used to

determine power is estimated via previous studies utilizing similar interventions or outcomes measures. In a meta-analysis of studies assessing financial incentives for medication adherence, an overall mean effect size of 0.77 was found as financial incentives significantly improved medication adherence relative to control groups¹⁰³. However, there is a paucity of literature assessing effect sizes of commitment devices or social incentives applied to medication adherence. Therefore, a moderate effect size of 0.50 was selected for this study.

Using G-Power software (version 3.1.9.2) to estimate a desired sample size with a two-sided alpha level of 0.05, effect size of 0.50, and desired power of 0.80 an estimated minimum sample size of 42 participants (14 per group) was needed. Allowing for a 30% loss due to attrition, a sample size of 60 participants across three groups (20 per group) was set as the target for enrollment and subsequent randomization.

Randomization

Eligible participants who completed the enrollment and training session (discussed below) were randomly assigned to one of three treatment groups. A stratified randomization procedure was implemented to ensure HTN and HLD medications were equally represented in each group. Randomization was conducted using a random number generator, a procedure that creates a block randomization list, which produces a sequence of numbers that meet certain statistical requirements for randomness. In this procedure, random numbers were chosen with equal probability from a finite set of

numbers. Randomization occurred electronically upon participants consenting during enrollment and automatically assigned participants to one of the following groups: 1) usual care group (UC), 2) financial incentive group (FI), or 3) social incentive group (SI).

Enrollment

A study website was utilized to facilitate the aims of this study and help alleviate staff burden the enrollment process. All participants were enrolled, consented, and trained at MCP in a private consultation area. Training materials, enrollment videos, and enrollment packets were created and a subsequent enrollment flow was implemented via the study website. The training materials served as supplemental documents for the enrollment/training videos. The enrollment packet included the following items: two copies of the IRB-stamped informed consent form, study group specific infographic sheets, MEMS vial (and if appropriate MEMS data reader) training sheet, and training documents corresponding to enrollment/training videos. All videos were embedded into the study website and included the following: informed consent video, explanation of study group and requirements video, how to use MEMS vial video, how to upload MEMS data video, and how to navigate the study website video.

Enrollment sessions were scheduled by the CITI-certified MCP staff members and were conducted by the principal investigator in a private consultation room. Upon arriving for a scheduled session, the participant was guided to the private consultation area and informed about the requirements of the enrollment session. At this point

participants were given an IRB-stamped informed consent form and instructed to watch the IRB-approved informed consent video and follow the on-screen prompts. The informed consent video was created to illustrate the contents of the paper form and ensure fidelity in how the information was communicated. The informed consent video marked the initial step of the enrollment flow embedded into the study website and informed each participant about the purpose of the study, what was involved to participate, compensation and requirements for participating, and that participation was completely voluntary. After the video ended participants were prompted to check 'yes' to accept or 'no' to reject consent. Once checked, the PI was signaled to return to the room, answer questions, and, if accepted, obtain consent by asking the participant to sign and initial the IRB-stamped informed consent form. The next steps involved the PI creating a profile for the participant on the study website, recording MEMS (vial) ID and study medication, and revealing the randomized group assignment to the patient. Next, participants received a group-specific enrollment packet and were instructed to watch the remaining videos, follow the on-screen prompts, and complete the electronic baseline survey. At this point the PI left the consultation room and prepared for closing procedures.

Group Assignments

All participants watched videos explaining their group assignment (incentive group explanation videos included the process of creating a commitment contract),

study requirements, how to use the MEMS vial, and how to navigate the study website. Participants randomized to either incentive group received a MEMS data reader, watched additional training videos on how/when to upload their data, and were prompted to complete a commitment contract during their baseline survey. Upon finishing the survey, the PI returned to the consultation room to answer questions and compensate the participant with a \$10 gift card. To conclude the enrollment session, the participant was instructed to pick-up their study medication and sign for their gift card. The following section describes each group assignment and study requirements.

Usual care group: Participants received a 30-day supply of their antihypertensive or antihyperlipidemic medication in a MEMS vial. No feedback or incentives were provided. Adherence was electronically tracked over the 90-day period using MEMS features (described below). Participants were instructed to use only the MEMS vial provided for their study medication (i.e., no pillboxes) and to remove their medication directly from the MEMS vial at each scheduled dose. UC participants did not upload their own MEMS data nor did they receive weekly emailed reports.

Financial incentive group: Participants received a 30-day supply of their antihypertensive or antihyperlipidemic medication in a MEMS vial and were given \$90 upfront, in a virtual account, at the beginning of the study. Participants signed a financially incentivized commitment contract requiring them to put “their” \$90 on the line

as an incentive to stay adherent to their chronic treatment regimen. The “stakes” were set as a potential loss of \$1 for every nonadherent day. Adherence was achieved if the patient took his or her medication as prescribed each day and was confirmed by MEMS adherence data. Incentive participants were required to upload their data weekly using a MEMS data reader and a computer. Each week participants received an emailed report stating their previous week’s adherence, amount of money subtracted from their virtual account, current account balance, and link to view this information on the study website.

Social incentive group: Participants received a 30-day supply of their antihypertensive or antihyperlipidemic medication in a MEMS vial and were informed of their selection into an online "community" known as the Marble City Pharmacy community adherence group. Participants signed a socially incentivized commitment contract whereby they pledged to take their medication every day as prescribed and were made aware that their weekly individual adherence would be visible to everyone in the group. However, to preserve anonymity participants were assigned a unique ID and chose an avatar to be displayed to represent their individual medication adherence online. In addition, participants were informed of having an individual and a community medication-taking goal. The individual goal was to reach 100% adherence each week. Doing so unlocked individual badges that highlighted weekly progress and were visible for all to see. The community goal was to achieve an 80% “community” medication adherence rate and

was defined as mean individual adherence rates for the group each week. If achieved then a community badge was unlocked and visible for all to see. On the study website participants could see illustrated graphics of both individual and “community” medication adherence data and a weekly leaderboard. Adherence was achieved if the patient took his or her medication as prescribed each day and was confirmed by MEMS adherence data. Incentive participants were required to upload their data weekly using a MEMS data reader and a computer. Each week participants received an emailed report stating the study website had been updated and provided a link for participants to view their weekly adherence and earned badges.

Study Requirements

To be eligible for gift cards and cash drawings all participants were required to fulfill the following study requirements: 1) sign informed consent and complete enrollment session, 2) complete two online surveys, 3) receive refills in the MEMS vial as necessary, 4) return all MEMS equipment to the pharmacy at the end of the 90-day period, and 5) sign necessary paperwork to document receipt of gift cards and/or cash drawings. All participants who completed the enrollment process received a \$10 Marble City Pharmacy gift card. In addition, those who completed all study requirements and returned all MEMS equipment to Marble City Pharmacy received an additional \$10 MCP gift card and qualified for a chance to win one of four \$50 visa gift cards. The winners of the \$50 gift cards were selected at random using a random number generator. In this

procedure, random numbers were chosen with equal probability from a finite set of numbers (e.g., the number of eligible participants at the end of the study period).

Study Website

A study website was built in collaboration with Auburn University's Campus Web Solutions (CWS), a team of experienced OIT professionals and student programmers, and was developed to facilitate the aims of this study. The website utilized an HTTPS (secure encryption methodology) connection and data was stored in the Auburn University Office of Information Technology datacenter on a secured SQL server. Email addresses collected from participants during enrollment were encrypted before being stored on the server. To access the study website, participants were required to login using the username and password created during enrollment. Upon logging in, participants were directed to a user-specific homepage displaying help tabs and information cards. Help tabs were listed vertically on the left and included the following: 1) 'contact us', 2) 'help' – this linked to all training materials and videos used during enrollment, 3) 'how to navigate study website video', 4) 'Marble City Pharmacy' direct link, and 5) 'upload data to medAmigo' direct link. (medAmigo is a MEMS platform that receives participant data) Information cards were visible in the center of the user's homepage and displayed the name of study medication and start/end date of their 90-day monitoring period. In addition, incentive-specific cards were displayed for participants of the incentive groups. A prominently displayed 'money lost' card written as

“So far you have lost \$X of your original \$90” and a ‘current balance’ card was visible to participants of the FI group. The framing of the ‘money lost’ card was intended to reinforce the principle of loss aversion. Social incentive participants were presented a card displaying ‘date of last data upload’, a table displaying the date/time of successful MEMS openings, the avatar chosen during enrollment, and an additional tab called ‘social’. Once clicked, the ‘social’ tab displayed the following sections: 1) medication adherence graphics, 2) community leaderboard, 3) personal badges earned, and 4) community badges earned.

In the center of the ‘social’ tab were two prominently displayed medication adherence graphics. The first graphic presented a 7-day bar graph indicating days in which personal medication adherence was achieved. The second graphic displayed two doughnut charts indicating the user’s individual adherence for the week and the community’s adherence for the week. The community leaderboard was displayed vertically along the right margin and presented a weekly ranked list of individual adherence rates with corresponding avatars. Displayed next to each avatar was the number of badges earned and upon hovering the badges became visible.

Each week participants had the opportunity to earn personal and community badges that represented weekly progress and accomplishment of adherence goals. During enrollment, weekly individual adherence was emphasized as playing a very important part in contributing to the community adherence goal. Participants were informed that by achieving 100% adherence for the week they were representing full support to the

group by contributing 100% to the collective community adherence goal. However, for each day one or more doses of medication was missed, they were showing less support by contributing less to the group and thus making it more difficult for the community adherence goal to be reached. The following badges (with subsequent rules) were available to be earned:

- Weekly adherence badge
 - Achieving 100% individual adherence for the given week
 - Achieving $\geq 80\%$ community adherence for the given week
- Streak badge:
 - Achieving 100% individual adherence X weeks in a row
 - Achieving $\geq 80\%$ community adherence X weeks in a row
 - X = 3 weeks, 6 weeks, 9 weeks, and 12 weeks
- Back on track badge:
 - Upon failing to reach a weekly adherence goal, this badge was earned by achieving 100% adherence over the following 2 weeks

Data Collection

Questionnaire & Measures

The electronic baseline questionnaire was integrated into the enrollment flow and was utilized to measure the following: objective socioeconomic status (education, income) and other demographics (age, sex, race, ethnicity, marital status, employment

status, living arrangements, total number of medications, and number of comorbid disease states), subjective socioeconomic status, self-reported medication adherence, and preferences for type of incentive. The electronic follow-up questionnaire was built in Qualtrics (a web-based survey platform) and was distributed to participants as a hyperlink in an email on day 90. It was utilized to measure the following: total number of medications, number of comorbid disease states, self-reported adherence, subjective socioeconomic status, and preference for type of incentive.

Subjective Social Status

The MacArthur Network on SES and Health developed a measure of subjective social status in an attempt to map out where an individual identifies himself or herself on the social ladder while also considering multiple dimensions of SES and social position. The MacArthur Scale of Subjective Social Status² is a validated^{100,101} visual analog scale (see Figures 5 & 6) and was developed to capture a general sense of social status across the traditional SES indicators. It is a picture of a ten-rung ladder, where 1 is the lowest and 10 is the highest, that is meant to represent a “social ladder” and asks participants to mark to which rung they feel they belong. Two versions of the visual analog scale are available. One is the national (or ‘US’) ladder (Figure 5) and is thought to be more closely linked to objective SES indicators. The other is the community ladder and is thought to be more closely linked to perceived social standing in one’s community (Figure 6). The national ladder asks individuals to rate where they stand in

relation to the US population and may be used to make comparisons between objective SES and subjective SES. The community ladder is linked to community standing and may provide insight into less affluent communities where individuals may not identify with “high” objective SES measures (e.g., income or education) but instead may hold high standing within their social network of local community (e.g., religious or social groups, family).

MEMS Adherence Tracking Device

Medication adherence was indirectly measured via an electronic MEMS (Medication Event Monitoring System) that was designed to compile the dosing histories of ambulatory patients prescribed oral medications. Assuming that bottle openings represent medication intake, MEMS provides a detailed profile of the patient’s adherence behavior⁴² and is currently regarded as the gold standard to measure adherence.⁴³ The system, manufactured by Westrock, is comprised: 1) the MEMS monitor/cap which is a standard plastic vial with threaded opening and a closure for the vial containing a micro-electronic circuit that records the date/time of the dosing dispenser opening, (It collects real-time data and stores the data in a non-volatile internal storage unit) 2) the MEMS data reader that transfers the data from the MEMS monitor via a distant network computer to the MWV servers and 3) the website www.medAmigo.com for uploading the MEMS data online via the medAmigo platform.

MEMS-Measured and Self-Reported Adherence Measures

Self-reported medication adherence was measured at baseline and 90-day follow-up using a previously validated visual analog scale known as the Medometer.¹ (see figure 2) The Medometer is a novel adherence measuring tool that resembles a speedometer. Patients were asked to self-assess overall adherence by placing a mark at the point that best describes how often s/he took their dose correctly as prescribed over the preceding 4 weeks, with 0 representing no doses taken, 100 representing all doses taken, and >100 to 120+ representing extra doses taken. Daily medication adherence was noninvasively tracked using a MEMS vial, where each vial opening locally stored and recorded a date and timestamp as an 'event'. These data (events) were collected weekly through a web-platform (medAmigo) by user upload via the MEMS data reader. Incentive group participants were instructed to upload their MEMS data weekly on Mondays by end of the day. Weekly emails were sent on Monday mornings as a reminder and that failure to meet upload deadlines resulted in "missed" adherence and was counted as if all medication doses were missed for the week. During enrollment, failing to meet an upload deadline was framed as 'contributing 0%' to the community adherence goal for SI participants and 'losing \$7 from your virtual account' for FI participants.

Adherence was evaluated on a day level; in other words, a participant must have taken all scheduled doses within a 24-hour period to be designated as adherent for that day. For this study, each day was set to begin at 0300 and end 24 hours later at 0259.

This timeframe was selected to allow flexibility for those working late night shifts or with bedtimes past midnight. Weekly adherence was calculated as the number of days the patient was adherent over the preceding 7 days. Cumulative adherence (%) was calculated as the number of days the patient was adherent since initiation of the fill, divided by the total number of days.

Data Entry and Management

Incentive group participants uploaded MEMS adherence data to the medAmigo platform weekly on Mondays. Each week the principle investigator downloaded these data into a Microsoft Excel spreadsheet and cleaned and sorted events by unique ID. Next, these data were sent to CWS who subsequently updated participant virtual accounts and social incentive pages on the study website. The principle investigator double checked the updated virtual accounts and social incentive pages for accuracy. Upon completion of the study, the principle investigator coded and entered all MEMS adherence data, baseline questionnaire data, and follow-up questionnaire data into SPSS version 23.0. After data collection and entry were complete, frequencies were calculated for all variables to determine incomplete data and to identify any abnormal entries that may have been missed during data entry.

Data Analysis

All quantitative statistical analyses were conducted using SPSS version 23 (IBM, Armonk, NY). Descriptive statistics were utilized to characterize the sample in terms of

objective socioeconomic status (education, income) and other demographics (age, sex, race, ethnicity, marital status, employment status, living arrangements, total number of medications, and number of comorbid disease states), subjective socioeconomic status, self-reported medication adherence, preferences for type of incentive, and MEMS measured adherence. Data were summarized descriptively: n (%) for categorical data; median (with range) for continuous non-normally distributed data; and mean (with standard deviation) for continuous normally distributed data. Statistical tests used throughout corresponded to the data distribution. A One-way ANOVA was used to determine differences in MEMS-measured adherence and self-reported adherence across the three study groups. Data that were non-normally distributed utilized the following non-parametric tests: chi-square tests for testing associations between categorical data, Spearman's rank-order correlation coefficients for testing associations between all variables including MEMS-measured medication adherence, self-reported adherence, subjective social status score, total number of medications, total number of conditions, and other demographic variables, and Kruskal-Wallis H test to determine differences in the distributions of MEMS-measured adherence between the three study groups. All statistical analyses were based on a significance level of 0.05.

Phase II: Qualitative Study

To explore factors that were associated with preference for type of incentive and satisfaction with incentive received (Specific Aim 3) as well as to better understand influential factors and provide meaningful insight into approaching effective health behavior change interventions, a qualitative study design was utilized. This aim had 2 parts. Part 1 involved semi-structured interviews with Marble City Pharmacy participants who completed the quantitative study and consented to participate. Initial interview questions asked about their overall thoughts on the study, motivations for joining, feelings regarding their group assignment, experience with the study website, and general feedback. Based on respondent answers, further probing attempted to elicit additional information from the participants. Part 2 of this aim was to utilize the information learned to formulate topic areas and questions for focus group discussions in a separate patient population. Preference for type of *social* incentive was determined to be an area that needed further exploration. Recent work in the realm of behavior change has begun to directly compare the efficacy of social incentives versus financial incentives in adopting specific behaviors.^{91, 92} People are inherently driven by social norms and social comparisons and therefore incentives that focus on groups may be more effective than incentives that focus on individuals.⁹³⁻⁹⁵ Perceptions of social norms may strongly influence people's behavior because they take their cues from what others do and use these observations as a reference point from which to compare their own behaviors.⁶⁶ Understanding and subsequently reframing people's perceptions of social

norms can be an efficient way of addressing and changing health behaviors.⁹⁶

Therefore, qualitative methods were used to explore and better understand the social factors that influenced healthful behaviors (such as medication adherence) and the types of interventions that were perceived as most relevant and useful. In particular, focus groups were conducted to explore how participants conceptualized social incentives, identified facilitators and barriers associated with social incentives, and understood to what extent they may be applied to motivate healthful behaviors. The phase II IRB protocol was approved.

Target Population and Research Site

The sampling frame consisted of patients who received their prescription medications from the Auburn University Employee Pharmacy (AUPEP). Participants were identified and recruited from pharmacy records. Inclusion criteria was age of 19 to 64 and able to speak, read, and understand English. Individuals were excluded if they did not administer their own medications or were not taking medications on a regular basis (e.g., maintenance medications vs. asthma “rescue” inhaler).

Recruitment

A waiver for preliminary activities for research was approved by the IRB so the PI could view contact information to adequately recruit participants. Pharmacy records were used to identify eligible patients and recruitment was accomplished using multiple methods of contact including phone calls, emails, social media, and active recruiting at

the point of care. An IRB-approved information letter was provided during recruitment in both electronic and hard-copy forms. Initially, a recruitment letter was emailed to all patients who met inclusion criteria. One week later, a follow up email was sent to non-respondents. As needed, follow up calls were initiated three days later with a maximum of three attempts at reaching the patient by phone. Prospective participants were screened for eligibility by phone and in person. Eligible patients were read an IRB-approved informed consent script to obtain verbal consent. Those interested in participating were scheduled to one of two focus group sessions stratified by age. Participants aged 19-49 were scheduled into focus group session I and participants aged 50-64 were scheduled into focus group session II.

Data Collection

Two focus group sessions were conducted with eligible patients of the AUPEP to generate data. A moderator was used to run the focus group while a research assistant took notes and summarized points for the end discussion. The session was scheduled for two hours. Participants were fed dinner and compensated with a \$10 gift card. Informed consent, including consent to audio-recording, was obtained on the day of the focus group session. Participants were encouraged to ask questions and were reminded that participation was voluntary. Upon agreeing to participate, participants signed the informed consent form and were given a copy for their records. Next, a paper baseline questionnaire was given and captured demographic information, objective and

subjective socioeconomic status, total number of medications, co-morbid conditions, preference and satisfaction with type of incentive received, and ownership and use of mobile technology and apps. A question guide was used by the moderator to facilitate discussion. These questions were grouped into the following 5 sections:

- Section 1: Defining social incentives
- Section 2: Experience with social incentives for healthful behaviors
- Section 3: Barriers/facilitators to using social incentives
- Section 4: Ownership and use of mobile technology and apps
- Section 5: Medication adherence scenario and social incentives

Focus group sessions were recorded using two digital voice recorders.

Participants were informed that all information, including their identities, would be kept confidential. In addition, participants were asked to respect the privacy of other group members by not divulging information discussed during the focus group. To ensure confidentiality, each participant was coded with a random alphanumeric ID and all recorded interviews were kept separate from the identifying code list. Recorded interviews were transcribed verbatim in a Microsoft Word document for analysis.

Data Analysis

Qualitative analysis of focus group data was conducted using ATLAS.ti (Scientific Software Development GmbH, Berlin, Germany) qualitative analysis software.

Transcripts of both focus group sessions were coded independently by two coders to

produce initial codes. Coders utilized initial coding, in vivo coding, and process coding during the first cycle coding process to generate a joint code list. Using this list, both coders went back over the transcript to recoded the data using second cycle coding process methods. Once completed, both coders met to discuss the need for additional codes and emergent themes. Next, the PI aggregated the codes and utilized a thematic analysis to determine appropriate themes. The Coding Analysis Toolkit (Texifter, LLC, Pittsburg, KS) was used to calculate Krippendorff's Alpha to determine inter-coder or inter-rater reliability; the percentage at which both coders initial codes were consistent and in agreement.

Chapter 4 Results

Phase I: Quantitative Study

Phase I of this dissertation used a longitudinal, randomized, controlled trial design and collected data from MEMS vial openings and 2 patient questionnaires. The first questionnaire was given during the enrollment process and was used as a baseline assessment. The second questionnaire was emailed to participants upon study completion and served as the 90-day follow-up. This section will describe the results of phase I, including participant recruitment, baseline and follow-up demographics and characteristics, and MEMS-measured medication adherence. Statistical analysis of quantitative data was performed with SPSS Version 23 (IBM, Armonk, NY).

Participant Recruitment

As previously described, multiple methods of recruitment were utilized for this study with mailed letters being the primary means of recruitment. Pharmacy records were used to generate a list of MCP patients who were currently prescribed a chronic medication aimed at treating hypertension or hyperlipidemia. A total of 1063 patients met this criteria. After removal of 27 patients less than 18 years of age, a total of 1036 eligible patients were mailed a recruitment letter asking them to join the study. Of the

1036 mailed letters, 70 were undeliverable as addressed and were returned to sender. Of the 966 recruitment letters presumed to be deliverable, a total of 17 enrollment sessions were scheduled within the first 2 weeks and were a direct result the recruitment letters. Of these 17 enrollment sessions, 5 patients failed to show up, 2 patients canceled with the intention of rescheduling, and 10 patients were enrolled into the study. Depending on group allocation, enrollment sessions lasted between 25-40 minutes. Over the subsequent 5 weeks, an additional 5 participants were recruited by means of active recruiting (e.g., approached while picking up a refill) and enrolled into the study. Therefore, a total of 15 participants completed the enrollment process, signed the informed consent form, and completed the baseline questionnaire. One participant, assigned to the usual care group, withdrew from the study the day after their enrollment session. Another usual care participant completed both questionnaires, however the patient subsequently passed away and medication adherence data was lost to follow-up. There was no indication that the patient's death was medication-related.

Participant Characteristics

Baseline characteristics of Marble City Pharmacy participants are displayed in Table 4.1. A total of 15 people were randomized to one of the following groups: 1) Usual Care group (n = 6), 2) Financial Incentive group (n = 3), and 3) Social Incentive group (n = 6). One patient in the UC group withdrew from the study very early and was not included in the analyses. Of the 14 participants, the majority were female (57%), white

(86%), not of Hispanic, Latino, or Spanish origin (86%), currently married (57%), and retired (50%). Over half (57%) of participants reported 'college' as their highest level of schooling and more than one-third (36%) held a Bachelor's degree. Most participants were homeowners (74%), did not live alone (60%), and had a combined household income of \$50,000 to \$100,000+ (57%). Age ranged from 40 to 82 years, with a mean (\pm SD) of 59 ± 13 years. On average, patients reported 10 total medications (9.9 ± 6.6) and 5 comorbid disease states (5.4 ± 6.6).

Table 4.1 Baseline Characteristics

| | Overall (n = 14), n (%) | UC (n = 5), n (%) | FI (n = 3), n (%) | SI (n = 6), n (%) |
|--|------------------------------------|------------------------------|------------------------------|------------------------------|
| Sex | | | | |
| Female | 8 (57.1%) | 2 (40%) | 2 (66.7%) | 4 (66.7%) |
| Male | 6 (42.9%) | 3 (60%) | 1 (33.3%) | 2 (33.3%) |
| Ethnicity | | | | |
| Not Hispanic, Latino, or Spanish Origin | 12 (85.7%) | 4 (80%) | 2 (66.7%) | 6 (100%) |
| Yes, Hispanic, Latino, or Spanish Origin | 1 (7.1%) | 0 (0%) | 1 (33.3%) | 0 (0%) |
| Prefer not to answer | 1 (7.1%) | 1 (20%) | 0 (0%) | 0 (0%) |
| Race | | | | |
| American Indian or Alaska Native | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Asian (e.g., Chinese, Filipino, Japanese, Korean, Vietnamese, other Asian) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Asian Indian | 2 (14.3%) | 2 (40%) | 0 (0%) | 0 (0%) |
| Black or African American | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Native Hawaiian or other Pacific Islander | 12 (85.7%) | 3 (60%) | 3 (100%) | 6 (100%) |
| White | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Prefer not to answer | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Marital Status | | | | |
| Single, never married | 3 (21.4%) | 1 (20%) | 1 (33.3%) | 1 (16.7%) |
| Currently married (or domestic partnership) | 8 (57.1%) | 4 (80%) | 1 (33.3%) | 3 (50%) |
| Separated, divorced, or widowed | 3 (21.4%) | 0 (0%) | 1 (33.3%) | 2 (33.3%) |
| Prefer not to answer | 0 (0%) | 0 (0%) | 0 (0%) | 0 (%) |
| School (highest level) | | | | |
| No schooling completed | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |

| | | | | |
|---|-----------|---------|-----------|-----------|
| Elementary school | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Junior high school | 4 (28.6%) | 3 (60%) | 0 (0%) | 1 (16.7%) |
| High school | 8 (57.1%) | 2 (40%) | 2 (66.7%) | 4 (66.7%) |
| College | 2 (14.3%) | 0 (0%) | 1 (33.3%) | 1 (16.7%) |
| Graduate school | | | | |
| Education (highest earned) | | | | |
| HS diploma or equiv. (GED) | 4 (28.6%) | 2 (40%) | 1 (33.3%) | 1 (16.7%) |
| Associate degree (Jr. college) | 3 (21.4%) | 2 (40%) | 1 (33.3%) | 0 (0%) |
| Bachelor's degree | 5 (35.7%) | 1 (20%) | 1 (33.3%) | 3 (50%) |
| Master's degree | 1 (7.1%) | 0 (0%) | 0 (0%) | 1 (16.7%) |
| Doctorate | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Professional (MD, JD, etc.) | 1 (7.1%) | 0 (0%) | 0 (0%) | 1 (16.7%) |
| None of above (less than HS) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Job Status | | | | |
| Working full-time | 6 (42.9%) | 2 (40%) | 1 (33.3%) | 3 (50%) |
| Working part-time | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Unemployed or laid-off | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Looking for work | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Keeping house or raising children full-time | 1 (7.1%) | 0 (0%) | 1 (33.3%) | 0 (0%) |
| Retired | 7 (50%) | 3 (60%) | 1 (33.3%) | 3 (50%) |
| Income | | | | |
| Less than \$5k | 2 (14.3%) | 1 (20%) | 0 (0%) | 1 (16.7%) |
| \$5k-\$11,999 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| \$12k-\$15,999 | 2 (14.3%) | 2 (40%) | 0 (0%) | 0 (0%) |
| \$16k-\$24,999 | 2 (14.3%) | 0 (0%) | 1 (33.3%) | 1 (16.7%) |
| \$25k-\$34,999 | 2 (14.3%) | 1 (20%) | 0 (0%) | 1 (16.7%) |
| \$35k-\$49,999 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| \$50k-\$74,999 | 2 (14.3%) | 1 (20%) | 1 (33.3%) | 0 (0%) |
| \$75k-\$99,999 | 2 (14.3%) | 0 (0%) | 0 (0%) | 2 (33.3%) |
| \$100k and greater | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |

| | | | | |
|------------------------------|---------------|---------------|---------------|---------------|
| Don't know | 2 (14.3%) | 0 (0%) | 1 (33.3%) | 1 (16.7%) |
| Prefer not to answer | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Household | median(range) | median(range) | median(range) | median(range) |
| # of people | 2 (5) | 2 (5) | 1 (1) | 2 (5) |
| Of these, # children | 0 (4) | 0 (4) | 0 (0) | 0 (4) |
| Of these, # adults | 2 (2) | 2 (1) | 1 (1) | 2 (2) |
| Of adults, # provide income | 1 (2) | 2 (1) | 1 (1) | 1 (2) |
| Home Ownership | | | | |
| Owned or being bought by you | 11 (78.6%) | 3 (60%) | 2 (66.7%) | 6 (100%) |
| Rented | 3 (21.4%) | 2 (40%) | 1 (33.3%) | 0 (0%) |
| Occupied without payment | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Other | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Prefer not to answer | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Combined Income | | | | |
| Less than \$5k | 1 (7.1%) | 0 (0%) | 0 (0%) | 1 (16.7%) |
| \$5k-\$11,999 | 2 (14.3%) | 1 (20%) | 0 (0%) | 1 (16.7%) |
| \$12k-\$15,999 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| \$16k-\$24,999 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| \$25k-\$34,999 | 1 (7.1%) | 1 (20%) | 0 (0%) | 0 (0%) |
| \$35k-\$49,999 | 1 (7.1%) | 0 (0%) | 1 (33.3%) | 0 (0%) |
| \$50k-\$74,999 | 2 (14.3%) | 2 (40%) | 0 (0%) | 0 (0%) |
| \$75k-\$99,999 | 3 (21.4%) | 1 (20%) | 1 (33.3%) | 1 (16.7%) |
| \$100k+ | 3 (21.4%) | 0 (0%) | 0 (0%) | 3 (50%) |
| Don't know | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Prefer not to answer | 1 (7.1%) | 0 (0%) | 1 (33.3%) | 0 (0%) |
| Lost Income | | | | |
| Less than month | 1 (7.1%) | 0 (0%) | 0 (0%) | 1 (16.7%) |
| 1-2 months | 1 (7.1%) | 0 (0%) | 0 (0%) | 1 (16.7%) |
| 3-6 months | 5 (35.7%) | 3 (60%) | 1 (33.3%) | 1 (16.7%) |
| 7-12 months | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |

| | | | | |
|-------------------------------|------------|----------|-----------|-----------|
| More than 1 year | 5 (35.7%) | 2 (40%) | 1 (33.3%) | 2 (33.3%) |
| Prefer not to answer | 2 (14.3%) | 0 (0%) | 1 (33.3%) | 1 (16.7%) |
| Savings (& assets) | | | | |
| Less than \$500 | 3 (21.4%) | 2 (40%) | 1 (33.3%) | 0 (0%) |
| \$500-\$4,999 | 3 (21.4%) | 2 (40%) | 0 (0%) | 1 (16.7%) |
| \$5k-\$9,999 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| \$10k-\$19,999 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| \$20k-\$49,999 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| \$50k-\$99,999 | 2 (14.3%) | 0 (0%) | 0 (0%) | 2 (33.3%) |
| \$100K-\$199,999 | 1 (7.1%) | 0 (0%) | 0 (0%) | 1 (16.7%) |
| \$200k-\$499,999 | 1 (7.1%) | 1 (20%) | 0 (0%) | 0 (0%) |
| \$500k+ | 1 (7.1%) | 0 (0%) | 1 (33.3%) | 0 (0%) |
| Don't know | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Prefer not to answer | 3 (21.4%) | 0 (0%) | 1 (33.3%) | 2 (33.3%) |
| Savings after debt | | | | |
| Less than \$500 | 6 (42.9%) | 4 (80%) | 0 (0%) | 2 (33.3%) |
| \$500-\$4,999 | 1 (7.1%) | 0 (0%) | 1 (33.3%) | 0 (0%) |
| \$5k-\$9,999 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| \$10k-\$19,999 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| \$20k-\$49,999 | 1 (7.1%) | 0 (0%) | 0 (0%) | 1 (16.7%) |
| \$50k-\$99,999 | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| \$100K-\$199,999 | 2 (14.3%) | 1 (20%) | 0 (0%) | 1 (16.7%) |
| \$200k-\$499,999 | 1 (7.1%) | 0 (0%) | 1 (33.3%) | 0 (0%) |
| \$500k+ | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Don't know | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| Prefer not to answer | 3 (21.4%) | 0 (0%) | 1 (33.3%) | 2 (33.3%) |
| Smartphone ownership | | | | |
| Yes | 10 (71.4%) | 5 (100%) | 2 (66.7%) | 3 (50%) |
| No | 4 (28.6%) | 0 (0%) | 1 (33.3%) | 3 (50%) |
| Smartphone type | | | | |
| | 5 (35.7%) | 3 (60%) | 0 (0%) | 2 (33.3%) |

| | | | | |
|--|--|----------------------------------|----------------------------------|---------------------------------|
| iPhone | 5 (35.7%) | 2 (40%) | 2 (66.7%) | 1 (16.7%) |
| Android-OS | 4 (28.6%) | 0 (0%) | 1 (33.3%) | 3 (50%) |
| None | | | | |
| | Overall (n = 14), Mean (SD) | UC (n = 5), Mean (SD) | FI (n = 3), Mean (SD) | SI (n = 6), Mean(SD) |
| Age (range: 40-82) | 59.1 (12.9) | 56.6 (11.2) | 59.3 (4.2) | 61 (17.3) |
| Total Medications | 9.9 (6.6) | 8.6 (6.7) | 16.7 (4.9) | 7.5 (5.6) |
| Total Conditions | 5.4 (4.4) | 10 (8.5) | 5.3 (2.1) | 3.6 (2.9) |
| Subjective Social Status: Community Ladder (1-10) | 7.9 (1.3) | 8.2 (0.4) | 8.0 (1.7) | 7.5 (1.6) |
| Subjective Social Status: National Ladder (1-10) | 6.9 (1.8) | 6.0 (2.0) | 8.3 (0.6) | 7.0 (1.8) |
| Self-reported adherence (0-120) | 93.6 (11.1) | 85.4 (15.6) | 95 (5) | 99.7 (0.8) |

Abbreviations: UC = usual care group, SI = social incentive group, FI = financial incentive group

MEMS-measured and Self-reported Adherence

A one-way ANOVA was conducted to determine if there was any difference in MEMS-measured medication adherence between groups. However, two assumptions were not met and the following steps were used to address these violations. Visual inspection of boxplots revealed two significant outliers; one in the UC group and another in the SI group. Before modifying the outliers or transforming the data, normality was assessed. MEMS-measured adherence was normally distributed for the FI group but was non-normally distributed for both UC and SI groups, as assessed by Shapiro-Wilk's test ($p < 0.05$). Before transforming the data, both outliers were modified by replacing the outlier's value with a less extreme value. These values were calculated and extrapolated based upon a 30-day consecutive window of participant medication

adherence. Nonetheless, modification of outliers neither removed outliers nor converted the data to normality. Returning to the original data, skewness and kurtosis indicated these data were moderately, negatively skewed. A square root transformation was applied however both outliers and non-normal distribution of the UC group data remained. A Log10 transformation successfully removed both outliers and converted the data to normality, as assessed by Shapiro-Wilk test ($p > .05$). Further, there was homogeneity of variances, as assessed by Levene's test for equality of variances ($p = .780$). Using the Log10 transformed values in an ANOVA, no statistically significant differences in MEMS-measured adherence between groups, $F(2,10) = .644$, $p = .546$.

Additional tests were run to compare and evaluate if the outliers or transformation had an appreciable effect on analysis. Using data containing both modified outliers, a square root transformation was applied and a subsequent one-way ANOVA was run. This resulted in removal of outliers, normal distribution of data, and homogeneity of variances however there were no statistically significant differences in MEMS-measured adherence between groups ($p = .620$). Another test comparison was run using data where both outliers were completely removed however similar results were achieved (e.g., $p = .634$). Next, a one-way ANOVA was run using the original data containing outliers and non-normally distributed data. The assumption of homogeneity of variances was met, as assessed by Levene's test for equality of variances ($p = .186$), however there were no statistically significant differences in MEMS-measured adherence between groups, $F(2,10) = .492$, $p = .626$. Lastly, a Kruskal-Wallis H test, a rank-based nonparametric test, was run to

determine if there was a statistically significant difference in the distributions of MEMS-measured adherence between the groups. Values (below) are mean rank unless otherwise stated. Distributions of MEMS-measured adherence were not similar for all groups, as assessed by visual inspection of a boxplot. MEMS-measured adherence increased from UC group (5.63), to SI group (7.42), to FI group (8.00), but the differences were not statistically significant, $\chi^2(2) = .785, p = .676$.

Given the results of the additional tests and comparisons showing no appreciable effect, the original data was used to conduct the one-way ANOVA. Table 4.2 presents MEMS-measured and self-reported medication adherence and Figure 7 presents MEMS-measured adherence for each group. Mean percentage (\pm SD) of MEMS-measured adherence, measured over 90 days, increased from UC group (77% \pm 34%), to SI group (87% \pm 20%), to FI group (95% \pm 6%), but the differences were not statistically significant, $F(2,10) = .492, p = .626$.

Mean self-reported adherence, measured using the Medometer, for all participants at baseline was 93.6% (\pm 11.1%) and ranged from 61%-100%. The average baseline Medometer score for the UC group, the SI group, and the FI group was 85.4% (\pm 15.6%), 99.7% (\pm 0.8%), and 95% (\pm 5%), respectively. Mean Medometer score for all participants at 90-day follow-up was 97.4% (\pm 7.9%) and ranged from 75%-100%. The average 90-day follow-up Medometer score for the UC group, the SI group, and the FI group was 100% (\pm 0%), 99.8% (\pm 0.5%), and 91.7% (\pm 14.4%), respectively. Self-reported adherence did not significantly differ between groups at baseline (*Welch's* $F(2,1.815) = 1.207, p = .464$), nor at

90-day follow-up (Welch's $F(2,1.612) = 1.182, p = .361$). Three participants in the UC group and one in the SI group failed to complete the follow-up questionnaire and were excluded from these analyses, leaving a final sample size of 10. The mean change (\pm SD) in self-reported adherence from baseline to 90-day follow-up was positive in the UC group (5 ± 7.1), the SI group (0.2 ± 0.5) and negative in the FI group (-3.3 ± 10.4), with no statistically significant difference across study groups ($F(2,7) = 1.794, p = .235$) and no statistically significant change from baseline to follow-up in any of the 3 groups ($P > 0.05$).

Table 4.2 MEMS-Measured and Self-Reported Medication Adherence

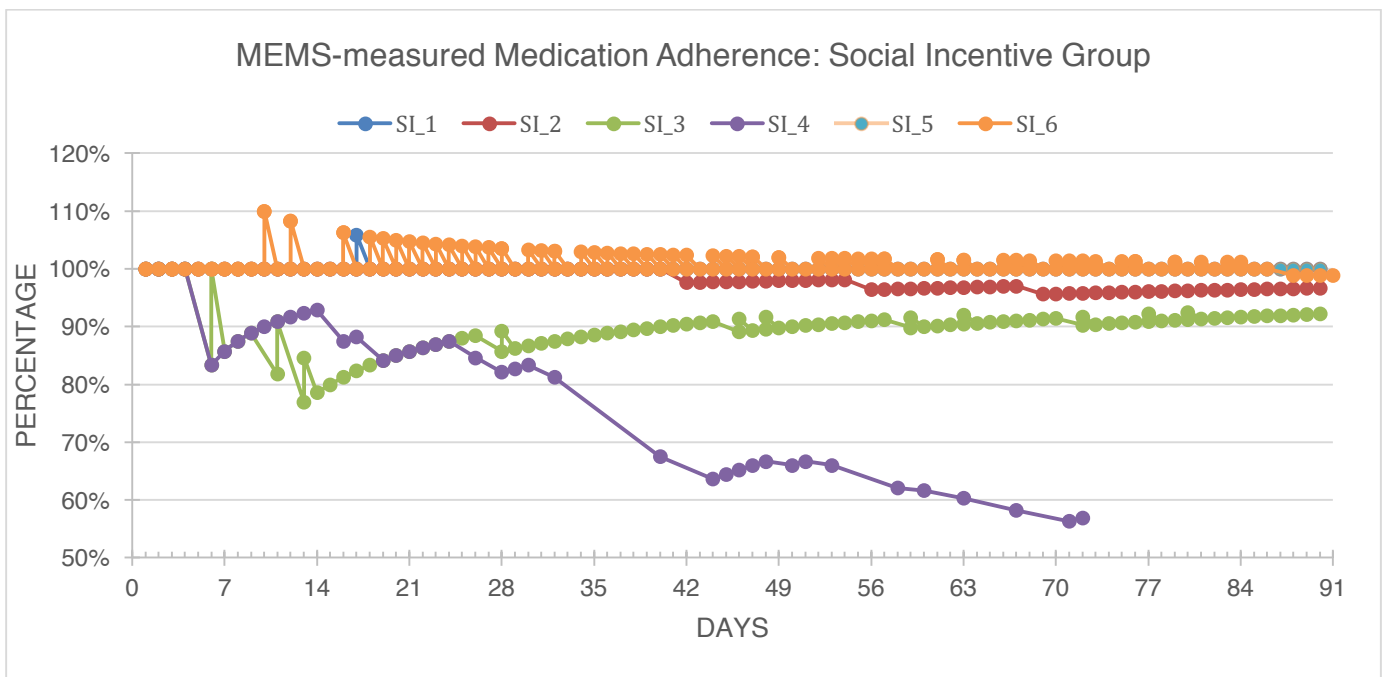
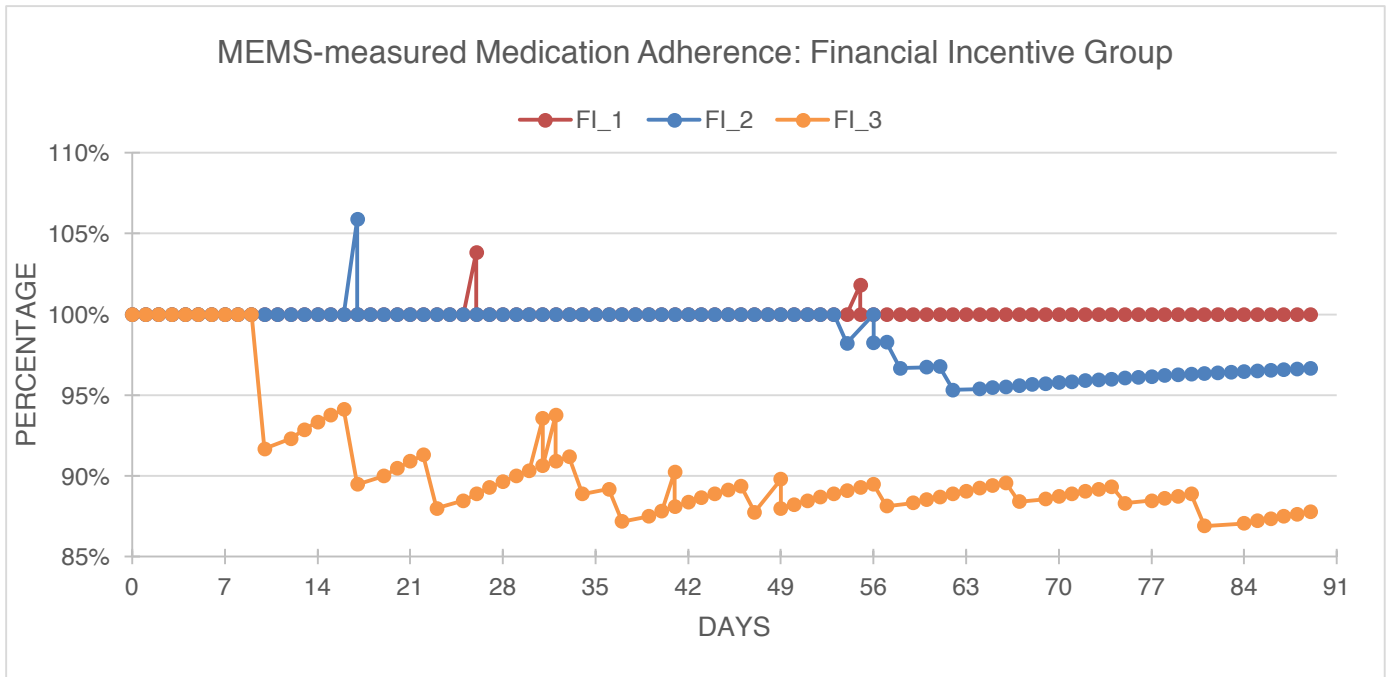
| | Overall (n = 14), Mean (SD) | UC (n = 5), Mean (SD) | FI (n = 3), Mean (SD) | SI (n = 6), Mean (SD) | <i>P</i> ^a |
|---|--|----------------------------------|----------------------------------|----------------------------------|-----------------------|
| MEMS-measured adherence | 86 (0.22) | 77.4 (33.5) | 94.8 (6.3) | 87.4 (20.4) | .626 |
| Self-reported adherence (baseline) | 93.6 (11.1) | 85.4 (15.6) | 95 (5) | 99.7 (0.8) | .464 |
| Self-reported adherence (90-day) ^b | 97.4 (7.9) | 100 (0) | 91.7 (14.4) | 99.8 (0.5) | .361 |
| Δ Self-reported adherence ^b | 3.8 (4.1) | 5 (7.1) | -3.3 (10.4) | 0.2 (0.5) | .235 |

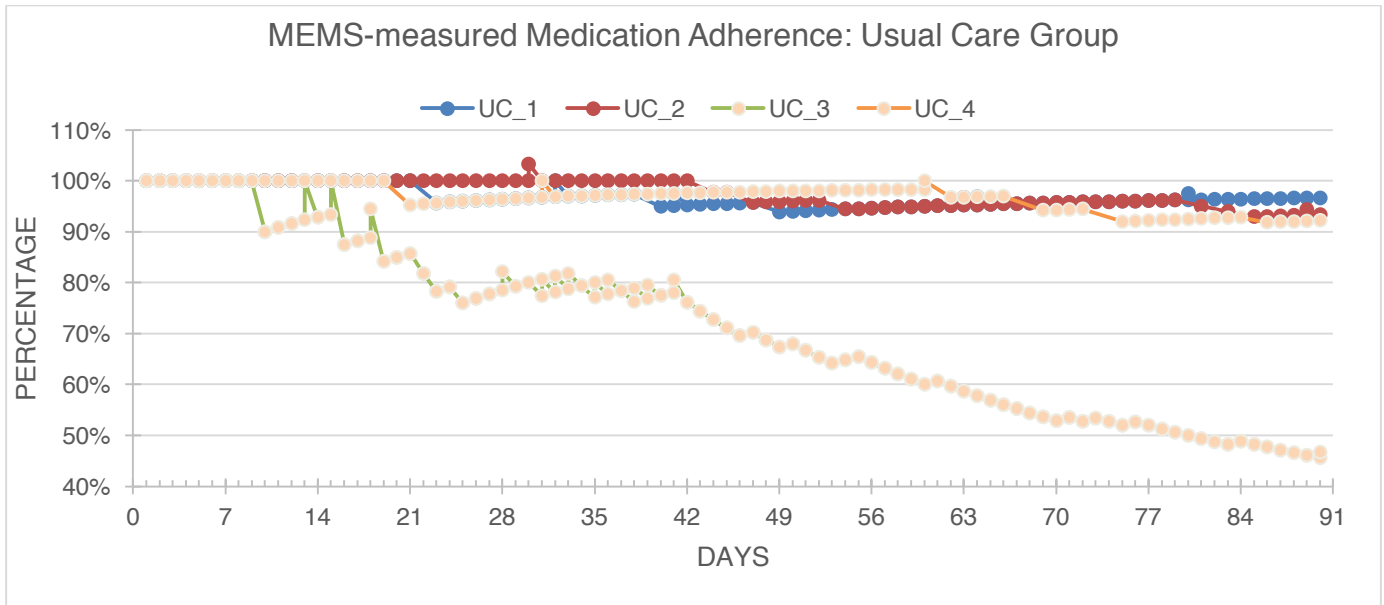
Abbreviations: UC = usual care group, SI = social incentive group, FI = financial incentive group

^aComparisons across study groups using ANOVA.

^bThree participants in the UC group and one in the SI group failed to complete the follow-up questionnaire and were excluded (n=10).

Figure 7 MEMS-Measured Medication Adherence





Subjective Social Status – Community and National Ladders

Table 4.3 presents participants scores of subjective social status on both the community and national ladders. Mean score (\pm SD) of subjective social status, measured using the MacArthur Scale of Subjective Social Status, for all participants at baseline on the community and national ladder was 7.9 (\pm 1.3) and 6.9 (\pm 1.8), respectively. The average baseline SSS community ladder score for the UC group, the SI group, and the FI group was 8.2 (\pm 0.4), 8.0 (\pm 1.7), and 7.5 (\pm 1.6), respectively. The average 90-day follow-up SSS national ladder score for the UC group, the SI group, and the FI group was 6.0 (\pm 2.0), 8.3 (\pm 0.6), and 7.0 (\pm 1.8), respectively. Subjective social status scores did not significantly differ between groups at baseline (community $p=.690$; national $p=.223$), nor at 90-day follow-up (community $p=.616$; national $p=.597$). Three participants in the UC group and one in the SI group failed to complete the follow-up

questionnaire and were excluded from these analyses, leaving a final sample size of 10. The mean change (\pm SD) in community SSS from baseline to 90-day follow-up was negative in the UC group (-2.2 ± 0.4), the FI group (-1.3 ± 1.2) and positive in the SI group (0.1 ± 1.1), with no statistically significant difference across study groups ($F(2,7) = 1.843$, $p = .388$) and no statistically significant change from baseline to follow-up in any of the 3 groups ($P > 0.05$). The mean change (\pm SD) in national SSS from baseline to 90-day follow-up was negative in the UC group (-0.5 ± 1.3), the FI group (-2.3 ± 2.5) and positive in the SI group (0.2 ± 1.3), with no statistically significant difference across study groups ($F(2,7) = 1.616$, $p = .432$) and no statistically significant change from baseline to follow-up in any of the 3 groups ($P > 0.05$).

Table 4.3 Subjective Social Status Scores - Community and National Ladder

| | Overall (n=14), Mean (SD) | UC (n=5), Mean (SD) | FI (n=3), Mean (SD) | SI (n=6), Mean (SD) | <i>P</i> ^a |
|---|------------------------------|------------------------|------------------------|------------------------|-----------------------|
| SSS Community (baseline) | 7.9 (1.3) | 8.2 (0.4) | 8.0 (1.7) | 7.5 (1.6) | .690 |
| SSS National (baseline) | 6.9 (1.8) | 6.0 (2.0) | 8.3 (0.6) | 7.0 (1.8) | .223 |
| SSS Community (90-day follow-up) ^b | 7.0 (1.9) | 6.0 (0.0) | 6.7 (2.9) | 7.6 (1.7) | .616 |
| SSS National (90-day follow-up) ^b | 6.6 (1.9) | 5.5 (0.7) | 6.3 (3.1) | 7.2 (1.5) | .597 |
| Δ SSS Community (baseline to 90-day) ^b | -0.9 (0.6) | -2.2 (0.4) | -1.3 (1.2) | 0.1 (1.1) | .388 |
| Δ SSS National (baseline to 90-day) ^b | -0.3 (0.9) | -0.5 (1.3) | -2.3 (2.5) | 0.2 (1.3) | .432 |

Abbreviation: SSS =Subjective Social Status, UC =usual care, SI =social incentive, FI =financial incentive

^aComparisons across study groups using ANOVA.

^bThree participants in the UC group and one in the SI group failed to complete the follow-up questionnaire and were excluded (n=10).

Spearman's rank-order correlations were run to assess relationships between the following: MEMS-measured medication adherence, self-reported adherence, total number of medications, total number of conditions, and other demographic variables. Preliminary analyses showed all relationships to be monotonic, as assessed by visual inspection of a scatterplot. MEMS-measured adherence was moderately correlated with self-reported adherence at baseline ($r_s(11) = .350, p = .241$) and 90-day follow-up ($r_s(7) = .472, p = .199$) however neither were statistically significant. There was a strong negative correlation between MEMS-measured adherence and total number of people living in the household ($r_s(7) = -.680, p = .044$), total number of adults living in the household ($r_s(7) = -.807, p = .009$), and total number of adults living in the household who provide income ($r_s(7) = -.810, p = .009$). An increase in total number of medications was strongly correlated with an increase in total number of conditions ($r_s(8) = .728, p = .017$). There was a positive correlation with wealth in the form of savings or liquid assets ($r_s(12) = .544, p = .045$).

Spearman's rank-order correlations were also run to assess relationships between subjective social status ladders (community and national ladder at baseline and 90-day follow-up), self-reported adherence, MEMS-measured adherence, and the variables mentioned in the previous paragraph. There were no statistically significant relationships between SSS (on either ladder), self-reported adherence, and MEMS-measured adherence (all P 's > 0.05). However, both measures of SSS were more

closely associated with each other, as can be seen in Table 4.4, than either MEMS-measured adherence or self-reported adherence. Across groups, both the SSS community ladder and SSS national ladder were moderately associated with each other at baseline and 90-day follow-up, with the baseline SSS national ladder having a positive significant correlation with the 90-day follow-up SSS national ladders. There was a strongly negative correlation between subjective social status, using the national ladder, and total number of people living in the household ($r_s(12) = -.680, p = .044$), total number of adults living in the household ($r_s(12) = -.560, p = .037$), and total number of adults living in the household who provide income ($r_s(12) = -.614, p = .019$).

Table 4.4 Correlations of MEMS-measured Adherence, Self-reported Adherence, and Subject Social Status (n=14)^a

| | MEMS | Self-report | SSS C | SSS N | Self-report 90-day ^b | SSS C 90-day ^b | SSS N 90-day ^b |
|---|----------------|----------------|---------------|------------------------------|---------------------------------|--------------------------------|---------------------------|
| MEMS-Measured Adherence | 1 | | | | | | |
| Self-reported Adherence (Baseline) | .350 (.24) | 1 | | | | | |
| SSS – C (Baseline) | -.081 (.79) | -.231 (.43) | 1 | | | | |
| SSS – N (Baseline) | -.049 (.87) | .055 (.85) | .487 (.08) | 1 | | | |
| Self-reported Adherence (90-day) ^b | .472 (.20) | .563 (.09) | .567 (.09) | .133 (.71) | 1 | | |
| SSS – C (90-day) ^b | -.115 (.77) | .265 (.46) | .625 (.05) | .410 (.24) | .617 (.06) | 1 | |
| SSS – N (90-day) ^b | -.230 (.55) | .105 (.77) | .580 (.08) | .641* (.04) | .189 (.60) | .811** (.004) | 1 |

Abbreviation: SSS = Subjective Social Status; C = community ladder; N = national ladder

^aSpearman's rank order correlations

^bThree participants in the UC group and one in the SI group failed to complete the follow-up questionnaire and were excluded (n=10).

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 4.5 summarizes descriptive findings of participant preference for type of incentive received. Participants were asked to indicate the extent of importance they felt towards the idea of receiving different types of incentives or rewards for accomplishing their medication-taking goals. When asked about “receiving personal gratification” from knowing that they took their medication everyday as prescribed, most respondents

reported it as 'extremely important' (50%) or 'very important' (43%). Upon asking about "receiving personal gratification" from knowing that *someone else knew* they took their medications every day, the majority reported 'extremely important' for "Your family and friends" (57%), "Your pharmacist" (43%), and "Others in your MCP community" (43%).

The next two questions aimed to assess social comparisons by asking the extent of importance of knowing that you take your medication "more often than" or "less often than" someone else taking a similar medication. The knowledge of taking their medication "more often than", 1) "Others in your MCP community" was reported by most as either 'moderately important' (36%) or 'not at all important' (29%); and 2) "Family and friends" was reported by most as either 'moderately important' (36%) or 'not at all important' (21%). Similarly, the knowledge of taking their medication "less often than", 1) "Others in your MCP community" was indicated by most as either 'moderately important' (36%) or 'not at all important' (21%); and 2) "Family and friends" was reported by most as either 'moderately important' (43%) or 'not at all important' (21%).

When asked about the importance of knowing their ranking among others in relation to medication adherence, nearly 40% of participants reported "not at all important" when considering either "Others in your MCP community" or "Family and friends". The remaining participants' responses (~60%) were nearly evenly spread among 'moderately important', 'very important', and 'extremely important' when considering either "Others in your MCP community" or "Family and friends". Upon assessing the perceived importance of "Receiving virtual badges that represent

personal milestones for taking your medication everyday as prescribed”, many respondents indicated this was ‘not at all important’ (36%) however some reported ‘moderately important’ (21%) or ‘very important’ (21%).

The final two questions assessed the importance of receiving a financial incentive for medication adherence. Nearly 40% of respondents felt “Receiving a small cash payout (e.g., \$1)” for daily medication adherence was ‘not at all important’, while nearly 30% felt it was either ‘very important’ (14%) or ‘extremely important’ (14%). When asked about “the opportunity to win a large cash payout (e.g., \$50) once a week” for medication adherence, nearly 40% reported ‘moderately important’, 14% reporting ‘very important’, and 21% reporting ‘extremely important’.

Table 4.5 Preference for Type of Incentive (n=14)

| | Not at all Important | Slightly Important | Moderately Important | Very Important | Extremely Important | Mean |
|---|-----------------------------|---------------------------|-----------------------------|-----------------------|----------------------------|----------------|
| | N % | N % | N % | N % | N % | (SD) |
| <i>Receiving personal gratification from knowing...</i> | | | | | | |
| YOU know you take your medication daily as prescribed | 0 0.0% | 1 7.1% | 0 0.0% | 6 42.9% | 7 50.0% | 4.36 (.84) |
| OTHERS in MCP Community know... | 1 7.1% | 1 7.1% | 2 14.3% | 4 28.6% | 6 42.9% | 3.93 (1.27) |
| Your FAMILY & FRIENDS know... | 0 0.0% | 2 14.3% | 1 7.1% | 3 21.4% | 8 57.1% | 4.21 (1.12) |
| Your PHARMACIST knows... | 1 7.1% | 1 7.1% | 1 7.1% | 5 35.7% | 6 42.9% | 4.00 (1.24) |
| <i>Knowing you take your medication MORE OFTEN THAN...</i> | | | | | | |
| OTHERS in MCP Community taking similar medications | 4 28.6% | 2 14.3% | 5 35.7% | 2 14.3% | 1 7.1% | 2.57 (1.28) |
| Your FAMILY & FRIENDS taking similar medications | 3 21.4% | 2 14.3% | 5 35.7% | 2 14.3% | 2 14.3% | 2.86 (1.35) |
| <i>Knowing you take your medication LESS OFTEN THAN...</i> | | | | | | |
| OTHERS in MCP Community taking similar medications | 3 21.4% | 3 21.4% | 5 35.7% | 2 14.3% | 1 7.1% | 2.64 (1.22) |
| Your FAMILY & FRIENDS taking similar medications | 3 21.4% | 2 14.3% | 6 42.9% | 2 14.3% | 1 7.1% | 2.71 (1.20) |
| <i>Knowing how you rank in how often you take your medication among...</i> | | | | | | |
| OTHERS in MCP Community taking similar medications | 5 35.7% | 1 7.1% | 3 21.4% | 3 21.4% | 2 14.3% | 2.71 (1.54) |
| Your FAMILY & FRIENDS taking similar medications | 5 35.7% | 1 7.1% | 3 21.4% | 4 28.6% | 1 7.1% | 2.64 (1.45) |
| <i>Receiving virtual badges for daily medication adherence</i> | 5 35.7% | 2 14.3% | 3 21.4% | 3 21.4% | 1 7.1% | 2.50 (1.40) |
| <i>Receiving a small cash payout (e.g., \$1) for daily medication adherence</i> | 2 14.3% | 5 35.7% | 3 21.4% | 2 14.3% | 2 14.3% | 2.79 (1.31) |
| <i>The opportunity to win a large cash payout (e.g., \$50) once a week for daily medication adherence</i> | 2 14.3% | 2 14.3% | 5 35.7% | 2 14.3% | 3 21.4% | 3.14 (1.35) |

Abbreviation: MCP = Marble City Pharmacy

Phase II: Qualitative Study

Part I of the second phase of this dissertation began with semi-structured “exit” interviews with the Marble City Pharmacy participants who completed phase I of the study. The purpose of these interviews was to learn about participant experiences with the study and to utilize this information to inform topic areas and questions for a separate qualitative study using focus groups. Of the 14 participants contacted, a total of 10 participants agreed to participate in a telephone interview. Of the 10 participants interviewed, 6 were in the social incentive group, 3 were in the financial incentive group, and 1 was from the usual care group. The length of time per interview averaged 31 minutes and ranged from 21 to 53 minutes. All interviews were transcribed verbatim which resulted in 28,882 words or 60 pages. Overall, participants viewed their experience with this study as favorable and, if asked, would participate again. When asked about their motivations for joining this study, most expressed a desire to “help out” their pharmacist(s) or the PI while few mentioned their health or the financial incentive as the primary reason for joining. When asked about satisfaction with incentive received and overall experience as a financial incentive participant, all three FI participants responded alike stating they were very satisfied with the financial incentive as it was a “nice bonus”, however it was “not the main reason for joining the study”. When pressed to discuss preference for different type of financial incentive all responded alike again stating that health was their main reason for taking their medications therefore the type of financial incentive didn’t matter. Upon asking social

incentive participants questions aimed at understanding their specific experiences and perceptions, most participants admitted to using the study website very minimally or not at all. Some of the expressed reasons for not using the study website included, 'trouble logging in, 'forgetting to login', 'traveling for the summer with limited internet access', 'not enough time', and 'no reason, I just didn't'. For those with minimal use of the study website, many enjoyed features such as the leaderboard and medication adherence graphs. However, with limited to no use of the study website participants were likely not exposed to the intended social incentive. Therefore, it was determined that preference for type of social incentives, especially when asked of medication-taking behaviors, was an area that needed further exploration. Recurrent themes and general insights were captured and used to inform the focus group question guide used in Part 2. Section headings and primary questions used are displayed below in Table 4.6.

Part 2 of the second part of this dissertation research utilized focus groups to explore and better understand the social factors that influenced healthful behaviors (such as medication adherence) and the types of interventions that were perceived as most relevant and useful. Eligible patients who received their prescription medications from the AUEP participated in one of two focus group sessions, divided by age (<50 and ≥ 50). A total of 7 participants participated in focus group session I (6 females and 1 male). Their ages ranged from 22 to 49 with a mean age of 31. A total of 10 participants attended focus group session II (8 females and 2 males). Their ages ranged from 53 to 62 with a mean age of 58. Each session lasted approximately two hours. A question

guide was used by the moderator to facilitate discussion while a research assistant took notes and summarized points for the end discussion. Both focus group sessions were transcribed verbatim which resulted in a total of 26,371 words or 69 pages of text; focus group session I consisted of 14,788 words or 40 pages of text and focus group session II consisted of 11,583 words or 29 pages of text.

Using ATLAS.ti, transcripts of both focus group sessions were coded independently by two coders (JO and JH) to produce initial codes, a subsequent master code list, and identify themes. To produce initial codes, each coder read through the first focus group transcript and independently assigned content-based phrases or 'tags' to quotations to categorize the data. Next, the coders met to review their independent coding lists and assess the similarities and differences between the quotations that were coded. Upon further deliberation, a master coding list was developed and used by the coders to independently code the entire transcript as well as to calculate inter-coder reliability. Coder 1 generated a total of 122 codes and coder 2 generated a total of 98 codes. The master code list was consolidated to a total of 104 codes that were applied to 533 quotations. Multiple codes were applied to each quote as appropriate. Both coders reconvened to discuss their reflections on the dataset and determined emergent themes.

Table 4.6 Focus Group Question Guide – Section Headings and Primary Questions

| Focus Group Question Guide |
|--|
| <p>Section 1: Defining social incentives</p> <p>What is a healthy habit or health behavior that you are working on or would like to start working on? <i>[Asked to write the following down before answering]</i></p> <p>When you think of a motivation or reason that may be social in nature for wanting to do a healthy habit or behavior, what comes to mind?</p> |
| <p>Section 2: Experience with social incentives for healthful behaviors</p> <p>What other social factors might motivate you to maintain a healthy lifestyle? What makes a good accountability partner?</p> |
| <p>Section 3: Barriers/facilitators to using social incentives</p> <p><i>Think back to the last time you wanted to make a health-related change. It may have been a change in your medication-taking behaviors, what you eat, your weight, smoking, or exercise habits.</i></p> <p>What kind of barriers or roadblocks did you run into? What helped you or would have helped you in changing this behavior and overcoming barriers? What role did or could other people have played in your success, changing this behavior? How does this apply to medication-taking behaviors?</p> |
| <p>Section 4: Ownership and use of mobile technology and apps</p> <p>What role does your smartphone (or technology) play in helping you maintain a healthy lifestyle? Staying accountable? How does this apply to medication-taking behaviors?</p> |
| <p>Section 5: Medication adherence scenario and social incentives</p> <p><i>While listening to the following scenario think about YOUR medication-taking behavior. Suppose you have been told by your doctor that your “levels” need to be improved and she has now prescribed you a medication-taking app.</i></p> <p>What features would this medication adherence app have to have make sure you are successful? What “social” [incentive] features would you prefer in the medication adherence app? Teamwork? Competition? Accountability? Feedback from health care member?</p> |

Themes

Thematic analysis of the dataset identified four themes among the participants of both focus group sessions. The number of quotations and codes per theme are found in Figure 8.

Quotations that characterize each theme are found in Table 4.7 and in the sections that follow. Inter-coder reliability was favorable overall (Krippendorff's $\alpha = 0.787$) as well as for each theme (Krippendorff's α ranged from 0.755 to 0.853). Identified themes are as follows: 1) Accountability, 2) Motivation, 3) Barriers and Solutions, and 4) Technology.

Figure 8 Number of Quotations and Codes Per Theme

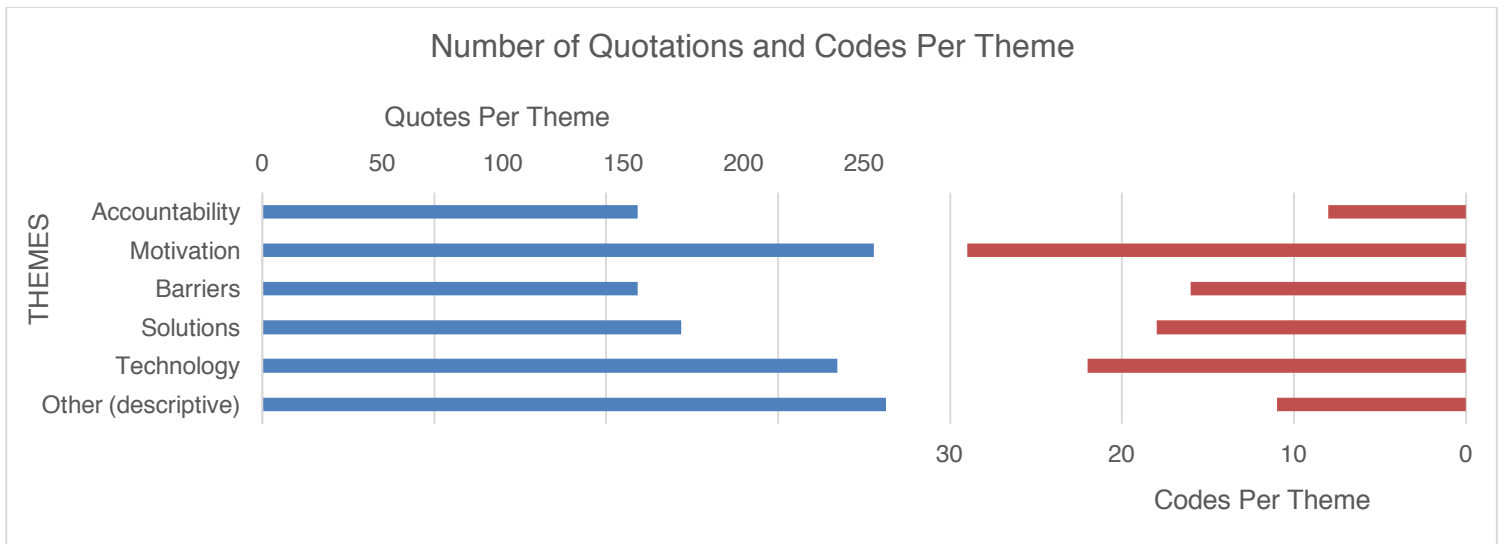


Table 4.7 Quotations from Focus Group Sessions Demonstrating Themes

| Theme | Quotes from focus group sessions I & II |
|-----------------------|--|
| Accountability | <p><i>"Making sure that you do what you said you were going to do. I really need to go do it, and keep my word."</i></p> <p><i>"Me and my friends, a lot of times we get discouraged by taking so much medication, and it does help for her to encourage me, because I just wanted to stop. And she'll say, "Well, you know you can't stop taking your medication." And I do her the same, so in a sense...I guess it just depends on who it is."</i></p> |
| Motivation | <p><i>"Well, if he's going to be number one, I've got to be in the top 10, you know, so it kind of motivates me, but not like it does him..."</i></p> <p><i>"Plus socially, I want to spend time with my family so I ... Living longer. I want to be with them for more time."</i></p> |
| Barriers | <p><i>"And that's what I'm missing. I'm missing that accountability, the friendship, being somewhere at a certain time to do something with somebody."</i></p> <p><i>"I think the work environment can hinder you. [IF] they're bringing in donuts... or not encouraging of walking or drinking water. I don't know. That social thing can be a struggle"</i></p> |
| Solutions | <p><i>"They had me counting calories at first, and I just can't deal with that, so they tried servings instead, which is something that's not as concrete, not as specific, but I'm more motivated to do it, because I can look and say, "Oh, yeah, that's a serving, that's a serving."... so counting calories did not work, but counting servings did."</i></p> <p><i>"You can't change it overnight, and sometimes the changes are small and incremental, but over time, they are significant...A pound a week's 52 pounds in a year. That's a lot of weight. A pound a week, I could do."</i></p> |
| Technology | <p><i>"This [Apple iWatch]...has a GPS on it. It does my steps, it does my pulse, it does my heartbeat. I'm consumed with my pulse. I'm consumed with every step I take every single day, and it's all heart-specific ...every hour it tells me to stand up, to breathe, to go for a walk every two hours. And it's really beneficial because an hour will pass and I am not aware of it. Then it will vibrate and say, "You need to take three deep breaths." And I actually do it"</i></p> <p><i>"We had a bunch of friends doing Whole30 from all over the U.S., and people that we knew, but they were just spread out...but just having a forum specifically to where those kinds of conversations can happen [is helpful]"</i></p> |

Accountability

A total of 11 codes were identified and grouped to comprise the theme 'Accountability'. (Table for these codes) These codes included 4 broad codes, 'accountability', 'accountability partner', 'discussing goals/progress', and 'frequent feedback', and 7 sub-category codes pertaining to an accountability partner. These codes were applied to 156 quotations and were coded 84 times by coder 1 and 72 times by coder 2. Questions were asked to explore the social factors that influenced healthful behaviors and a major recurrent theme within the responses was a sense of accountability. This sense was expressed by one participant as "*Making sure that you do what you said you were going to do*" and was often discussed in terms of having some form of accountability partner. When the moderator asked each group what they thought made a good accountability partner, many responses referred to specific characteristics or types of people. For instance, one participant stated that it should be "*...somebody that you can be honest with both ways, and say stuff without it coming off as being judgmental or poor criticism*" while another stated it should be "*someone you're not related to...or even a significant other.*" For most, characteristics of a good accountability partner include someone who is honest, encouraging, has similar goals, and "*actually holds you accountable*".

Communication was a further element of accountability that became apparent during both sessions. Whether tracking progress through a mobile app or wearable device, participants emphasized the importance of human interaction on being

successful with their goals. One participant stated, *“back when I was losing all that weight, me and my coworker, we were accountable to each other, every day, like, ‘What have you eaten,’ or like, ‘What did you do this weekend,’ and things like that. We both had a Fitbit, but us actually talking about it was much more important than even just tracking.”* Many agreed with this sentiment and another participant added, *“...you’re actually keeping track of it and you’re actually thinking about it, even if what you’re doing isn’t the best...but just having, like a Facebook group or group text messaging, where people can discuss or complain [about their progress], just having a forum specifically to where those kinds of conversations can happen is very important.”*

Motivation

The next theme, ‘Motivation’, was a compilation of 22 codes and was applied to a total of 254 quotations. This theme was coded 136 times by coder 1 and 118 times by coder 2. When prompted to reflect on “reasons that may be social in nature for wanting to do a healthy habit or behavior” many stated reasons of personal health such as weight loss, longevity, or summertime activities, while others stated reasons for family, friendship, or accountability. For instance, one participant said, *“It was the camaraderie that you get when you do that [triathlons and exercising] with other people. It gives you motivation... I know it used to give me motivation, then accountability.”* Being able to spend time with family and loved ones was another important motivation. Many from both groups expressed a strong desire to be alive and active when kids or grandkids

grow up or to simply “spend more time with family”. One participant asserted this sentiment by saying, *“There was a time when I exercised because I wanted to look as good as I can. Now I exercise because I don’t want to die.”*

Participants also discussed the notion of accountability being a strong motivator to engage in an activity or accomplish a goal. One participant stated, *“What motivates me is when somebody else is counting on me, to be somewhere at a certain time, I’m accountable to someone.”* Many talked about being involved with structured programs, such as joining a three-month exercise study, participating in monthly food diary check-ins with a professional, or attending a weekly yoga class with coworkers, that provided this level of accountability. One participant described their experience in an exercise study as helpful and exclaimed, *“Yeah, nothing to motivate you like having a group of really fit, young people watch you work out, and taking notes about what you’re doing!”* When asked about competition as a motivator many responded with a simple “no” or *“It’s not for me”* while another participant elaborated by saying, *“Competition is always hard for me, because it’s challenging to find somebody, or a group of people, with the same or similar goals.”* Another participant followed with, *“It would also help if they were on the same physical level as you...I can’t really compete with a guy that does 14 miles on the elliptical everyday...especially when you are just starting out.”* Overall, both groups favored collaboration over competition as a driving force of motivation.

Lastly, many participants described being more motivated when they were in a supportive social environment; especially when being around others with similar goals

and aspirations. For example, one participant noted that, *“If your work environment’s support, since you’re there 5 days of 7, it can help, if other people are doing the same thing as you.”* Others added that a supportive environment doesn’t just apply to the workplace but also can be found online. In general, most participants were familiar with social media and many participants expressed using social media as a means of and motivation and support. Many described drawing inspiration from platforms such as Instagram, YouTube, or Facebook. One participant expressed Instagram as a source of her inspiration by saying, *“Instagram has been huge [for me] for food and fitness...I don’t interact a lot but I follow a lot of fitness people...[well] people who were like me and lost like 100 pounds, or who’ve had gastric bypass, or maybe who have done it just natural or whatever, and so I find that Instagram’s been a huge motivator for me.”* Another described her experience using social media as, *“we share video ideas, and who to watch, and what exercise videos to watch so its support and accountability kind of combined.”*

Barriers and Solutions

The next two themes that became evident were barriers and solutions to health behavior change. The theme ‘Barriers’ consisted of 18 codes and was applied to a total of 156 quotations. These codes were coded 91 times by coder 1 and 65 times by coder 2. The theme ‘Solutions’ consisted of 16 codes and was applied to a total of 174 quotations. These codes were coded 95 times by coder 1 and 79 times by coder 2. Both

themes became most apparent when questions were asked that were aimed at understanding the types of barriers or roadblocks they seemed to encounter, the potential solutions to overcome these barriers, and to consider the role that other people played (or could have played) in helping them overcome their barriers. Responses differed between both focus group sessions. Participants in session I (< 50 years old) discussed barriers in terms of financial concerns or time constraints and most all agreed with statements such as *“Gym memberships are expensive.”* or *“The healthier food is so much more expensive [and takes longer to prepare] than the quick, fast, horrible stuff.”* On the other hand, participants in session II (\geq 50 years old) discussed barriers in terms of health issues/injuries or external life events that limited their time or efforts. One participant answered, *“[I changed jobs] and I moved away from everybody I used to work out with. So now I'm in a new environment and go out and try to do things on my own. It just isn't as fun, you know? It just isn't. And to try to find people, especially at my age, people already have their little group of friends and the people that they do things with. So, trying to break into [these groups] ... It's not very comfortable.”*

Temptation was another barrier expressed by few but affirmed by most. Some participants expressed this as “being lazy” or “lacking motivation” however one participant characterized it as the following, *“Temptation. Your friends. Like, I was going to stop eating fast food for the New Year or whatever, and then, people ask you to go out to eat, and then they'll just want to eat fast food or something like that, so it's just like what other people are doing, what your friends are doing if they're not trying to be*

healthy, and then you don't just, you know. It's just tough. Then you see pizza, like, "Well, that would be really good right now," so, it's just stuff like that. You just see stuff, and you're like, "Well, it'll be okay, if I just eat it one day," and then the next day you eat it, and it's just, you kind of ruined it." In addition, having a lack of social support or encouraging environment was frequently brought up when further discussing roadblocks or setbacks. For example, one participant mentioned the work environment as a potential roadblock "if coworkers are bringing in donuts or not encouraging of walking or drinking water then... that social thing can be a struggle" while another exclaimed, *"And that's what I'm missing. I'm missing that accountability, the friendship, being somewhere at a certain time to do something with somebody."*

When participants were asked about potential solutions for overcoming their barriers, many discussed setting realistic goals, incorporating incremental change, and not getting discouraged by allowing self-forgiveness when temptation prevails. One participant expressed this as, *"One of the things that I noticed in previous attempts, when I've done any healthy habit, whether it be losing weight or eating better or exercising, is that I don't set realistic goals or expectations... I've been struggling with setting small enough, concrete enough goals, and integrating them into what I'm already doing, and I've found that to be more successful than the big, grand lifestyle changes."* This participant later exemplified this attitude by stating, *"they had me counting calories at first, and I just can't deal with that, so they tried servings instead, which is something that's not as concrete, not as specific, but I'm more motivated to do it, because I can*

look and say, 'Oh, yeah, that's a serving, that's a serving.'... so counting calories did not work, but counting servings did." While discussing potential solutions, participants were asked to consider what role other people may play in helping them overcome these barriers. One participant suggested, "By getting on an agenda with you... If you're going to meet a friend you're more bound to make it happen" and most agreed with this sentiment by adding suggestions such as scheduling group meetings or joining established classes or programs of something you enjoy. Other suggestions included receiving more support or encouragement from family, receiving social praise, or even receiving social shame to help overcome a barrier.

Technology

Technology was the final theme identified and was broadly comprised of 29 codes that were applied to 239 quotations. These codes were coded 126 times by coder 1 and 113 times by coder 2. Two participants in focus groups session I and two participants in focus group session II did not own a smartphone. Since all participants stated being familiar with social media, those who did not own a smartphone were asked to refer to their social media use when questions regarding smartphones and mobile apps were being asked. Of those owning smartphones, nearly all participants in session I and half of the participants in session II acknowledged using or at least downloading an app for social media or maintaining a healthy lifestyle. When asked about the role their smartphone played in helping them maintain a healthy lifestyle,

many discussed using “health” apps and/or a wearable device to track their activities while a few said their smartphone played no role. The most commonly mentioned “health” app used was MyFitnessPal with Apple’s iHealth app being the second. Of those who use these apps or acknowledged using a wearable device, most use them to track calorie consumption, calories burned, steps taken, and heartrate. For example, one participant explained their use of MyFitnessPal by saying, *“I use the MyFitnessPal app, keep up with logging and my calorie intake, and add in my exercise...so it kind of keeps me more mindful about how many, not necessarily about the foods that I'm eating, but about the calories that I'm taking in.”* Another participant added, *“I noticed when I do my MyFitnessPal, [and] when I log my stuff in, I do better. But when I don't, I don't do good. And I found out that works for me... I also have friends on there and we watch each other and keep each other accountable.”* When asked to elaborate on the social aspect of using this app, they responded, *“You have people on there, not all friends and maybe some family, they will comment, ‘Oh good job. Good work.’ And it’s encouraging. If I see one of my friends on there, I go on there and say something. Normally, I could ask them a question, ‘Well, how do you do this? Or what kind of exercises are you doing?’ And we respond back to each other.”* Although many acknowledged using apps or social media to derive inspiration or create motivation, some felt using apps was too much trouble by stating, *“I don’t want to know every single ounce of whatever I eat. I don’t care...”* while others responded with *“I’ve downloaded apps but I don’t use them”* or *“I don’t download”*.

Medication Adherence Scenario and Social Incentives

In order to specifically explore participant perceptions of social incentives applied directly to medication adherence participants were prompted with a scenario. In this scenario, participants were instructed to think about their medication-taking behavior and subsequently imagine their physician prescribing them a medication adherence app. When asked about the features that would be needed in this app to help them be successful, the most common responses included 'reminders' (for refills and taking scheduled dose), 'adherence tracking', 'adherence trends/', and 'user friendly'. A few participants suggested having access to educational information about their medication, the ability to check drug-drug or drug-supplement interactions, or incorporating financial incentives in the form of discounts or coupons. When asked specifically about the social features that they would like to have in this app, most participants were adamant about not wanting or needing social features associated with a medication-taking app. For example, one participant stated, *"I don't want any social features attached to my medication. That's just weird."* Another participant explained, *"That's different than the exercise ones...where people were saying, 'Good job. Way to go.' And all that stuff, and I think I'd even like that more from people who don't know me, because my family, it's their job to urge me on. So I'd like to get people I don't even know clicking in and saying, 'Way to go.' But your medicine, I mean how hard is it to pick up a pill and take it. If somebody gives me three cheers for that, it's like, "Well, did I deserve that? I just walked two miles, yeah that's an 'atta girl.'"*

Most agreed with these sentiments and others added that medication-taking behaviors are “private” and sharing this information is “too personal”. Some participants felt that medication-taking isn’t necessarily a goal or that social features attached to medication-taking aren’t trendy or appealing. For instance, one participant explained, *“I see food and exercise as my goal, and medicine as just something to help me when I have a problem. I don't see medicine as a long-term thing that I will be taking. Medication is not a goal for me.”* She continued, *“Vitamins and supplements are one thing, and then medicine, I feel like, for so many people, just implies pain and sickness, and a lot of people just don't tie social into that.”* Another participant agreed and added, *“Yeah, it's not trendy. It's fun to post that cute outfit that you can now buy because you're a size lower, or that really healthy plate you are about to eat, but what are you going to post a picture of, your pill bottle? Or [that I] took my pill seven days in a row, right? #bloodpressure. I think because it seems like there's not a lot of public recognition or congratulations, or it's not like your coworkers are going to notice that something's different about [you] so It's harder to try and think of structures and ways that we can integrate this into what we're already doing.”*

Although most disagreed about incorporating social features into a medication-taking app, two participants offered differing insights. The first by saying, *“Me and my friends, a lot of times we get discouraged by taking so much medication, and it does help for her to encourage me, because I just wanted to stop. And she'll say, ‘Well, you know you can't stop taking your medication.’ And I do her the same, so in a sense it*

could work the opposite thing.” When asked how they communicate she continued, “We do it on the phone. But if we had a app, I’m sure that would just ... Like texting maybe, that type of thing, it’d probably help, but we talk on the phone. I say we get discouraged sometimes, because of the amount of medication that we have to take, and we encourage each other. I guess it just depends on who it is.” The second participant explained, *“The only time that I can think, though, is like, if my parents are getting older and I want to make sure that they’re taking their medication, because I want them to see their grandkids, or something like that. You know, if it’s something serious and I want to make sure that they’re keeping track of it, that I would be interested in. If, you know, they need to be taking some blood pressure medication and I guess they would have to agree to let me, you know, to where I could see it, whether, if they’re taking it or not, but then if I could log on and say, call my dad and say, ‘You haven’t been taking this in a week. You need to get back on it,’ that would be useful, I think, or parents with kids.”*

Although many participants agreed that this would be a useful feature, some were skeptical of their parents or grandparents being amenable to using the app. Overall, participants were not receptive to incorporating social features into a medication-taking app, however most were receptive to sharing their data or medication-taking behaviors with their prescribing physician or insurance company.

Chapter 5 Discussion

This chapter will discuss the overall findings of the research project and will focus on the methodology, results, implications thereof, limitations, recommendations for future studies, and conclusions.

Phase I: Quantitative Study

The underlying goal of this study was to understand what impact behavioral economics-based interventions have on enhancing medication adherence. **Specific Aim 1** was to compare the effectiveness of an intervention to improve medication adherence via incentivized commitment contracts vs. usual care. This aim included **research questions 1 and 2**. The first was to explore the extent to which an incentivized commitment contract increased medication adherence rates compared to usual care. The second was to determine which incentive structure, financial or social, would show a greater medication adherence improvement.

Study results suggest that medication adherence rates appear to be enhanced using either financial or social incentives compared to usual care, although sample size in the current study was too small to detect statistically significant differences between

groups. These results are similar to a recent systematic review and meta-analysis of randomized controlled trials assessing the effects of feedback on medication adherence.⁸⁵ Results found 16 studies demonstrating significant improvements in medication adherence in the intervention groups compared to the control groups. Many interventions utilized financial incentives while others incorporated aspects of social incentives via feedback in the form of support from family, peers, or health professionals. Further, the results of this study are similar to those of previous research showing that financial incentives^{78-80,83,84,86,104} and social incentives^{105,106} can enhance medication adherence relative to a usual care group. However, a pair of recent pilot randomized controlled trials assessing “social forces” to improve medication adherence among patients with diabetes did not show significant improvements over the control group.¹⁰⁷ This resonates with the current study as the authors attributed these results to low enrollments rates, high baseline adherence rates despite enrolling patients with a medication possession ratio (MPR) of <80% based upon claims data, and the possibility that the “mode of message delivery” was not an effective intervention. The first two reasons are apparent and imply a more rigorous and judicious approach is needed to effectively identify and recruit patients who are truly nonadherent. The last reason is less apparent but makes sense as reasons for medication nonadherence are multifaceted and patient-specific. Future studies may benefit from incorporating specific patient feedback and input on the modes of message delivery, or *types* of social incentives they feel would be most effective.

Despite no significant difference in medication adherence between groups, study results suggested that the financial incentive structure seemed to be more effective than the social incentive structure. This may be because the financial incentive is clearly defined and readily relatable whereas the social incentive may seem ambiguous or less straightforward. The 'social incentive', intended to be delivered via the study website, was multifaceted and not designed to distinguish between the types of social incentives that may have been driving an increase in medication adherence. For instance, there was no way to determine if a participant was more motivated by their position on the leaderboard or their relative weekly adherence. Or perhaps earning a new badge or contributing to community adherence. Without appropriate mechanisms to isolate and capture the preferred social incentive, it would have been difficult to determine which social incentive was most effective. Although it would have been less difficult to determine the relative effectiveness of receiving social incentives (overall) compared to financial incentives, it is unlikely that participants fully received the social incentive. As mentioned in Chapter 4, most social incentive participants admitted to minimal (or no) use of the study website and were likely not exposed to the intended social incentive. It is possible that the weekly emailed reports asking participants to login to the study website served as an incidental 'social incentive' as frequent feedback has been associated with enhanced medication adherence.⁸⁵ However this is unlikely as analytics of the emailed reports were utilized and indicated weekly "open rates" and "click rates" as low as 15% or 30% on average. Given the 6 social incentive participants, this

translates to only 1 or 2 participants opening the weekly email or clicking on the study website link to login and experience the social incentive. Although it is possible that participants directly accessed the study website, analytics were not utilized to capture the data needed to confirm participant use of the study website. It is difficult to discern how many, if any, experienced or utilized the intended social incentives as a means of enhancing medication adherence. Given this uncertainty, it is not unreasonable to suggest the social incentive was less effective than the financial incentive at enhancing medication adherence. Future studies should attempt to explore potential barriers with the method of delivery of social incentives and subsequently determine an appropriate setting to use them. Also, future studies should attempt to distinguish the effects of social incentives by comparing individual social incentives such as social comparisons of individual medication adherence, effects of receiving virtual badges for medication adherence, or effects of competition on medication adherence (e.g., leaderboard).

Specific Aim 2

Specific aim 2 was to evaluate the association between participants' subjective social status, self-reported adherence, and MEMS-measured adherence. This aim included research question 3.

Research Question 3

Research question 3 was to determine the relationship between subjective social status (SSS), self-reported adherence, and MEMS-measured adherence. Results of

Spearman's rank-order correlations showed no statistically significant relationships between SSS, self-reported adherence, and MEMS-measured adherence. These results are not consistent with previous studies demonstrating strong relationships between SSS and broader health status^{23-25,101} or a previous study demonstrating a relationship between SSS and low medication adherence in African Americans.²⁶ One reason the results of this study differ may be related to a smaller sample. Another may be related to a lack of broader health perception assessment in the questionnaires. Interestingly, both measures of SSS, the community and national ladder, were more closely associated with each other than with self-reported adherence or MEMS-measured adherence. This is consistent with other studies demonstrating strong correlations with the community and national ladder.^{108,109} Across groups, both the SSS community ladder and SSS national ladder were moderately associated with each other at baseline and 90-day follow-up, with the baseline SSS national ladder having a positive significant correlation with its 90-day follow-up counterpart. Overall this suggests good test-retest reliability¹¹⁰ with the latter result being consistent with a previous study demonstrating construct validity of both MacArthur SSS scales.¹⁰⁰

Although MEMS-measured adherence was moderately correlated with self-reported adherence at baseline ($r_s = .350$) and 90-day follow-up ($r_s = .472$), neither were statistically significant. This could be due to inflated self-reported adherence rates, via social desirability motives, being much higher than MEMS-measured adherence rates. Self-reported adherence rates of this study were consistently higher than MEMS-

measured adherence rates and is consistent with studies demonstrating that patients are likely to exaggerate self-reported adherence when compared with electronically-measured adherence.^{39,48,111} Alternatively, the lack of statistical significance may be related to the low sample size given these results are consistent with previous studies reporting moderate to high correlations of differing measures of adherence (including electronically measured) with self-reported adherence.^{111,112} In particular, these results are consistent with a recent meta-analysis concluding MEMS-measured adherence and self-reported adherence are likely to be “at least moderately correlated”.⁴⁴ Further research is needed to better understand this correlation.

Results of additional Spearman's rank-order correlations showed significant findings. MEMS-measured adherence was strongly associated with a few objective SES measures including a positive association with wealth in the form of assets (e.g., savings or liquid assets, before and after debt) and a negative association with total number of people living in the household (including adults who provide income). Self-reported adherence also demonstrated a positive association with wealth in the form of savings or liquid assets.²⁶ This is consistent with previous research demonstrating strong associations with medication adherence and objective SES measures¹¹³ and one previous study reporting income being associated with electronically measured adherence.¹¹⁴ However, other studies have reported opposite findings.^{115,116}

Specific Aim 3

Specific Aim 3 was to explore factors that were associated with preference for type of incentive and satisfaction with incentive received. This aim included Research Questions 4, 5, and 6 and was addressed in both the quantitative and qualitative phases of this dissertation.

Research Questions 4 & 5

Both research question 4 and research question 5 were aimed at exploring the factors associated with preference for type of incentive and satisfaction with incentive received, respectively. Study participants were asked to indicate the extent of importance they felt towards the idea of receiving different types of social or financial incentives for accomplishing their medication-taking goals. In general, participants viewed “receiving personal gratification” as more important when it was derived internally as opposed to externally. Seemingly, the knowledge of someone else knowing they took their medications did not appear to be very important. This is consistent with the patients who participated in the semi-structured interviews as their responses also reflected internally driven motivations for taking their medications as well as joining the study. Personal health and the notion of “It’s just what you do” was commonly cited as important reasons for taking their medications. Overall, it was not very important for participants to receive and compare medication adherence rates from either friends and family, or peers in their community. This could be related to the previous question where

participants were not motivated by the thought of someone else knowing they are adherent (or not). However, research has shown that normative feedback, presenting people with information about what others are doing, can be a strong driver of behavior.¹¹⁷ Depending on how a message is framed, feedback can be used to evoke a social comparison of what the majority of people are doing (e.g., 90% of people your age always take their medication on time) or what the majority of people think should/not be done (e.g., littering).¹¹⁸ On the one hand this could prove effective for those who found it important that others knew they took their medications as prescribed; perhaps even more so if informed of below average medication adherence. On the other, such a social comparison may lower self-regard (given low self-esteem) and subsequently deter them from enhancing their behavior. A recent study posits that social comparison information acts as a point of reference, and when feedback is perceived negatively it is coded as a loss. This in turn activates loss aversion and subsequently encourages people to improve their behavior. Results of this study demonstrated that social comparison feedback encouraged participants to walk more than control.⁹⁸ Regarding the current study, it is likely the social comparison feedback questions (e.g., “more” or “less often than” others) were not salient or relatable and therefore perceived as unimportant. Similarly, it is possible that the social comparison portion of the social incentive (intervention) was either diluted or not possible given the anonymous nature of the social incentive group and/or lack of participation. Future research is needed to explore these possibilities.

Research suggests that people are influenced by their perception of their rank relative to others, and not necessarily by how they perceive they differ from the mean.^{119,120} When asked about the importance of knowing their ranking among others in relation to medication adherence, nearly 40% of participants viewed it as not at all important. On the other side of the scale, nearly 30% of participants viewed this as very or extremely important and no clear distinction was made between peers or family and friends. This is a seemingly interesting divide among participants perceived importance of competition and essentially a leaderboard. Similar opinions were expressed during both focus group sessions when asked about competition as a social incentive. Namely, most participants expressed distinct views regarding competition in general and thus as a social incentive. Most focus group participants expressed having little to no interest in competition as a social incentive, however the few who did expressed it as a strong motivator. The few patients who participated in the semi-structured exit interviews *and* admitted to using the study website on occasion expressed similar sentiments. One patient particularly enjoyed the leaderboard aspect mentioning how they “finished in 1st place”, while another patient expressed more interest in their chosen avatar and overall aesthetics of the study website. According to social comparison theory, social comparisons can drive competition among peers, where comparison depends on the social status of an individual, and the context in which their abilities are being evaluated.¹²¹ Given this, perhaps a lack of face-to-face interactions or likely the

anonymous avatars may offer an additional explanation as to why some patients did not get invested into the leaderboard.

Lastly, the final two questions assessed the importance of receiving a financial incentive for medication adherence. Opinions were essentially divided with nearly 40% of respondents viewing “Receiving a small cash payout (e.g., \$1)” for daily medication adherence as ‘not at all important’, while nearly 30% felt it was either ‘very important’ (14%) or ‘extremely important’ (14%). When asked about “the opportunity to win a large cash payout (e.g., \$50) once a week” for medication adherence, opinions slightly shifted towards higher importance with nearly 40% reporting ‘moderately important’ and roughly 35% reporting ‘very important’ (14%) or ‘extremely important’ (21%). The slight shift might be explained by ‘unrealistic optimism’, which is the tendency for individuals to give a greater weight to a small probability of winning a large reward. The opportunity to win a once weekly \$50 payout is seemingly more enticing than a guaranteed payout of \$1 per day. As previously mentioned, many studies have demonstrated the effectiveness of utilizing financial incentives and particularly lottery-based payouts.^{69,86,88,90,104}

Phase II: Qualitative Study

To explore factors that were associated with preference for type of incentive and satisfaction with incentive received (Specific Aim 3), semi-structured “exit” interviews and 2 focus group sessions, divided by age (<50 in group 1 and ≥ 50 in group 2) were utilized to better understand the social factors that influenced healthful behaviors (such as medication adherence).

Research Question 6

Research question 6 was to determine the perceptions of social incentives for healthful behaviors (such as medication adherence) and explore the interventions that were perceived as most relevant and useful. Thematic analysis identified four themes among the participants of both focus group sessions: 1) Accountability, 2) Motivation, 3) Barriers and Solutions, and 4) Technology. The following sections will briefly discuss these themes and participant perceptions of social incentives as they relate to healthful behaviors and medication adherence.

Themes

Recurrent themes and general insights from the semi-structured interviews were used to inform the question guide used in both focus group sessions. The discussion was subsequently developed around the use of social incentives in health behaviors. Participants were prompted to consider a specific health behavior they were interested in and initial questions were broadly aimed at general health behaviors while later

questions were aimed at social incentives and medication-taking behaviors. For both groups, nearly all participants were interested in behaviors related to healthy eating or physical activity. The opening questions loosely assessed how participants interpreted social incentives and to what extent they have experienced them as “motivations or reasons” to do their healthy habit or behavior. The first two major themes that emerged were a sense of accountability and having someone or something as a source of motivation. Participants discussed accountability in terms of someone holding them to their word and most preferred to have an accountability partner to help them along the way. For most, characteristics of a good accountability partner include someone who is honest, encouraging, has similar goals, and is likely not your significant other or related to you. Although most people agreed with the last part, discussions seemed to regard the first three characteristics as most important when selecting a good accountability partner. This was important because it seemed that an accountability partner lacking any of these qualities was perceived as much less motivating or helpful. In addition, it also seemed that frequent communication and feedback were both crucial qualities of accountability. Whether tracking progress through a mobile app or wearable device, participants emphasized the importance of human interaction on being successful with their goals.

In terms of motivation, participants expressed both intrinsic and extrinsic sources of “social” motivation. It was interesting to see the varied responses between the two focus group sessions. Those in session I (<50 years old) seemed to emphasize their

“social” motivations in terms of looking or feeling good, summertime activities, inspiration from social media, or friendships. Those in session II (≥ 50) seemed to emphasize reasons such as being able to spend more time with family or loved ones, longevity, or personal health. Whether participants were deriving motivation from intrinsic or extrinsic means, both groups emphasized being more motivated when they felt they were in a supportive social environment. This can occur both online and in the workplace. One participant elaborated by stating, *“If your work environment’s support, since you’re there 5 days of 7, it can help, if other people are doing the same thing as you.”* This comment and other discussions describing the influence of social support or having an encouraging environment on behavior change align well with social norm theory (e.g., “...[Y]ou know you can’t stop taking your medication”) and social comparisons (e.g., “she can do it, so why can’t you?”) when regarding both motivation and accountability. Research has shown that perceptions of social norms may strongly influence people’s behavior because they take their cues from what others do and use these observations as a reference point from which to compare their own behaviors.⁶⁶ This seemed especially influential when in the presence of others with similar goals and aspirations but less so when not.

For instance, when asking about competition as a source of motivation most agreed it was not for them and dismissed the idea. However, one participant explained by saying, “[I]f somebody's struggling with the same issue or has the same barriers or constraints, then sure, it might be incentivizing or it might be motivating to work with that

particular group of people, but in my experience, it's tough identifying that person or that group.” Another participant elaborated by stating, “If someone's trying to lose weight and other people are trying to tone, right, having those different goals...It's totally different. You can't compete.” These discussions seemed to express competition as isolating or de-motivating however it seemed to be a lack of similar goals as the source of aversion. Competition aside, other participants expressed shifting sources of motivation and accountability when discussing health behaviors with differing goals, such as levels of physical activity, using technology to track progress, and especially regarding medication-taking behaviors. Nonetheless, it appears the notion of deriving motivation or accountability from those with similar goals or similar experiences seems to be a crucial piece when considering the role social incentives may play in health behaviors. Perhaps this is because those with similar interests allow genuine connections to be made and thus add to one's supportive social environment.

Barriers and solutions were the next set of themes that emerged as questions were aimed at understanding types of barriers likely to encounter, potential solutions to overcome these barriers, and the role that other people played (or could have played) in helping them overcome their barriers. It was interesting to see the stark contrast in responses between the two focus group sessions. Those in session I (<50 years old) expressed financial and time-based concerns whereas those in session II (≥ 50) expressed health-related and external obligations as concerns. These also seemed to reflect a slight difference in overall priorities when comparing both groups. For instance,

it seemed that those in session II discussed preventative health measures with a greater sense of urgency when compared to session I. One participant asserted this sentiment by saying, “*There was a time when I exercised because I wanted to look as good as I can. Now I exercise because I don’t want to die.*” This statement is interesting because it acknowledges a priority shift and emphasizes this participant’s apparent motivation to exercise.

Two barriers that were commonly expressed by both groups were a lack of motivation (e.g., to begin or continue a behavior) and giving in to temptation. It seemed that both barriers were frequently mentioned when participants were discussing other barriers such as lacking social support or lacking an encouraging environment. For example, one participant mentioned the work environment as a potential barrier “if coworkers are bringing in donuts or not encouraging of walking or drinking water then... that social thing can be a struggle” while another exclaimed, “*And that’s what I’m missing. I’m missing that accountability, the friendship, being somewhere at a certain time to do something with somebody.*” These comments adequately contrast the previous supportive social environment example as it illustrates the potential influence of other’s behavior on one’s own. Arguably, situations such as these are likely to either breed new barriers or reinforce existing ones however many participants offered practical solutions to overcome such barriers. Among the most frequently discussed involved setting realistic goals, making small manageable changes, and utilizing an accountability partner to create a mutual plan. In a sense, these solutions and the

accountability partner serve as precommitment through a commitment device in the social realm. Further, participants seemed to be inherently interested in applying this to their current health behaviors. For instance, one participant suggested, “By getting on an agenda with you... If you’re going to meet a friend you’re more bound to make it happen”. Many participants made similar suggestions to overcome barriers however the primary message seemed to revolve around enhancing their social support environment.

Technology was the final theme that emerged and was discussed throughout both sessions. Two participants in focus groups session I and two participants in focus group session II did not own a smartphone. Interestingly, this is consistent with the percentage of US adults (77%) who currently own a smartphone. Participants described using “health” apps and/or wearable devices to track their daily health activities when asked about the role their smartphone played in helping them maintain a healthy lifestyle. There were a few participants who did not have a smartphone and/or wearable device or who did but expressed no interest in using their smartphone to aid in health tracking. Reasons varied however many simply did not want to (without offering additional explanation) while another felt content accessing the Internet via a desktop computer. MyFitnessPal was the most commonly mentioned “health” app and was mentioned most frequently in session I. Of those who used health apps or acknowledged using a wearable device, most used them to track calorie consumption, calories burned, steps taken, and heartrate. In addition, most of these participants were

not only aware of social media integration with their health app, but also utilized the ability to share their tracked progress with others online. Several discussions revolved around participating in social media initiatives involving healthy eating and increasing physical activity and exercise. Many participants lauded their experiences and the ability to quickly access friends or loved ones whenever they needed communication or inspiration. Some participants expressed the benefit of having forums, online or in-app, to discuss goals, to have somewhere to show off their progress, or to easily check-in to see how each other is doing. Regarding health behaviors that address physical activity or healthy eating, most of the participants were either familiar with or actively participating in using social incentives to aid with their goals. However, when the discussion was turned to medication taking-behaviors, the idea of using social incentives to stay accountable or as a source of motivation was poorly received and severely off-putting.

Initially, participants were given a scenario in which they were prompted to think about their medication-taking behavior and subsequently imagine their physician prescribing them a medication adherence app. Upon asking participants about the features needed to help them personally be successful, most included reminders, tracking, educational features, or financial incentives. When asked specifically about the social features that they would like to have in this app, many participants were adamant about not wanting or needing social features associated with a medication-taking app. Most agreed and others added that medication-taking behaviors are “private” and

sharing this information is “too personal”. One participant explained by stating, “No, the only time that I even share that kind of information is when I was on three blood pressure pills and I've gotten to the point where I got to kick one off, and I of course bragged to my sisters. But that's the only time. Aside from that, I find it very private.” Both groups seemed to express similar feelings towards sharing medication-taking behaviors however their reasons were somewhat different.

In session I, opinions were mixed regarding medication-taking behaviors being “too private” to share on social media or with their friends. Some expressed that this was simply too personal and although others did not agree they expressed that they did not care to know about their friends’ medication-taking behaviors. Additionally, some in session I felt that medication-taking isn’t necessarily a health goal or that posting their medication-taking behaviors was unappealing. Reasons included that it was “not trendy”, or “not perceived as cool”, or “it can’t be displayed in an appealing way like posting a beautiful salad or showing a sweaty selfie”. Interestingly, many in session I did not feel that medication adherence was an actual health goal. At least not for them. One participant mentioned that they didn’t intend to take medication for the rest of their life so it simply was not a long-term health goal. It wasn’t something that she wanted to strive for or even hold her friends accountable to. For instance, she stated, “When I think about people that I know, that I interact with on a daily basis, that I'm closest to, and what they're taking that I already know about, they're already so consistent. I mean, you know, we have alarms on our phone for taking it, and like, you know, if it's birth

control or if it's heart, blood pressure medicine or something like that, I just don't, for me, I don't see a benefit of holding my friend accountable for taking their medicine.” Given the previous discussion on diet and exercise, it is likely that this is not truly the case. However, it seems that many in session I attached a stigma to taking medications regularly. One participant expressed this as, “[V]itamins and supplements are one thing, and then medicine, I feel, for many people, just implies pain and sickness, and a lot of people just don't tie social into that...they don't tie being sick or having a problem with being social.” Those in session II did not feel the same way. In addition to believing that sharing medication-taking behaviors is too personal or too private, they felt that posting this information would be a misuse of social media because, “It's not the same as diet and exercise. It's not something that I really want to get pats on the back for – it's just something that you do. I mean how hard is it to pick up a pill and take it. If somebody gives me three cheers for that, it's like, ‘Well, did I deserve that?’” Many in session II agreed or offered similar comments however one participant offered a different perspective and described utilizing an accountability partner to help her stay accountable when she became discouraged by taking so much medication. Nonetheless, the general consensus was that “you take your medications because you are supposed to” and that is only your responsibility. This attitude seemed very similar to that of the Marble City Pharmacy participants who did an exit interview. Both groups seemed intrinsically motivated to take their medications. Since both groups are similar in age, perhaps this is related to them having similar health-related goals, experiences,

and priorities. Additionally, both groups seemed to be less interested in receiving extrinsic offers. Perhaps the thought of receiving social incentives for something they are already “supposed” to do is redundant. Alternatively, it is feasible that a scenario prompting the use of social incentives for medication adherence may seem to ambiguous for any of the focus group participants when compared to being in the study. Although, this may offer additional explanation for those in the social incentive group who failed to visit the study website and thus received less of a “dose” of the intended social incentive. In either case, it is apparent that more needs to be done to explore the role of social incentives in medication-taking behaviors. Unlike diet and exercise, medication adherence seems to be regarded in a very personal and private manner. Thus, a reasonable area to explore could be derived from insights discussed regarding supportive social environments and accountability partners with similar experiences and medication-taking goals.

Limitations

This study has several limitations, some of which have been previously mentioned. The following section describes the study limitations regarding patient recruitment, data collection methods, and generalizability of findings.

Patient recruitment

The study’s first limitation was having a small sample size. Despite using multiple methods of contact and inviting a large number of participants, recruitment of

patients took much longer and brought in much less than originally expected. In addition, several subjects were lost to follow-up further reducing sample size. The lack of patient recruitment may be related to several factors including lack of full cooperation and support from pharmacy and staff, minimal “buy-in” from pharmacy and staff, research-naïve patient population, lack of patient access to required technology (e.g., Internet access), and likely due to the PI not being a recognized member of the MCP community. Due to inadequate patient recruitment, not enough participants were enrolled to adequately power the study. This limited the ability to detect statistically significant differences. Another limitation was the lack of a baseline adherence measurement. If measured, it is likely that a high baseline adherence or “ceiling-effect” may have been detected and contributing to the lack of statistical significance. If detected, this might have been attributed to highly motivated participants who joined the study already with an interest in enhancing medication adherence or possibly due to an increased proportion of once daily dosing compared to multiple doses per day (research has shown increased adherence¹²²). In addition, participants in all three study groups used MEMS vials and were therefore aware of being monitored. Knowledge of being observed changes behavior (Hawthorne effect) and may have contributed to increasing medication adherence. Another limitation is a potential selection bias given the relative success of “active recruiting” compared to mailed letters and/or flyers and potentially the financial incentives offered to join the study. Both may attract more highly motivated and potentially more adherent individuals.

Data Collection Methods

Several limitations exist regarding the MEMS vial. First is the fact that MEMS vial openings merely serve as a proxy for medication adherence, an indirect measure, and therefore may not accurately represent medication-taking behavior. For instance, one study identified the following reasons for inaccurate adherence results including inconsistent use of the electronic monitoring device, removing more than 1 dose at a time, and opening the vial to record an event but not taking the medication.¹²³ Another limitation is that it does not integrate with a pill box and only has the capability to track one medication at a time. This may be a limiting factor for patients who take multiple medications and/or require the use of a pill box. Another limitation is the now antiquated *wired* data upload which may serve as a reminder for a patient to take their medication.

A further limitation of this study is related to the questionnaires administered at baseline and 90-day follow-up. The participant was guided into a private consultation area and asked to complete the baseline self-report questionnaire. Although the PI was not in the room while the participant completed the questionnaire, there is always a risk of social desirability bias with self-reported measures. This is when a participant answers the questionnaire in a way they perceive as socially desirable. The 90-day follow-up questionnaire was e-mailed to the participant and where they could take it at a location of their choosing. Another limitation of self-report questionnaires is the potential for recall or response bias. Recall of information is contingent upon memory which can tend to be unreliable.¹²⁴ This is important to consider when interpreting results derived

from self-reported measures. For instance, there is conflicting evidence regarding the accuracy of self-reported adherence^{111,125}, however some studies have demonstrated that patients are likely to exaggerate self-reported adherence when compared with electronically-measured adherence,^{39,48,111}

Another potential limitation of this study is broadly related to the intended social incentive. An individual exit interview was conducted with all 6 members of the social incentive group. Most admitted to minimal or no use of the study website and were likely not exposed to the intended social incentive. This may be the result of many factors. First, it is possible that the majority of participants have a low digital literacy and were hesitant to use the study website. Although it was not formally assessed, this is feasible given the PI's interactions with the patients during the enrollment process, troubleshooting technology with participants throughout the study, and information gleaned during the exit interview process. Second, despite creating ample physical and digital training and troubleshooting materials, it is possible that participants had trouble logging in to the study website and did not communicate this information out. This limitation could have been mitigated by tracking the frequency of patient website visits and duration of time spent on the study website. Upon tracking these data, it would have been feasible to generate a weekly report to determine how often participants were using the website and to subsequently touch base if needed. Third, presuming the first two limitations are relevant, it is possible that the intended social incentive and/or method of delivery was not suitable for the study population. For instance, many

patients expressed interest in joining the study however the primary reason for them not joining was lack of access to the Internet and/or a computer with Internet access. Four, despite above, it is possible that the social incentive was seen as ambiguous or perhaps less straightforward than the financial incentive and thus less attractive. For instance, the 'social incentive' was multifaceted and not designed to distinguish between the types of social incentives that may have been driving an increase in medication adherence. It is possible that the weekly emailed reports asking participants to login to the study website served as an incidental 'social incentive' since frequent feedback has been associated with enhanced medication adherence.⁸⁵ This is unlikely as the average 'open rate' for the weekly reminder email was less than 25%. Thus, it is difficult to discern how many, if any, participants utilized the social incentives as a means of enhancing medication adherence.

Future Studies

The findings of this study present an inviting opportunity for future research. This includes refining the methodology and exploring novel ways to test behavioral economics-based interventions on enhancing medication adherence. The areas listed below would benefit from further research.

Future studies exploring novel interventions that aim to enhance medication adherence are needed. The numerous factors that influence medication adherence are multifaceted and ever present. In this study, behavioral economics-based interventions

were assessed to compare the effectiveness of financial incentives vs. social incentives vs. usual care on improving adherence to antihypertensive or antihyperlipidemic medications. Future research could conduct a similar study where the social incentive is distinct, well-defined, and appropriately delivered in a low baseline adherence, more diverse, larger population so that differences between the study groups can be identified. A more robust and proactive approach at patient recruitment is also needed. This may be accomplished by collaborating with an experienced and cooperative pharmacy, staff, and even a champion in the local community. If utilizing an electronic device, it would be beneficial to use wireless technology as this would minimize patient burden and reduce potential confounders. In addition, it might be valuable to conduct brief exit interviews at the end of the study to receive immediate feedback and a richer assessment of the patient's experience.

Future studies should also focus on refining the methodology and attempt to distinguish social incentives that effectively enhance medication adherence. This study failed to identify a significant difference between financial and social incentive groups; however, if one was found in favor of social incentives it would have been difficult to determine from which social incentive it came. A deliberate approach to discern the effects of social incentives should be taken. One approach might utilize the notion that people are inherently driven by social norms and social comparisons and therefore incentives that focus on groups may be more effective than incentives that focus on individuals.⁹³⁻⁹⁵ Another may pertain to the idea that perceptions of social norms may

strongly influence people's behavior because they take their cues from what others do and use these observations as a reference point from which to compare their own behaviors.⁶⁶ Understanding and subsequently reframing people's perceptions of social norms can be an efficient way of addressing and changing health behaviors and feasibly medication adherence.⁹⁶ Thus, a future study could utilize social comparisons and assess the differences between groups receiving personal 'loss-framed' medication adherence messaging and groups receiving personal 'gain-framed' medication adherence messaging. Likewise, the effects of competition on medication adherence could be explored via 'loss-framed' leaderboard messages and gain-framed leaderboard messages. Nonetheless, a strategic approach should be taken to distinguish the effects of distinct social incentives on medication adherence and other health behaviors.

Future research utilizing social incentives to enhance medication adherence could benefit from incorporating qualitative methods into the preliminary procedures. In this study, focus group sessions revealed that participants were comfortable discussing and even actively using social incentives in the realm of exercise and healthy eating, however opinions severely shifted when discussing medication-taking behaviors and social incentives. Therefore, the perceived barriers and facilitators of distinct social incentives applied specifically to medication-taking behaviors could be explored, defined, and subsequently integrated into larger quantitative studies. This may help

guide selection of an appropriate method of delivery for the intended social incentive intervention.

Conclusions

In this study, the underlying goal was to understand what impact behavioral economics-based interventions have on enhancing medication adherence. Study results suggest that medication adherence rates appear to be enhanced using either financial or social incentives compared to usual care, however the low sample size was too small to detect statistically significant differences between groups. Although the underpowered study limits statistical interpretation the results still provide meaningful insight to applying behavioral economic-interventions to medication adherence. Future research should seek to refine the methodology, namely adopt proactive recruiting strategies thus increasing sample size, prioritize low baseline adherence enrollees, and a diverse population so that the results are generalizable to a larger population. In consideration of the social incentive, a strategic approach should be taken to distinguish the effects of distinct social incentives on medication adherence and other health behaviors.

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Appendices

Appendix A1: Phase I RECRUITMENT LETTER



Marble City Health Mart Pharmacy

HEALTH MART
PHARMACY

Owners:

Jared Johnson, PHARM.D.

Jared@marblecitypharmacy.com

Jacob Johnson, PHARM.D.

Jared@marblecitypharmacy.com

264 W. FORT WILLIAMS ST.

SYLACAUGA, ALABAMA 35150

TELEPHONE:

256-245-4446

FAX:

256-245-4484

www.marblecitypharmacy.com

Date:

Dear:

Are you interested in learning what motivates you to take your medications? Would you act differently if you were paid? What if your peers knew whether or not you took your medications?

If you are 19 years of age or older and have weekly access to a computer or tablet computer with Internet access then you are invited to participate in a medication-taking research study to see what rewards or incentives motivate you to take your medications!

Participants who enroll will receive a \$10 gift card and those who complete the study will receive another \$10 gift card plus qualify for a chance to win cash drawings of one of four \$50 gift cards. In addition, participants assigned to one of the three study groups will also receive the opportunity to receive up to \$90 for taking their medication as prescribed by their healthcare provider.

This study is being conducted by Dr. Justin Owensby, pharmacist and graduate student of the Auburn University Harrison School of Pharmacy in the Department of Health Outcomes Research & Policy.

For more information or to join this study, you may contact the pharmacy at 256.245.4446 to speak with a research team member or you may directly contact Dr. Owensby at 334.246.0882 or by email at MCP.ResearchStudy@auburn.edu.

Jared Johnson, PharmD
Co-Owner of Marble City Pharmacy

Jacob Johnson, PharmD
Co-Owner of Marble City Pharmacy

"The Way A Drug Store Use To Be"

Appendix A2: Phase I Recruitment Materials and Emails

Recruitment Flyer (to be placed on prescription bags of eligible medications)

Medication-taking Research Study

Be part of an important medication-taking research study

Are you interested in learning what motivates you to take your medications? Would you act differently if you were paid? What if your peers knew whether or not you took your medications?

If you are 19 years of age or older and have weekly access to a computer or tablet computer with Internet access then you are invited to participate in a medication-taking research study to see what rewards or incentives motivate you to take your medications!

Participants who enroll will receive a \$10 gift card and those who complete the study will receive another \$10 gift card plus qualify for a chance to win cash drawings of one of four \$50 gift cards. In addition, participants assigned to one of the three study groups will also receive the opportunity to receive up to \$90 for taking their medication as prescribed by their healthcare provider.

This study is being conducted by Dr. Justin Owensby, pharmacist and graduate student of the Auburn University Harrison School of Pharmacy in the Department of Health Outcomes Research & Policy.

For more information or to join this study, you may contact the pharmacy at 256.245.4446 to speak with a research team member or you may directly contact Dr. Owensby at 334.246.0882 or by email at MCP.ResearchStudy@auburn.edu.



BE PART OF AN IMPORTANT MEDICATION-TAKING STUDY



MARBLE CITY PHARMACY



Are you interested?

- Interested in what motivates you to take your meds?
- Would you act differently if you were paid?
- What if your peers knew whether or not you took your medication?



Are you eligible?

If you are 19 years or older & have weekly access to a computer with Internet access then you are invited to participate in a study to see what rewards or incentives motivate you to take your medications!



What happens if I join?

Participants who enroll will receive a \$10 gift card & those who complete the study will receive another \$10 gift card + qualify for a chance to win cash drawings of one of four \$50 gift cards. In addition, participants assigned to one of the three study groups will also receive the opportunity to receive up to \$90 for taking their meds as prescribed by their healthcare provider.



Who is doing this study?

Dr. Justin Owensby, pharmacist and graduate student of the Auburn University Harrison School of Pharmacy in the Department of Health Outcomes Research & Policy

How can I join?



For more information or to join, you may contact the pharmacy 256.245.4446 to speak with a research team member or you may directly contact Dr. Owensby at 334.246.0882 or @MCP.ResearchStudy@auburn.edu

Recruitment E-mail

Subject: [Marble City Pharmacy] Medication Adherence Study – Invitation to Participate

Dear Study Participant:

A letter was recently sent to your mailing address describing a study we are conducting at Marble City Pharmacy. We wanted to ensure that you received your letter and ask if you have any questions about our study. A copy of the letter is attached to this e-mail for your review. If you have questions, or are interested in participating in the study, you may contact Marble City Pharmacy at 256.245.4446 and ask to speak to a research team member, or simply respond to this e-mail.

All the best,

Justin Owensby

Justin K. Owensby, PharmD, Principle Investigator
PhD Candidate Health Outcomes Research and Policy
Harrison School of Pharmacy Auburn University
056 James E. Foy Hall Auburn, AL 36849-5506
334.246.0882
MCP.ResearchStudy@auburn.edu; Owensjk@auburn.edu

Recruitment E-mail

Subject: [Marble City Pharmacy] Medication Adherence Study – Invitation to Participate

Dear Study Participant:

A letter was recently attached to your prescription bag describing a study we are conducting at Marble City Pharmacy. We wanted to ensure that you received your letter and ask if you have any questions about our study. A copy of the letter is attached to this e-mail for your review. If you have questions, or are interested in participating in the study, you may contact Marble City Pharmacy at 256.245.4446 and ask to speak to a research team member, or simply respond to this e-mail.

All the best,

Justin Owensby

Justin K. Owensby, PharmD, Principle Investigator
PhD Candidate Health Outcomes Research and Policy
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MCP.ResearchStudy@auburn.edu; Owensjk@auburn.edu

Recruitment phone call (script)

“Hi Mr./Mrs./Ms. [last name]. This is _____ at Marble City Pharmacy. We recently mailed a letter to your home address with details about a study that is being conducted by Justin Owensby, who is a graduate student with the Auburn University Harrison School of Pharmacy. I wanted to check with you to see if you received it and answer any questions you may have.

If the patient says they didn't receive it or didn't read it:

“Do you mind if I take a few minutes to tell you about the study?” If the patient says, “yes,” the caller would proceed to read from the approved recruitment letter to the patient and begin to ask screening questions where appropriate.

“This research study is interested in seeing what types of rewards or incentives might motivate you to take your medications. Do you think you might act differently if you were paid to take your medications? What about if your friends or family members knew whether or not you took your medications? Different things motivate different people and this study is trying to learn how this works.”

“Does this sound like something you may be interested in learning more about?”

-If patient says “no” then the caller will thank them for their time.

-If patient says, “yes”:

(Please note the portion of the script below will also be used when patients call the pharmacy and want more information or express interest in joining)

“Do you have at least weekly access to a computer or tablet computer with Internet access?”

-If “no” then the caller will thank them for their time.

-If “yes” then:

“Great. Would you like me to go over some more details of the study now or would you like me to send you these details (as an email or in the mail)?”

-If patient would like the details as an email then the caller will obtain the email address and confirm the patients understanding that study specific information will be sent to this email address.

-If patient would like the details sent through the mail then the caller will confirm the mailing address on file and confirm the patients understanding that study specific information will be sent to the given address.

-If patient would like to hear study details over the phone then caller will read from the following:

“Researchers at the Auburn University Harrison School of Pharmacy are currently recruiting adults to participate in a study to assess the effectiveness of various interventions to improve how well individuals take their medicines as prescribed by their healthcare provider. Those who receive a medication for either high blood pressure or high cholesterol from the Marble City Health Mart Pharmacy are invited to participate.

This study is being conducted by Dr. Justin Owensby, pharmacist and graduate student, under the direction of his advisor Dr. Kimberly Garza, assistant professor in the Department of Health Outcomes Research and Policy. If you express interest in participating in the study, your information will then be forwarded to Dr. Owensby. Should you choose to participate, you will receive your high blood pressure or high cholesterol medication in a special electronic pill bottle, called a MEMS vial, which counts the number of times you open the bottle to take a dose of medication and records the date and time of each bottle opening. You will receive refills in the MEMS vial as necessary, and monitoring will continue for a total of 90 days. If you are assigned to an intervention group you will perform a brief data upload using a MEMS data reader each week. Once you have completed the 90 days, you will return the empty MEMS vial (and data reader if applicable) to Marble City Pharmacy. Any charges you normally incur when getting your prescription filled will still apply, but use of the special electronic pill bottle is free. In order to be eligible for the study, you will need access to an e-mail account that you can check at least weekly and a computer or tablet computer (containing a USB port) with Internet access that you can use once per week to upload data from your MEMS vial.

Study participants will be randomly assigned to one of three different study groups. All participants will also complete two online surveys, requiring approximately 15 minutes each to complete, that will contain questions related to medication-taking behavior, past medical history, and how important different incentives and types of reward structures are to you. All participants who complete the enrollment process will receive a \$10 gift card. In addition, those who complete all requirements of the study and return the MEMS equipment to Marble City Pharmacy at the end of the study will receive an additional \$10 gift card and qualify for a chance to win cash drawings of one of four \$50 gift cards. In addition, participants assigned to one of the three study groups will also receive the opportunity to receive up to \$90 for taking their medication as prescribed by their healthcare provider.

“Do you have any questions for me or do you think you might want to participate in this study?”

If the patient says “no” to questions and “no” to the invitation to participate then the caller will thank them for their time.

If the patient says, “yes,” to the invitation to participate then the caller will proceed to schedule an appointment for enrollment.

Voicemail script (when participants directly call Justin Owensby's research phone number)

Hello. This is Dr. Justin Owensby with Auburn University's Harrison School of Pharmacy. Thank you for expressing interest in my research study. Please leave your name, number, and a detailed message about yourself and I will get back to you as soon as possible. Have a great day!

Appendix: Phase I – SCRIPTS FOR WEEKLY E-MAIL NOTIFICATIONS Initial Notification – Usual Care Group

Subject: MCP Medication Adherence Study - Welcome!

Dear Study Participant:

Thank you for your participation in our study. During enrollment you were assigned a unique study participant identifier.

Your unique identifier is: _____.

Over the next 90 days, you will be taking your medication as prescribed by removing the appropriate number of pills from the special MEMS vial you were given at study enrollment. You will take your medication just as you normally would. The MEMS vial will keep track of the doses you take and communicate that information back to us when you return the bottle to the pharmacy to obtain your refill and at the completion of the study.

You've already completed the baseline survey and to complete all study requirements there is an additional online survey you will take in approximately 90 days. You will receive refills in the MEMS vial as necessary, and monitoring will continue for a total of 90 days. Once you have completed the 90 days, you will return the MEMS vial to Marble City Pharmacy. Even if you have additional pills leftover please bring your MEMS vial back to the pharmacy with the remaining pills in it. Upon doing this we will give you a replacement pill bottle containing your remaining pills. This will conclude your participation in the study.

As discussed during enrollment, you will have access to the training videos on the study website. Please login by clicking <here> or you may copy/paste the following URL into your browser: cws.auburn.edu/medicationadherence

If you have any questions regarding the study, you may contact the research team using the contact information below.

All the best,

Justin Owensby

Justin K. Owensby, PharmD, Principle Investigator
PhD Candidate Health Outcomes Research and Policy
Harrison School of Pharmacy Auburn University
056 James E. Foy Hall Auburn, AL 36849-5506
334.246.0882
MCP.ResearchStudy@auburn.edu; Owensjk@auburn.edu

Initial Notification - Financial Incentive Commitment Contract Group

Subject: MCP Medication Adherence Study - Welcome!

Dear Study Participant:

Thank you for your participation in our study. During enrollment you were assigned a unique study participant identifier.

Your unique identifier is: _____.

Over the next 90 days, you will be taking your medication as prescribed by removing the appropriate number of pills from the special MEMS vial you were given at study enrollment. You will take your medication just as you normally would. The MEMS vial will keep track of the doses you take and communicate that information back to us when you connect to the Internet using the data reader as instructed. You should upload your data on Monday of each week. Should we have any difficulty in receiving the information, we will contact you. You will receive an e-mail each Monday reminding you to upload your data and another e-mail each Thursday stating how many days out of the previous week you took your dose as prescribed.

Individually you have committed to taking your medication everyday as prescribed by your healthcare provider. You will begin this study with a virtual account that contains \$90. Each Thursday, you will receive a report stating how many days in the past week you took your medication as prescribed by your healthcare provider. For each day that you miss one or more doses of your medication, your virtual account will be decreased by \$1. The weekly report will state the balance remaining in your account. Also, as discussed during enrollment, you will have access to the study website where you will be able to check your virtual account balance and view the training videos. Please login by clicking <here> or you may copy/paste the following URL into your browser: cws.auburn.edu/medicationadherence

You've already completed the baseline survey and to complete all study requirements there is an additional online survey you will take in approximately 90 days. You will receive refills in the MEMS vial as necessary, and monitoring will continue for a total of 90 days. Once you have completed the 90 days, you will return the MEMS vial and MEMS data reader to Marble City Pharmacy. Even if you have additional pills leftover please bring your MEMS vial back to the pharmacy with the remaining pills in it. Upon doing this we will give you a replacement pill bottle containing your remaining pills. This will conclude your participation in the study.

You will receive any remaining balance from your virtual account in the form of a cash pay-out at the completion of the 90-day study period and after filing the appropriate paperwork to have the money deposited into your personal banking account. In order to claim the money in your account, you must complete all study requirements and return the MEMS vial and MEMS data reader to Marble City Pharmacy.

If you have any questions regarding the study, you may contact the research team using the contact information below.

All the best,

Justin Owensby

Justin K. Owensby, PharmD, Principle Investigator
PhD Candidate Health Outcomes Research and Policy
Harrison School of Pharmacy Auburn University
056 James E. Foy Hall Auburn, AL 36849-5506
334.246.0882
MCP.ResearchStudy@auburn.edu; Owensjk@auburn.edu

Initial Notification - Social Incentive Commitment Contract Group

Subject: MCP Medication Adherence Study - Welcome!

Dear Study Participant:

Thank you for your participation in our study. During enrollment you were assigned a unique study participant identifier.

Your unique identifier is: _____.

Over the next 90 days, you will be taking your medication as prescribed by removing the appropriate number of pills from the special MEMS vial you were given at study enrollment. You will take your medication just as you normally would. The MEMS vial will keep track of the doses you take and communicate that information back to us when you connect to the Internet using the data reader as instructed. You should upload your data on Monday of each week. Should we have any difficulty in receiving the information, we will contact you. You will receive an e-mail each Monday reminding you to upload your data and another e-mail each Thursday stating that the study website has been updated with how many days out of the previous week you took your dose as prescribed.

As mentioned during enrollment, you have been placed into an online “community” of other Marble City Pharmacy patients who have also been selected into this group. You have been granted exclusive access to the study website to view your individual and your group’s medication-taking behaviors. This means that everyone in the group will be able to see each other’s medication-taking behaviors. In order to keep your identity anonymous, the avatar assigned to you will be used to represent your place in the Marble City Pharmacy community adherence group. The study website will be updated each week and you will receive weekly email reminders of when updates occur.

Individually you have committed to taking your medication everyday as prescribed by your healthcare provider. For every week you successfully do this, you will earn an individual badge (meaning you reached 100% adherence for the week). In addition, by doing this you can represent your full support to your group by contributing 100% to the collective community adherence goal! As a “community” or group, you have a collective goal of achieving an 80% “community” medication-taking rate. This is determined by taking the average of everyone’s weekly individual medication-taking rate. If this weekly average is at 80% or higher then your Marble City Pharmacy community adherence group will earn a badge. However, each day that you miss one or more doses of your medication you are representing less support to the group by contributing less and therefore it will be harder for your group to reach the community’s adherence goal. This is why your weekly individual adherence is very important.

You’ve already completed the baseline survey and to complete all study requirements there is an additional online survey you will take in approximately 90 days. You will receive refills in the MEMS vial as necessary, and monitoring will continue for a total of

90 days. Once you have completed the 90 days, you will return the MEMS vial and MEMS data reader to Marble City Pharmacy. Even if you have additional pills leftover please bring your MEMS vial back to the pharmacy with the remaining pills in it. Upon doing this we will give you a replacement pill bottle containing your remaining pills. This will conclude your participation in the study.

To access the study website, where you will be able to see your progress and view the training videos, please login by clicking <here> or you may copy/paste the following URL into your browser: cws.auburn.edu/medicationadherence

If you have any questions regarding the study, you may contact the research team using the contact information below.

All the best,
Justin Owensby

Justin K. Owensby, PharmD, Principle Investigator
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Data Upload Instructions – Send to Participants in Incentive Groups upon Enrollment [attach pdf file]

Subject: MCP Medication Adherence Study – Instructions for Uploading Data

Dear Study Participant:

You will upload data from your MEMS vial every week on Monday (please do this no later than 3am on Tuesday morning - remember this is to accommodate you night owls and late night workers ☺.) for the duration the study. If you fail to upload your data by this deadline then your progress will be counted as if all doses of your medication were missed for that week. As a friendly reminder, I will send you an e-mail every Monday morning.

To upload your data, you may go to www.medAmigo.com or you may click the “upload data to medAmigo” link located on the front page of the study website. You will need the following information -

Login:

Password:

You may change your password after logging in for the first time. To change your password, click on your unique identifier in the top right portion of the screen. You will be given a drop-down menu. Choose “Change Password” and follow the prompts. Passwords must be between 6 and 15 characters, letters, numbers, or special characters, with at least one capital letter and one number.

Follow the instructions on the screen to upload your data. An instruction sheet demonstrating how to upload your data is available on the study website and is also attached to this e-mail.

All the best,

Justin Owensby

If you have any questions regarding the study or need assistance with uploading your data, you may reply to this e-mail or contact the research team using the contact information below:

Justin K. Owensby, PharmD, Principle Investigator
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Harrison School of Pharmacy Auburn University
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WEEKLY REPORTS – to be sent each Thursday by 5 pm

Financial Incentive Group – 100% adherence

Subject: MCP Medication Adherence Study – Weekly Report for [dates included]

Dear Study Participant:

Congratulations! You took your medication as prescribed _ out of _ days during this week's reporting period. Your account balance remains at \$_____. You may check your account balance at any time by logging into the study website.

Remember that you must complete the study requirements and turn in the data reader at the end of the study in order to claim the money in your account. Keep up the good work!

All the best,

Justin Owensby

If you have any questions regarding the study or this report, you may reply to this e-mail or contact the research team using the contact information below:

Justin K. Owensby, PharmD, Principle Investigator
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Financial Incentive Group – Less than 100% adherence

Subject: MCP Medication Adherence Study – Weekly Report for [dates included]

Dear Study Participant:

You took your medication as prescribed ___ out of ___ days during this week's reporting period. Your account has been decreased by \$_____. Your account balance is now \$_____. You may check your account balance at any time by logging into the study website.

Remember that you must complete the study requirements and turn in the data reader at the end of the incentive period in order to claim the money in your account.

All the best,

Justin Owensby

If you have any questions regarding the study or this report, you may reply to this e-mail or contact the research team using the contact information below:

Justin K. Owensby, PharmD, Principle Investigator
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Social Incentive Group – study website has been updated

Subject: MCP Medication Adherence Study – Weekly Report for [dates included]

Dear Study Participant:

The study website has been updated!

Please click here <cws.auburn.edu/medicationadherence> and login to check your weekly adherence and to see what badges you and your community have earned.

Keep up the good work!

All the best,

Justin Owensby

If you have any questions regarding the study or this report, you may reply to this e-mail or contact the research team using the contact information below:

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Incentive Groups – Upload Reminder Email – to be sent each Monday by 9 am

Subject: MCP Medication Adherence Study – Data Upload reminder

Dear Study Participant:

Don't forget to upload your data for the week! You should perform the upload sometime today and at the very latest before 03:00 am Tuesday morning. Keep in mind that if you fail to upload your data, your progress is counted as if all doses of your medication were missed for that week.

All the best,

Justin Owensby

If you have any questions regarding the study or this reminder, you may reply to this e-mail or contact the research team using the contact information below:

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All Groups – Follow-up Survey Notification

Subject: MCP Medication Adherence Study – Follow-up Survey

Dear Study Participant:

Thanks again for your participation in our study. Please click here cws.auburn.edu/medicationadherence to login to the study website and take the second online survey. You may complete this survey from any computer with Internet access. To complete all study requirements, we ask that you complete this survey within 2 days of taking the last dose of your current fill.

As a reminder, your unique identifier is: _____. You will need this to complete your survey.

All the best,

Justin Owensby

If you have any questions regarding the study or this notification, you may reply to this e-mail or contact the research team using the contact information below:

Justin K. Owensby, PharmD, Principle Investigator
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334.246.0882
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All Groups – Follow-up Survey Reminder (to be sent to those who have not completed the survey within 2 days of last dose)

Subject: MCP Medication Adherence Study – Follow-up Survey Reminder

Dear Study Participant:

Thanks again for your participation in our study. We have not yet received your completed follow-up survey. Please click here cws.auburn.edu/medicationadherence to login to the study website and take the second online survey. You may complete this survey from any computer with Internet access. To complete all study requirements, we ask that you complete this survey within 2 days of taking the last dose of your current fill.

As a reminder, your unique identifier is: _____. You will need this to complete your survey.

*****For the financial incentive group*****Please note that you must complete this survey in order to be eligible to receive any winnings you have accumulated over the course of the study.****

All the best,

Justin Owensby

If you have any questions regarding the study or this notification, you may reply to this e-mail or contact the research team using the contact information below:

Justin K. Owensby, PharmD, Principle Investigator
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Financial Incentive Group – Final Upload Completed – Money Earned

Subject: MCP Medication Adherence Study – Final upload received

Dear Study Participant:

Thanks again for your participation in our study. We have received your final data upload. For the remainder of the study, you should continue to take your medication as prescribed, using the MEMS vial, until you have finished your entire fill. No further uploads will be required. If you have not already picked up your refill, please contact the Marble City Pharmacy team at 256-245-4446 to schedule an appointment and drop off your MEMS equipment.

Congratulations! Your winnings accumulated over the 90-day study period total \$_____. Keep up the momentum.

Please note: Attached is a document that you will need to print and complete in order to receive the winnings you accumulated over the course of the study. You may complete it, scan it, and return the scanned copy to me by replying to this email. Alternatively, you may mail the completed copy to me at the address listed below or give the completed copy to a Marble City Pharmacy team member when you return your MEMS equipment. We cannot process your pay out until we receive the completed form. Please feel free to contact me if you have any questions or concerns.

All the best,

Justin Owensby

Justin K. Owensby, PharmD, Principle Investigator
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334.246.0882
MCP.ResearchStudy@auburn.edu; Owensjk@auburn.edu

Social Incentive Group – Final Upload Completed

Subject: MCP Medication Adherence Study – Final upload received

Dear Study Participant:

Thanks again for your participation in our study. We have received your final data upload. For the remainder of the study, you should continue to take your medication as prescribed, using the MEMS vial, until you have finished your entire fill. No further uploads will be required. If you have not already picked up your refill, please contact the Marble City Pharmacy team at 256-245-4446 to schedule an appointment and drop off your MEMS equipment.

All the best,

Justin Owensby

If you have any questions regarding the study, you may reply to this e-mail or contact the research team using the contact information below:

Justin K. Owensby, PharmD, Principle Investigator
PhD Candidate Health Outcomes Research and Policy
Harrison School of Pharmacy Auburn University
056 James E. Foy Hall Auburn, AL 36849-5506
334.246.0882
MCP.ResearchStudy@auburn.edu; Owensjk@auburn.edu

All Groups – Final Study Notification

Subject: MCP Medication Adherence Study – Congratulations on completion of our study!

Dear Study Participant:

Thanks again for your participation in our study. You are nearing the end of the study period. **In order to meet all study requirements and to be eligible to receive the \$10 Marble City Pharmacy gift card and qualify for a chance to win one of the four \$50 gift cards, you must return the MEMS vial cap once you have completed the last day of monitoring (**insert date here**).** We need the cap in order to retrieve your adherence data. No appointment will be necessary. We need only the cap to be returned and the empty vial may be discarded. However, if you have additional pills leftover please bring your MEMS vial back to the pharmacy with the remaining pills in it. Upon doing this we will give you a replacement pill bottle containing your remaining pills.

Once we have received your MEMS cap and verified that you have completed the study requirements, we will send you an email notifying you of the available \$10 Marble City Pharmacy gift card. At the end of the study we will contact the winners of the \$50 gift card.

If you have any questions regarding the study, feel free to contact the research team using the contact information below. For questions about your medication, please contact the Marble City Pharmacy at 256-245-4446.

All the best,

Justin Owensby

Justin K. Owensby, PharmD, Principle Investigator
PhD Candidate Health Outcomes Research and Policy
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056 James E. Foy Hall Auburn, AL 36849-5506
334.246.0882
MCP.ResearchStudy@auburn.edu; Owensjk@auburn.edu

All Groups – Notification of Available \$10 Gift Card

Subject: MCP Medication Adherence Study – \$10 Gift Card

Dear Study Participant:

Congratulations! We have received your MEMS equipment and you have completed all study requirements. Your \$10 gift card is now available for pick-up at Marble City Pharmacy.

If you have any questions regarding the study, feel free to contact the research team using the contact information below. For questions about your medication, please contact the Marble City Pharmacy at 256-245-4446.

All the best,

Justin Owensby

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334.246.0882
MCP.ResearchStudy@auburn.edu; Owensjk@auburn.edu

Winner of \$50 Gift Card Random Drawing

Subject: MCP Medication Adherence Study – Winner of \$50 Gift Card Drawing

Dear Study Participant:

Congratulations! The study period has officially ended and your name has been drawn as a winner for the \$50 gift card.

Upon returning to the pharmacy you will need to fill out the necessary paperwork to receive your gift card. Thank you once again for your participation.

If you have any questions regarding the study, feel free to contact the research team using the contact information below. For questions about your medication, please contact the Marble City Pharmacy at 256-245-4446.

All the best,

Justin Owensby

Justin K. Owensby, PharmD, Principle Investigator
PhD Candidate Health Outcomes Research and Policy
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334.246.0882
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Appendix B: Phase I IRB Stamped Informed Consent

(NOTE: DO NOT SIGN THIS DOCUMENT UNLESS AN IRB APPROVAL STAMP WITH CURRENT DATES HAS BEEN APPLIED TO THIS DOCUMENT.)

INFORMED CONSENT

for a Research Study entitled

“Commitment Contracts: Leveraging Behavioral Economics-based Interventions to Improve Medication Adherence”

You are invited to participate in a research study to assess the effectiveness of various interventions to improve how well individuals take their medicines as prescribed by their healthcare provider. The study is being conducted by Justin Owensby, graduate student, under the direction of Kimberly Garza, assistant professor in the Auburn University Department of Health Outcomes Research and Policy. You were selected as a possible participant because you receive a medication for either high blood pressure or high cholesterol from Marble City Health Mart Pharmacy and are 19 years of age or older. In order to be eligible for the study, you must administer your own medications, be able to speak and understand English, and have access to an e-mail account that you can check at least weekly and a computer or tablet computer (containing a USB port) with Internet access.

What will be involved if you participate? If you decide to participate in this research study, you will receive your high blood pressure or high cholesterol medication in a special electronic pill bottle, called a MEMS vial, which records the time and date you take each dose of medication. If you are assigned to an intervention group you will perform a brief data download each week using a MEMS data reader and a computer or tablet computer (containing a USB port) with Internet access. You will be given instructions on how to do this. You will receive refills in the MEMS vial as necessary, and monitoring will continue for a total of 90 days. Once you have completed the 90-day study period, you will return the empty MEMS vial and the MEMS data reader (if applicable) to Marble City Pharmacy. You will also complete two online surveys, one will occur the day you enroll in the study and another within two days after taking the last dose of the 90-day study period. The surveys each take approximately 15 minutes to complete and will contain questions related to medication-taking behavior, past medical history, and how important different incentives and types of reward structures are to you.

You will be randomly assigned to one of three different study groups (control group, financial incentive group, or social incentive group). Participants in the financial incentive group will receive opportunities to earn cash prizes for taking their medication as prescribed by their healthcare provider. If you are assigned to the financial incentive group, you will begin the study with a virtual “account” containing \$90 and will sign a commitment contract pledging to take your medication everyday as prescribed by your healthcare provider. Each week, you will receive a report stating how many days in the past week you took your medication as prescribed by your healthcare provider. For each day that you miss one or more doses of your medication, your account will be decreased by \$1. The weekly report will state the balance remaining in your account. You will also have access to a study website that will contain this information.

The Auburn University Institutional
Review Board has approved this
Document for use from
02/17/2016 to 02/16/2017
Protocol # 16-009 MR 1602

Participant’s Initials _____

If you are in the social incentive group, you will be granted access to an online “community” of your Marble City Pharmacy peers who have also been selected into this group. In order to preserve anonymity, you will be assigned a unique ID and an avatar that will be used for “community” medication adherence. You will have access to a study website that will contain visualized graphics of yours and your peers’ medication adherence data and also a weekly leaderboard. The study website will be updated each week and you will receive weekly email reminders of when updates occur. In addition, you will sign a commitment contract pledging to take your medication every day as prescribed by your healthcare provider.

Your total time commitment will be approximately 60 minutes for enrollment and completion of the online surveys. An additional 5 minutes per week (approximately 65 minutes total) will be required from those assigned to an intervention group to perform weekly data downloads. Otherwise, you will continue taking your medication just as you normally would over the 90-day study period.

Are there any risks or discomforts? The risks associated with participating in this study include inconvenience due to the required use of the prescription bottle provided and possible breach of confidentiality. To minimize these risks, we will use unique identifiers to link data collected from the surveys to the data collected from the MEMS vial. You will be assigned a unique identifier at the time of enrollment which you will enter when completing the online surveys. Your name and contact information will be stored separately from the data obtained from online surveys.

Are there any benefits to yourself or others? If you participate in this study, you can expect to improve your awareness of adherence problems and possibly improve adherence to your medication regimen. Participants in the financial incentive group of the study may receive financial incentives for adherence in the form of cash at the conclusion of the study. We/I cannot promise you that you will receive any or all of the benefits described.

Will you receive compensation for participating? Participants will be compensated for participation in the study. All participants who complete the enrollment process will receive a \$10 gift card. In addition, those who complete all requirements of the study and return the MEMS equipment to Marble City Pharmacy at the end of the study will receive an additional \$10 gift card and qualify for cash drawings for a chance to win one of four \$50 gift cards. Chances of winning are approximately 1 in 15. If you are assigned to the financial incentive group, you will receive any money you make over the course of the study period in the form of a cash payout at the completion of the 90-day study period and after filing the appropriate paperwork to have the money deposited into your personal banking account. In order to claim the money in your account, you must complete all study requirements, including weekly data downloads, completion of surveys, and returning of the MEMS vial and data reader to Marble City Pharmacy.

Are there any costs? If you decide to participate, any charges you normally incur when getting your prescription filled will still apply, but use of the special MEMS vial is free.

If you change your mind about participating, you can withdraw at any time during the study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the Department of Health Outcomes Research and Policy, the Harrison School of Pharmacy, or Marble City Health Mart Pharmacy.

Your privacy will be protected. Any information obtained in connection with this study will remain confidential. Information obtained through your participation may be published in a professional journal or presented at a professional meeting. Your name will not be used in publications or presentations that result from this study.

If you have questions about this study, please ask them now or contact Justin Owensby by phone at 334-246-0882 or e-mail at MCP.ResearchStudy@auburn.edu. A copy of this document will be given to you to keep.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334)-844-5966 or e-mail at IRBadmin@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH STUDY. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE.

Participant's signature Date

Investigator obtaining consent Date

Printed Name

Printed Name

020 JAMES E. FOY HALL
282 WEST THACH CONCOURSE
AUBURN, AL 36849

Co-Investigator Date

Printed Name

TELEPHONE:
334-844-5152

FAX:
334-844-8307

**The Auburn University Institutional
Review Board has approved this
Document for use from
02/17/2016 to 02/16/2017
Protocol # 16-009 MR 1602**

Participant's Initials _____

Appendix C1: Enrollment Materials

**Appendix C2: Enrollment Materials
Technician Enrollment Flow Sheet**

IF someone is interested in joining the study:

1. Verify eligibility to join study

- ✓ \geq 19 years of age
- ✓ On high blood pressure or high cholesterol med
- ✓ Access to email (at least weekly)
- ✓ Access to computer (or tablet with USB port) with internet access (at least weekly)
- ✓ No caretaker (must take own medication)

2. Inform patient purpose of enrollment (their scheduled appointment)

- ✓ 45-60 min session
- ✓ Will go over details & requirements of the study
- ✓ If you want to join, then you can sign the form
- ✓ Will train on equipment and steps moving forward
- ✓ Will receive medication in a special MEMS vial
- ✓ Mention headphones

3. Schedule an appointment

➤ Please record the following:

| | |
|---|--|
| First name | |
| Middle initial | |
| Last name | |
| Email address | |
| Medication & sig | |
| Appointment date | |
| Appointment time | |
| Additional notes (e.g., how did they hear about this study, anything you want add, etc.) | |

4. Send this info to JO

✓ If you use the paper form, then either:

1. Scan it then email it to me
(mcp.researchstudy@auburn.edu)
2. Use tigertext app to send it to me
3. Fill out the electronic form then send it to me

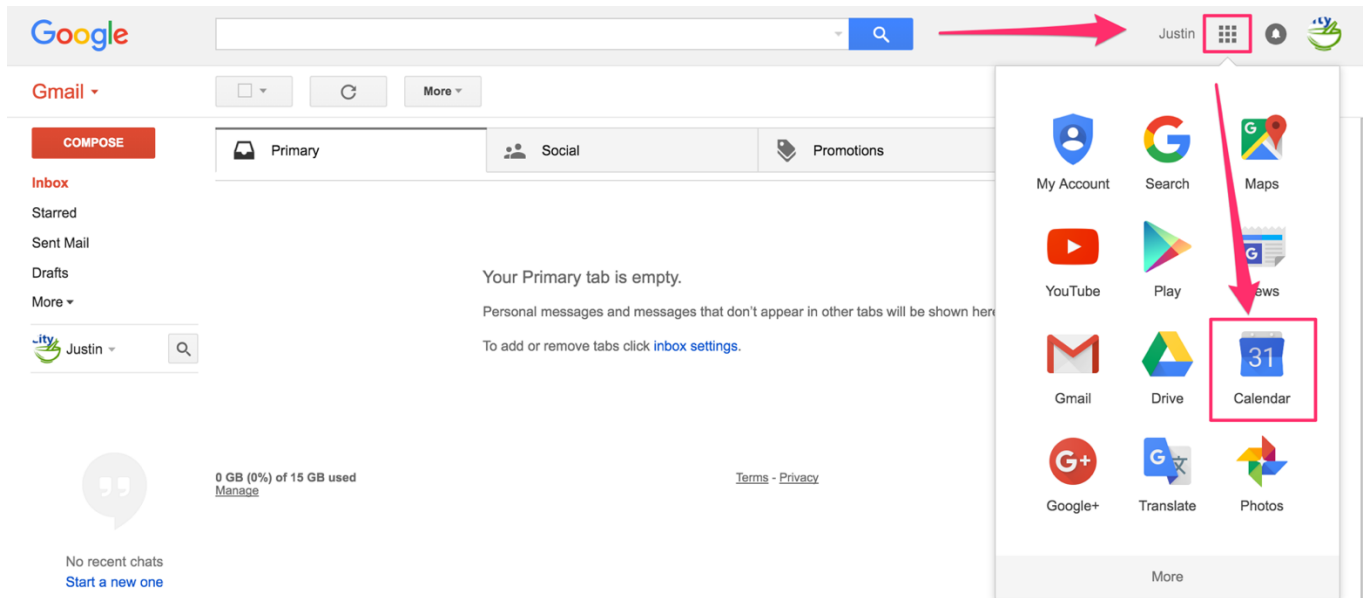
- ✓ If you use the electronic form, then either:
 1. Use the shortcut I put on your phone then fill out the form
 2. Use the shortcut I put on the desktop computer then fill out the form
- ✓ Here is the link to the electronic form (in case you need it)
 1. https://auburn.qualtrics.com/jfe/form/SV_9n8fPDnCkMY4OwZ

5. Mark on calendar

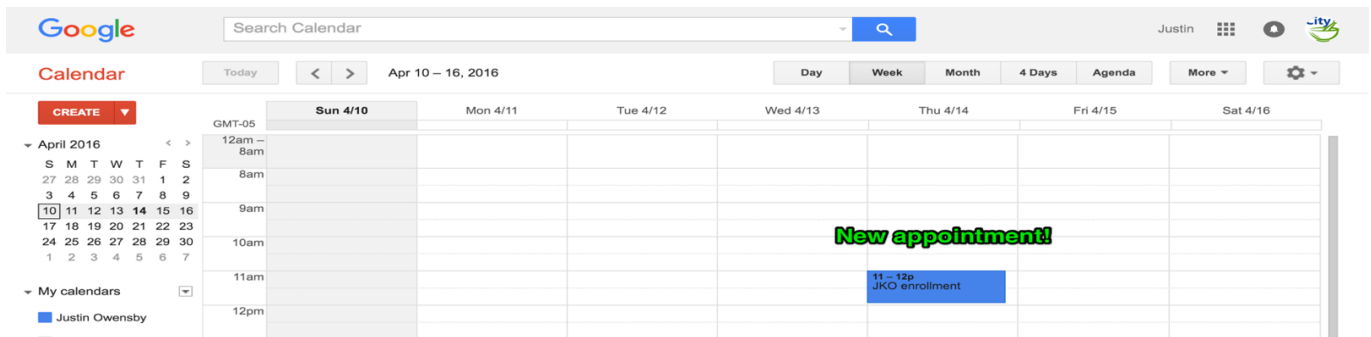
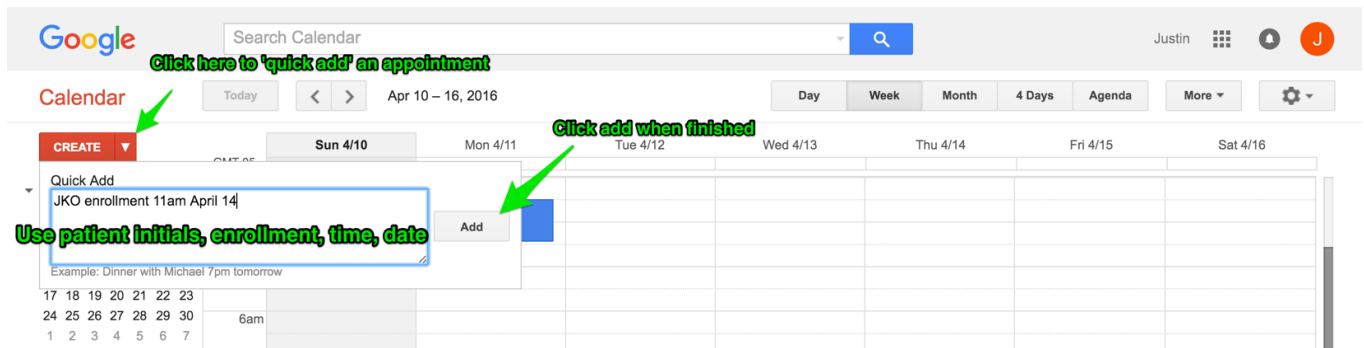
- ✓ Record appointments on the physical calendar
- ✓ Add appointment to electronic calendar (gmail)
 1. If you are able, if not then I will add it
 2. Gmail user name: mcp.researchstudy@gmail.com
 3. Gmail password: #MCP#2454446

✓ Steps to add an appointment to gmail calendar

✓ Login, then click  & then  Calendar



Next – add an appointment (quick add)



You can also add an appointment by clicking the **CREATE** button and this will pull up a more detailed page

Google Justin

← **SAVE** Discard

Untitled event

4/10/2016 10:00pm to 11:00pm 4/10/2016 [Time zone](#)

All day Repeat...

Event details [Find a time](#)

Where

Video call [Add video call](#)

Calendar Justin Owensby

Description

Attachment [Add attachment](#)

Event color

Notifications Pop-up 1 hours [Add a notification](#)

Show me as Available Busy

Visibility Calendar default Public Private

By default this event will follow the [sharing settings](#) of this calendar: event details will be visible to anyone who can see details of other events in this calendar. [Learn more](#)

Add guests
 Add

Guests can

- modify event
- invite others
- see guest list

If someone wants to join the study:

- ✓ Verify eligibility
- ✓ Purpose of the enrollment session
- ✓ Schedule an appointment (and record it!)
- ✓ Send this info to JO
- ✓ Mark on the calendar

Patient comes in for appointment (enrollment)

1. Take patient to counseling room

a. Supplies in counseling room:

i. MBP (+ charger, mouse (+batteries))

ii. MEMS vial (& data reader)

1. For patient to view

iii. Headphones (over the ear and buds)

iv. Pen, paper

b. Packet for patient:

i. IC x2, MEMS, medAmigo, Java (?), CWS

ii. Handouts to follow along with the videos (?)

c. Paperwork before patient leaves enrollment session

i. Qualtrics info (MCP tech to fill out)

ii. Gift card info (pt to fill out)

d. Something that will alert tech if pt has a question (?)

2. Orient patient

a. To supplies in room, laptop and website, if have questions

3. CWS flow (for techs)

a. Homepage (CWS), Youtube videos, medAmigo website, cws site (in tabs)

4. Record patient info and send to JO (Qualtrics)

a. Or via tigertext

Appendix C3: Enrollment Materials

Usual Care Group Information Sheet

Welcome to the Usual Care Group

Dr. Owensby Contact Info:
Email: MCP.ResearchStudy@auburn.edu
Mobile: 334.246.0882
Website: Click "Contact Us" tab

Welcome

Beginning on your start date, take your medication as prescribed by removing the appropriate number of pills from the special MEMS vial

Take your medication just as you normally would however please don't use pillboxes or other similar dispensers for this medication during this study

Your 90-Day Study Period:

Start date: _____

End date: _____



Using the MEMS Vial

To open, press down then turn counter-clockwise

Each opening records the date & time

Please don't open the MEMS vial unnecessarily as this may misrepresent you and your data

If your MEMS vial gets dirty use a slightly damp cloth to wipe it clean

Study Requirements

Complete these & become eligible for the gift cards & cash drawings*:

Survey 1 (during enrollment) | Survey 2 (end of study)

If receiving a refill bring MEMS vial to the pharmacy
Return MEMS vial at the end of your 90-day period

Once completed you will receive another \$10 gift card

*Cash drawings will occur after study completion
Winners will be notified by email



Study Website

You can access all videos & materials at the following address:
cws.auburn.edu/MedicationAdherence

User Name: _____

Password: _____

*Click "How to Navigate" to re-watch the website navigation video

*Click "Help" to explore all videos and training materials

Appendix C4: Enrollment Materials

Financial Incentive Group Information Sheet



Welcome to the

Financial Incentive Group

Dr. Owensby Contact Info:
Email: MCP.ResearchStudy@auburn.edu
Mobile: 334.246.0882
Website: Click "Contact Us" tab

Welcome

Beginning on your start date, take your medication as prescribed by removing the appropriate number of pills from the special MEMS vial

Take your medication just as you normally would however please don't use pillboxes or other similar dispensers for this medication during this study

Your 90-Day Study Period:

Start date: _____

End date: _____



Using the MEMS Vial

To open, press down then turn counter-clockwise

Each opening records the date & time

Please don't open the MEMS vial unnecessarily as this may misrepresent you and your data

If your MEMS vial gets dirty use a slightly damp cloth to wipe it clean

Study Requirements

Complete these & become eligible for the gift cards & cash drawings*:

Survey 1 (during enrollment) | Survey 2 (end of study)

If receiving a refill bring MEMS vial to the pharmacy
Return all MEMS equipment at the end of your 90-day period

*Cash drawings occur after study completion
Winners will be notified by email

Once completed you will receive another \$10 gift card + remaining balance in virtual account



Study Website

You can access all videos & materials at the following address:
cws.auburn.edu/MedicationAdherence

*Click "Financial" to view virtual account balance

*Click "How to Navigate" to re-watch the website navigation video

*Click "Help" to explore all videos and training materials

User Name: _____

Password: _____

Welcome to the Financial Incentive Group

Dr. Owensby Contact Info:
Email: MCP.ResearchStudy@auburn.edu
Mobile: 334.246.0882
Website: Click "Contact Us" tab

How this group works

You will begin with a virtual account that contains \$90
Each day you miss one or more doses of your study medication, you will lose \$1 from your virtual account balance
Each Thursday, you will receive an emailed report stating how many days in the past week you took your medication as prescribed
For this study, each day will begin at 0300am and will end 24 hours later at 0259am.



Uploading MEMS Data

Upload your data every MONDAY

The deadline is 3am Tuesday morning but please don't wait until then

If you miss this deadline, then your progress will be counted as if all doses of were missed for that week AND YOU WILL LOSE \$7 from your virtual account

As a friendly reminder, I will send you an email every Monday morning

Commitment Contract

At the end of the enrollment session, you will have the opportunity to commit to your medication-taking goal by filling out a commitment contract

This pledge will serve as a proclamation of your intention to accomplish your medication-taking goal and it will serve as reminder of what's at stake



Study Website

You can access all videos & materials at the following address:
cws.auburn.edu/MedicationAdherence

*Click "Financial" to view virtual account balance

*Click "How to Navigate" to re-watch the website navigation video

*Click "Help" to explore all videos and training materials

User Name: _____

Password: _____

Appendix C5: Enrollment Materials

Social Incentive Group Information Sheet



Welcome to the

Marble City Pharmacy Community Adherence Group

Dr. Owensby Contact Info:
Email: MCP.ResearchStudy@auburn.edu
Mobile: 334.246.0882
Website: Click "Contact Us" tab

Welcome

Beginning on your start date, take your medication as prescribed by removing the appropriate number of pills from the special MEMS vial

Take your medication just as you normally would however please don't use pillboxes or other similar dispensers for this medication during this study

Your 90-Day Study Period:

Start date: _____

End date: _____



Using the MEMS Vial

To open, press down then turn counter-clockwise

Each opening records the date & time

Please don't open the MEMS vial unnecessarily as this may misrepresent you and your data

If your MEMS vial gets dirty use a slightly damp cloth to wipe it clean

Study Requirements

Complete these & become eligible for the gift cards & cash drawings*:

Survey 1 (during enrollment) | Survey 2 (end of study)

If receiving a refill bring MEMS vial to the pharmacy
Return all MEMS equipment at the end of your 90-day period

Once completed you will receive another \$10 gift card

*Cash drawings occur after study completion
Winners will be notified by email



User Name: _____

Password: _____

Study Website

You can access all videos & materials at the following address:
cws.auburn.edu/MedicationAdherence

*Click "Social" to view activity within the MCP Community Group

*Click "How to Navigate" to re-watch the website navigation video

*Click "Help" to explore all videos and training materials

Welcome to the

Marble City Pharmacy Community Adherence Group

Dr. Owensby Contact Info:
Email: MCP.ResearchStudy@auburn.edu
Mobile: 334.246.0882
Website: Click "Contact Us" tab



What does this group mean?

- You and other study participants will form a small online community within MCP
- You have been granted exclusive access to our study website
- You can view illustrations of your and your communities medication-taking behaviors
- Your place within the MCP community adherence group will be represented via the avatar your chose
- You may also view the weekly leader board to see your place within this online community

How this group works

- You will have an individual and a community medication-taking goal
- Individually your goal is to reach 100% adherence each week - by doing this you'll earn badges that represent your progress over the 90-day study period.
- For the community, you will have a collective goal of achieving an 80% community medication-taking rate (taken via average of everyone's weekly rate)
- If accomplished then a community badge will be unlocked!
- This information will be updated every Thursday on the study website



Uploading MEMS Data

Upload your data every MONDAY

The deadline is 3am Tuesday morning but please don't wait until then

If you miss this deadline, then your progress will be counted as if all doses of were missed for that week, your contribution to the community goal will be 0%, & you will lost the opportunity to earn individual badges for that week

As a friendly reminder, I will send you an email every Monday morning

Commitment Contract

At the end of the enrollment session, you will have the opportunity to commit to your medication-taking goal by filling out a commitment contract

This pledge will serve as a proclamation of your intention to accomplish your medication-taking goal and it will serve as reminder of what's at stake





Be part of an important medication-taking study



Are you interested?

- Are you interested in learning what motivates you to take your medications?
- Would you act differently if you were paid?
- What if your peers knew whether or not you took your medication?



Are you eligible?

If you are 19 years of age or older and have weekly access to a computer or tablet with Internet access then you are invited to participate in a medication-taking research study to see what rewards or incentives motivate you to take your medications!



What happens if I join?

Participants who enroll will receive a \$10 gift card and those who complete the study will receive another \$10 gift card plus qualify for a chance to win cash drawings of one of four \$50 gift cards. In addition, participants assigned to one of the three study groups will also receive the opportunity to receive up to \$90 for taking their medication as prescribed by their healthcare provider.



Who is doing this study?

This study is being conducted by Dr. Justin Owensby, pharmacist and graduate student of the Auburn University Harrison School of Pharmacy in the Department of Health Outcomes Research & Policy.



How can I join?

For more information or to join this study, you may contact the pharmacy 256.245.4446 to speak with a research team member or you may directly contact Dr. Owensby at 334.246.0882 or by email at MCP.ResearchStudy@auburn.edu

Appendix C6: Enrollment Materials
How to Navigate the Study Website [Usual Care Group]

The screenshot shows a web browser window with the URL <https://cws.auburn.edu/MedicationAdherence/>. The page has a blue header with the text "MEDICATION ADHERENCE" and a "Login" button. On the left, there is a sidebar with "Contact Us", the "Marble City PHARMACY" logo, and "Upload Data To medAmigo". A blue "Join Us" button is centered. Two numbered instructions are present: "1. To access the study website type in the following URL into the address bar: **cws.auburn.edu/MedicationAdherence**" and "2. Once here please click login". Arrows point from the first instruction to the URL in the address bar, from the second instruction to the "Login" button, and from the "Login" button back to the first instruction.

2016 - Campus Web Solutions

Log in using the username and password you created during enrollment

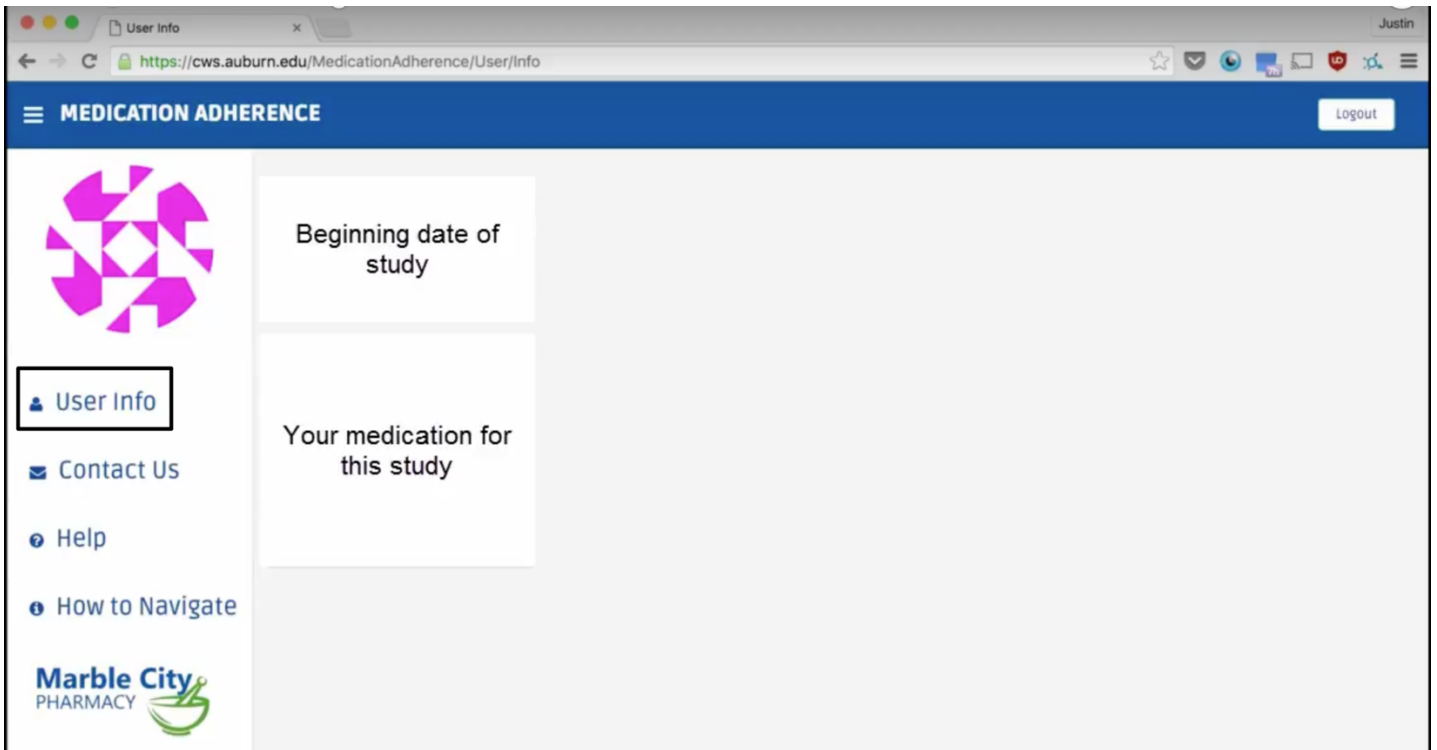
Login

Username

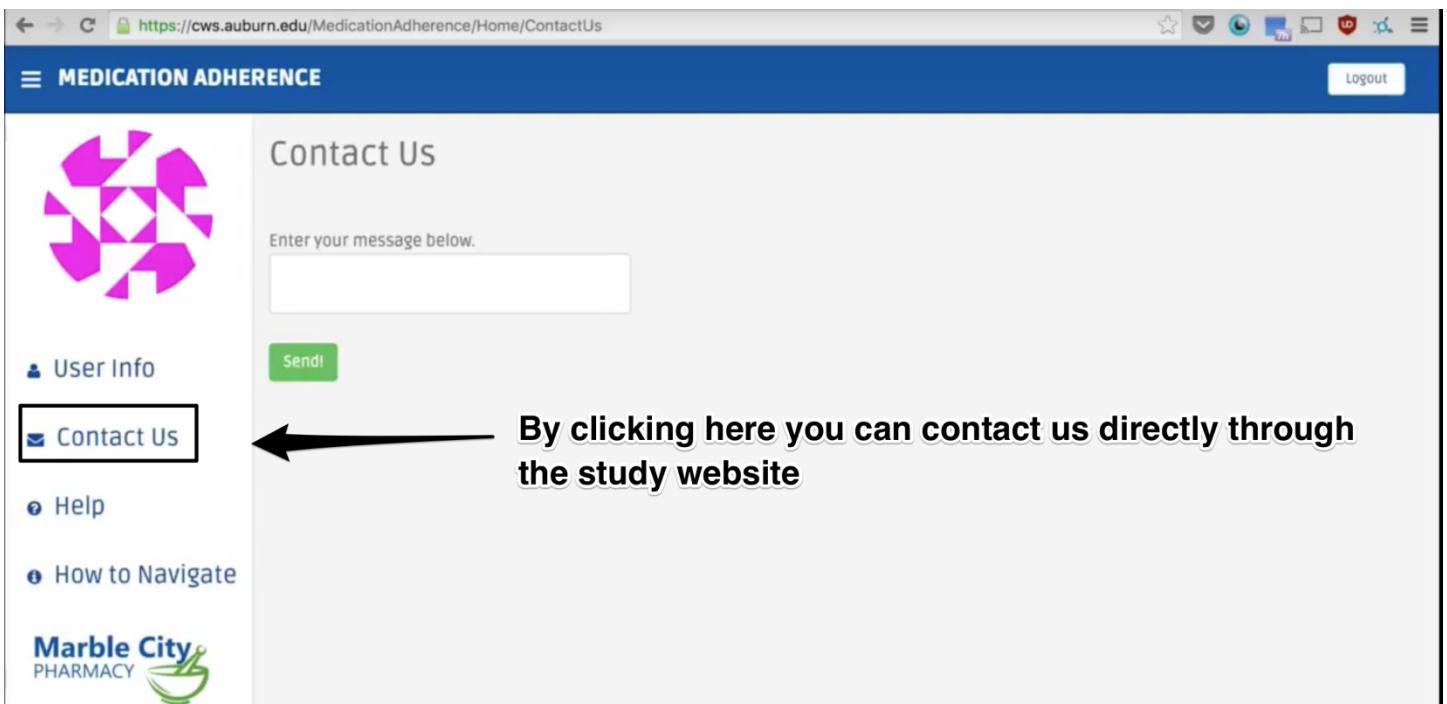
Password

Log In

This is your user info page. It contains the date you began the study and the medication you are taking for this study.




CONTACT US PAGE




HELP PAGE – please click here to access all training videos and materials

← → C <https://cws.auburn.edu/MedicationAdherence/UserCategory/Help> ☆ 📧 📄 📱 📧 🔍 ☰

☰ MEDICATION ADHERENCE Logout



- User Info
- Contact Us
- Help**
- How to Navigate

Marble City PHARMACY 

Usual Care Group

On this page you can access all of the training videos and materials that you viewed during the enrollment session.

Videos:
[Informed Consent Video](#)
[Explanation of the Usual Care Group Video](#)
[Thank You Video](#)

Documents:
[Informed Consent](#)

You may click on any of these links to watch videos or view documents

Click here for access to all videos and training materials

HOW TO NAVIGATE page

← → C <https://cws.auburn.edu/MedicationAdherence/Home/HowToNavigate> ☆ 📧 📄 📱 📧 🔍 ☰

☰ MEDICATION ADHERENCE Logout



- User Info
- Contact Us
- Help
- How to Navigate**

Marble City PHARMACY 

How to Navigate This Site

[Click here to watch the video of how to navigate this site!]

Please click here to re-watch the website navigation video

Please click here to visit the Marble City Pharmacy homepage

When you are finished using the study website you may logout by clicking the icon in the upper right corner.

Appendix C7: Enrollment Materials
How to Navigate the Study Website [Marble City Community Adherence Group]

Home x Justin

https://cws.auburn.edu/MedicationAdherence/

MEDICATION ADHERENCE Login

Contact Us

Marble City PHARMACY

Upload Data To medAmigo

Join Us

1. To access the study website type in the following URL into the address bar:
cws.auburn.edu/MedicationAdherence

2. Once here please click login

2016 - Campus Web Solutions

Log in using the username and password you created during enrollment

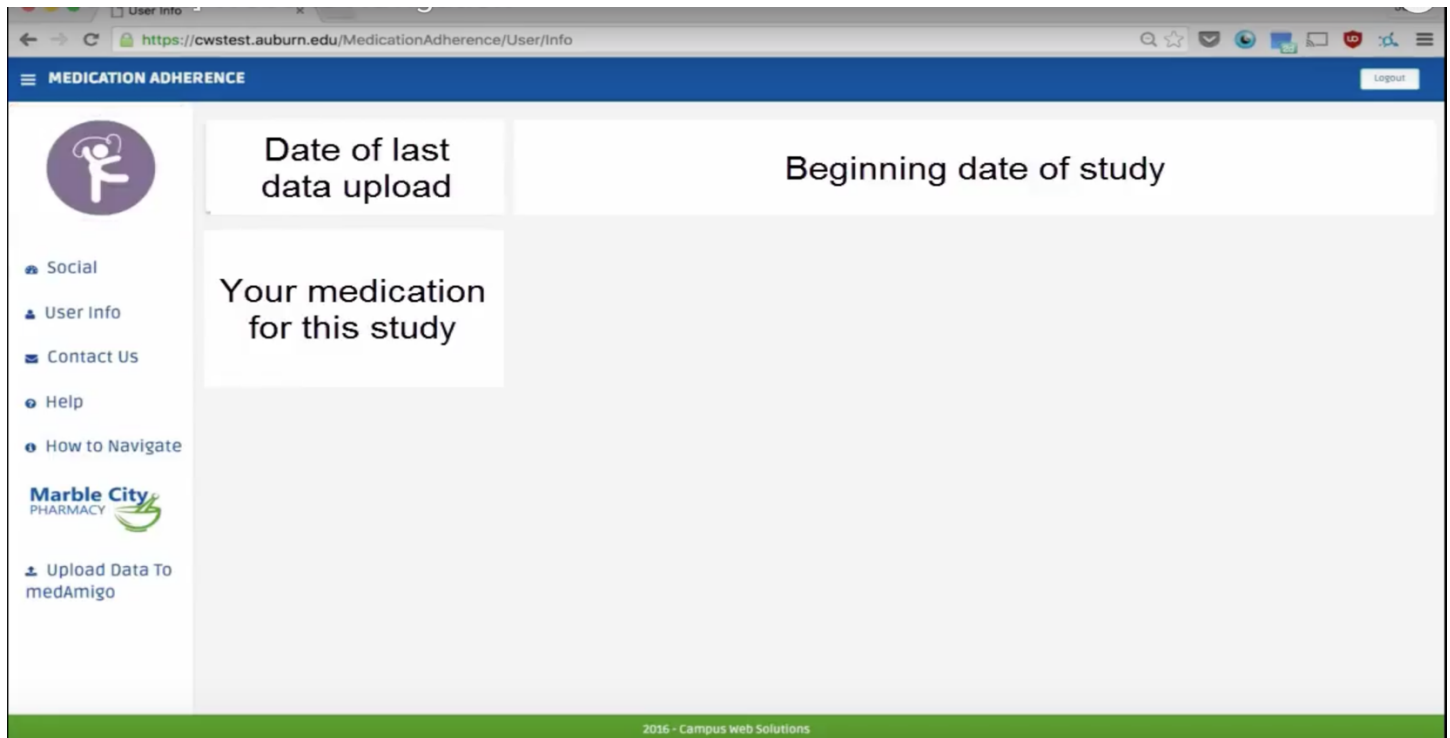
Login

Username

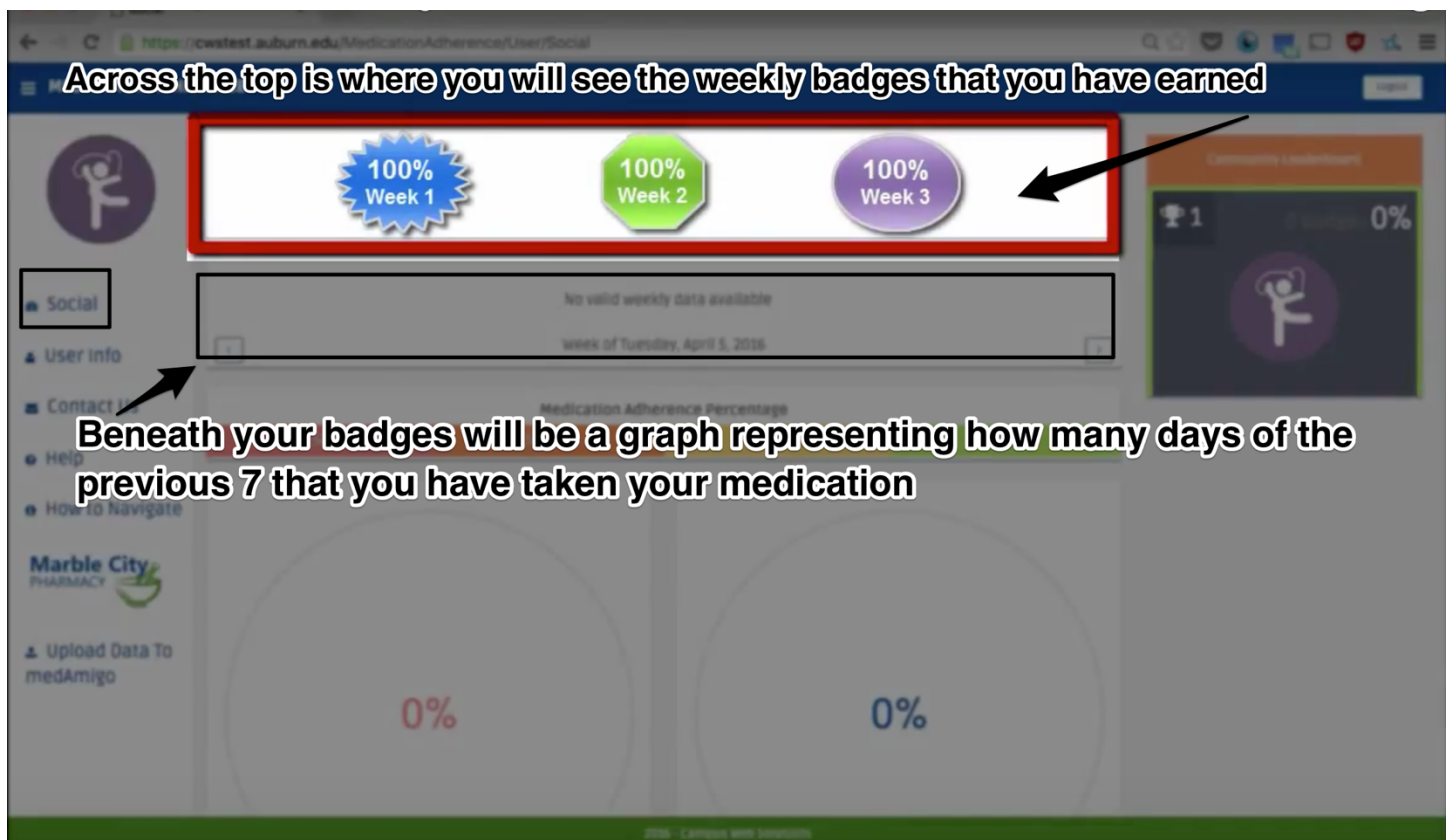
Password

Log In

It contains the avatar you chose during enrollment, the date you began the study, the medication you are taking for this study, and the date of your most recent data upload.



SOCIAL PAGE – this is where you will see all of you and your groups activities. The very top row will represent the weekly badges that you have earned and the row below that will represent the days of the week that you have taken your medication.



SOCIAL PAGE – (continued) When you scroll down you will see 2 circle graphs. These will represent your individual and community medication adherence rates over the previous 7 days.

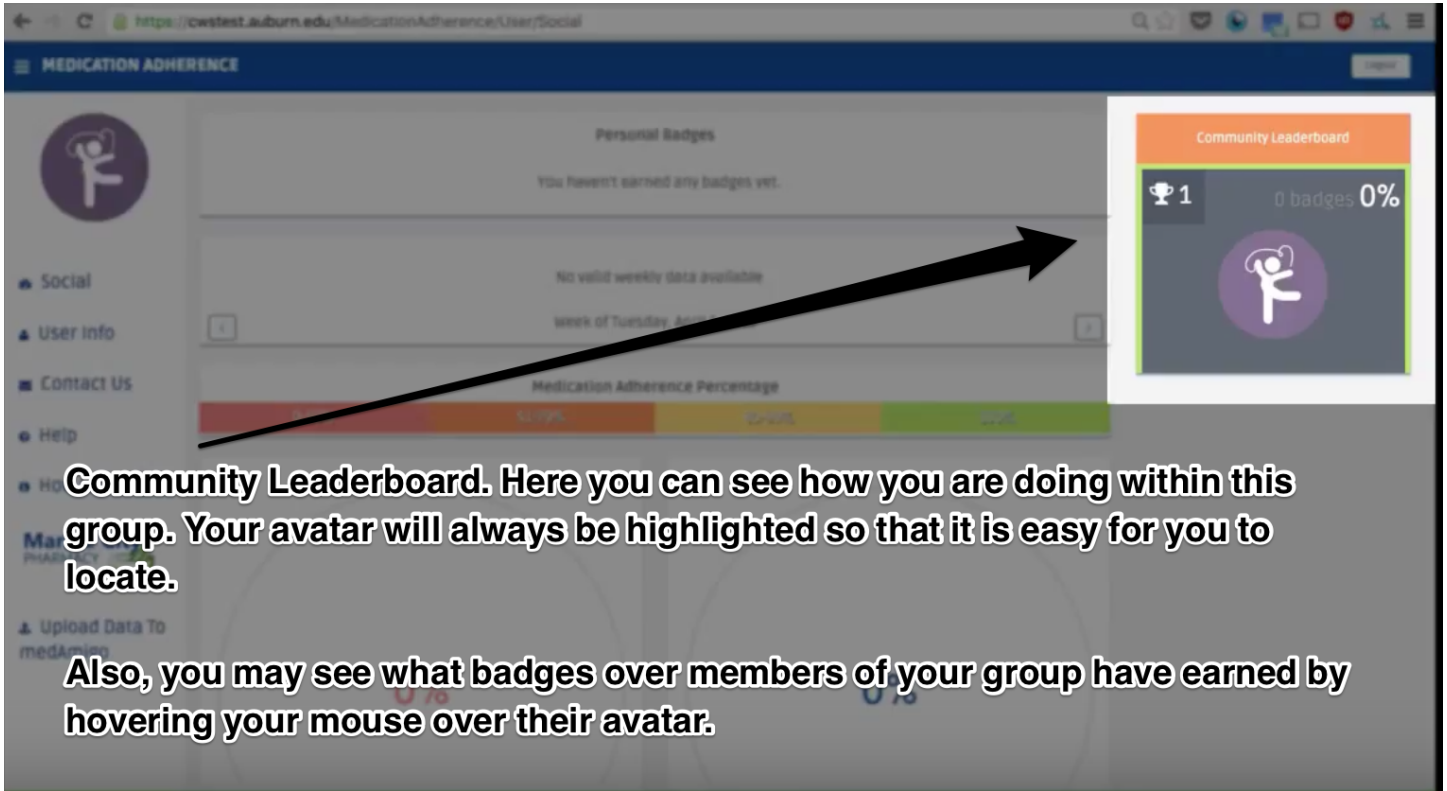
← This graph represents the percentage of days that you have taken your medication over the previous 7 days. The left graph is your individual medication adherence and the right graph will be the Marble City Pharmacy Community Group adherence.

The dashboard is titled "Medication Adherence Percentage" and features a horizontal bar at the top with four segments: 0-50% (red), 51-79% (orange), 80-99% (yellow), and 100% (green). Below this, the text "7 days out of 7 days =" is displayed in green. The left side contains a large green circle with "100%" inside, labeled "Your Average" below it. The right side contains a large empty white circle, labeled "Community Average" below it. A sidebar on the left lists navigation options: Social, User Info, Contact Us, Help, How to Navigate, Marble City PHARMACY (with logo), and Upload Data To medAmigo. The footer reads "2016 - Campus Web Solutions".

Directly below these graphs will be the community badges

The "Community Badges" section contains two octagonal badges. The first is green and labeled "Community Week 1". The second is blue and labeled "Community Week 2".

SOCIAL PAGE – (continued) On the right side of the screen you can view the community leaderboard. Here you can see how you are doing within your group.

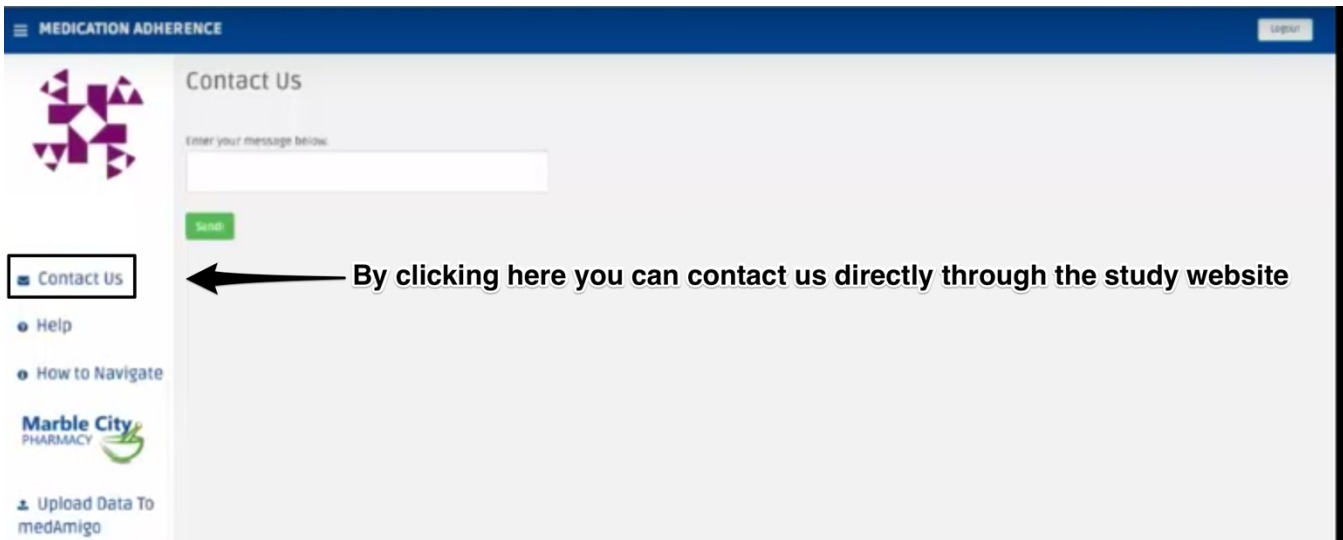


The screenshot shows a web interface for 'MEDICATION ADHERENCE'. On the right side, there is a 'Community Leaderboard' panel. It displays a trophy icon with the number '1', a user's avatar, and the text '0 badges 0%'. A large black arrow points from the main content area towards this leaderboard panel.

Community Leaderboard. Here you can see how you are doing within this group. Your avatar will always be highlighted so that it is easy for you to locate.

Also, you may see what badges over members of your group have earned by hovering your mouse over their avatar.

CONTACT US PAGE



The screenshot shows the 'Contact Us' page. On the left sidebar, the 'Contact Us' menu item is highlighted with a black box. A black arrow points from this box to the right, towards the main content area. The main content area contains a text input field with the placeholder 'Enter your message below:' and a green 'Send' button.

By clicking here you can contact us directly through the study website

HELP PAGE

MEDICATION ADHERENCE Logout

Social Incentive Group

On this page you can access all of the training videos and materials that you viewed during the enrollment session.

Videos:

- [Informed Consent Video](#)
- [Financial Incentive Group Video \(explanation of your group\)](#)
- [Thank You Video](#)

Documents:

- [Informed Consent](#)
- [\[MEMS\]](#)
- [\[medAmigo\]](#)
- [\[Java\]](#)
- [\[Commitment contract\]](#)

[Click here to access all videos and training materials](#)

You may click on any of these links to watch videos or view documents

[Contact Us](#)

[Help](#)

[How to Navigate](#)

Marble City PHARMACY

[Upload Data To medAmigo](#)

HOW TO NAVIGATE page

MEDICATION ADHERENCE Logout

How to Navigate This Site

[\[Click here to watch the video of how to navigate this site\]](#)

Please click here to re-watch the website navigation video

Please click here to visit the Marble City Pharmacy homepage

Please click here to visit the medAmigo platform. Here you may upload your data or change your password.

[Contact Us](#)

[Help](#)

[How to Navigate](#)

Marble City PHARMACY

[Upload Data To medAmigo](#)

When you are finished using the study website you may logout by clicking the icon in the upper right corner.

Appendix C8: Enrollment Materials
How to Navigate the Study Website [Financial Incentive Group]

Home x Justin
https://cws.auburn.edu/MedicationAdherence/

MEDICATION ADHERENCE Login

Contact Us

Marble City PHARMACY

Upload Data To medAmigo

Join Us

1. To access the study website type in the following URL into the address bar:
cws.auburn.edu/MedicationAdherence

2. Once here please click login

2016 - Campus Web Solutions

Log in using the username and password you created during enrollment

Login

Username

Password

Log In

It contains the date you began the study, the medication you are taking for this study, and your current virtual account balance.

The screenshot shows the 'MEDICATION ADHERENCE' page. On the left is a navigation menu with 'Financial' highlighted. The main content area features three boxes: 'So Far, You Have Lost \$0 Of Your Original \$90' (with an arrow pointing to it from the label 'Current virtual account balance'), 'Beginning study date', and 'Your medication for this study'. The Marble City PHARMACY logo is visible in the bottom left.

CONTACT US PAGE

The screenshot shows the 'CONTACT US' page. The 'Contact Us' menu item in the left navigation bar is highlighted with a box. An arrow points from the text 'By clicking here you can contact us directly through the study website' to this menu item. The main content area contains a 'Contact Us' heading, a text input field, and a 'Send' button.

HELP PAGE

The screenshot shows the 'HELP PAGE' titled 'Financial Incentive Group'. The 'Help' menu item in the left navigation bar is highlighted with a box. An arrow points from the text 'Click here to access all videos and training materials' to this menu item. Another arrow points from the text 'You may click on any of these links to watch videos or view documents' to a list of links under 'Videos' and 'Documents'. The 'Videos' list includes 'Informed Consent Video', 'Financial Incentive Group Video (explanation of your group)', and 'Thank You Video'. The 'Documents' list includes 'Informed Consent [MEMS]', '[medAmigo]', '[Java]', and '[Commitment contract]'.

HOW TO NAVIGATE page

The image shows a screenshot of a website titled "MEDICATION ADHERENCE" in a blue header. In the top right corner, there is a "Logout" button. On the left side, there is a navigation menu with the following items: "Financial", "Contact Us", "Help", "How to Navigate", "Marble City PHARMACY" (with a logo), and "Upload Data To medAmigo". A central white box contains the text "How to Navigate This Site" and a link "[Click here to watch the video of how to navigate this site!]", which is highlighted by a black arrow pointing to the "How to Navigate" menu item. Below the menu, three additional black arrows point to the "How to Navigate", "Marble City PHARMACY", and "Upload Data To medAmigo" items, each accompanied by a text instruction.

How to Navigate This Site
[Click here to watch the video of how to navigate this site!]

Financial
Contact Us
Help
How to Navigate
Marble City PHARMACY
Upload Data To medAmigo

Please click here to re-watch the website navigation video

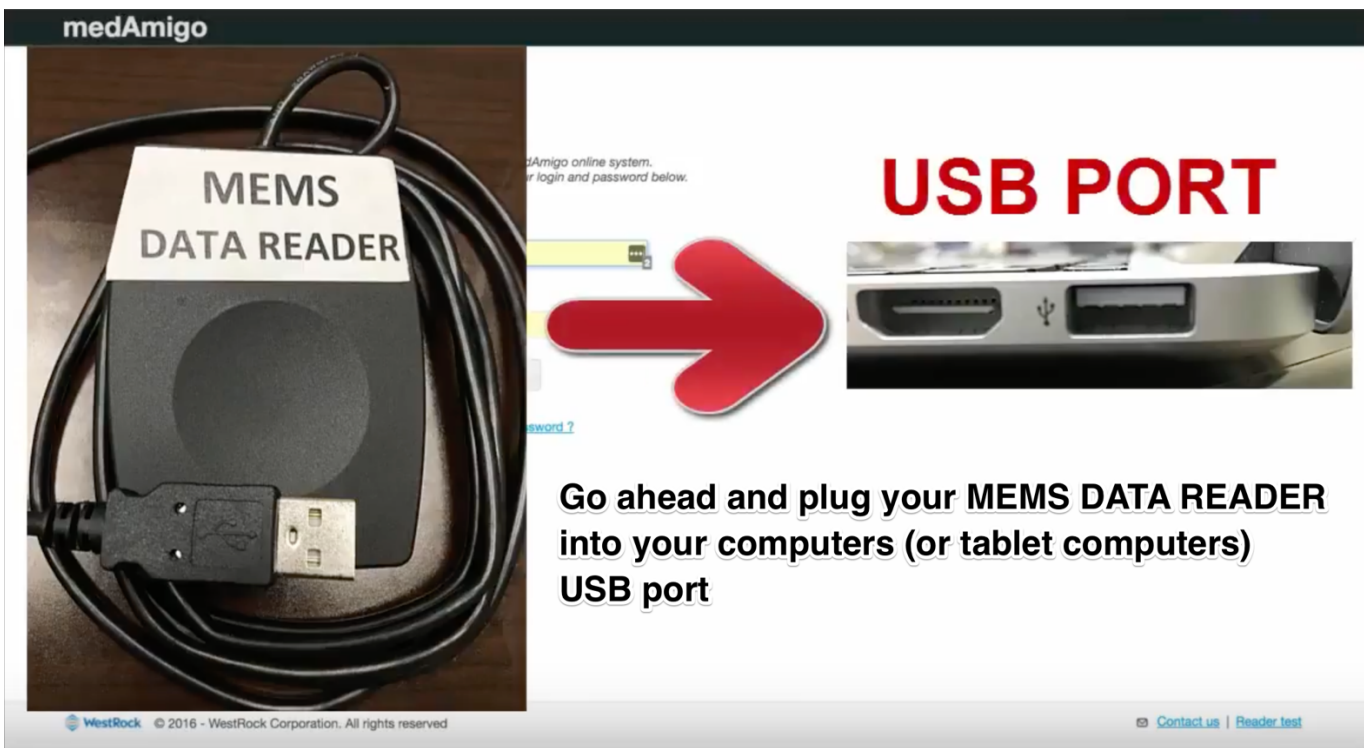
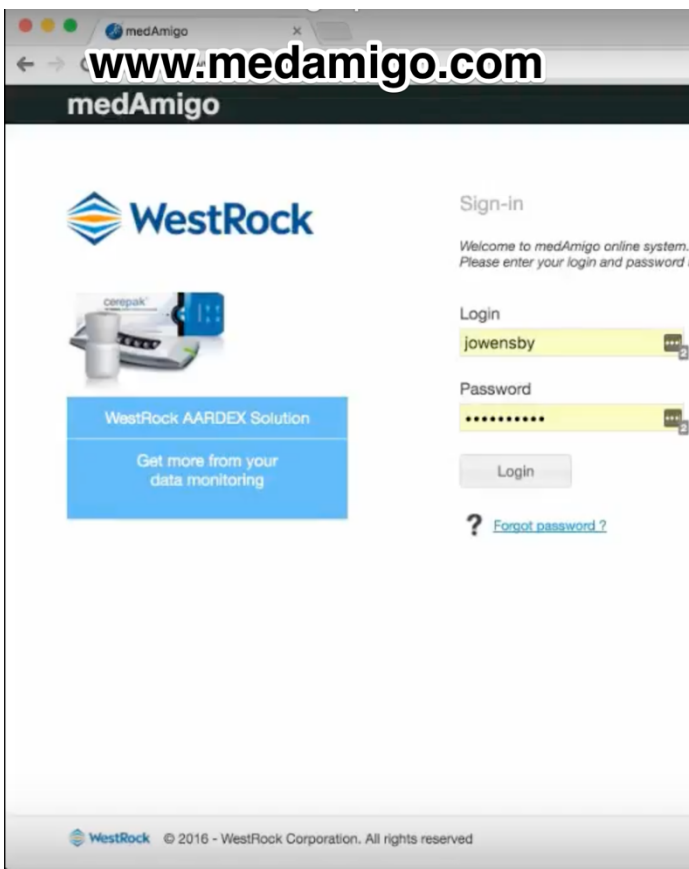
Please click here to visit the Marble City Pharmacy homepage

Please click here to visit the medAmigo platform. Here you may upload your data or change your password.

When you are finished using the study website you may logout by clicking the icon in the upper right corner.

Appendix C9: Enrollment Materials
How to upload your data to the medAmigo platform

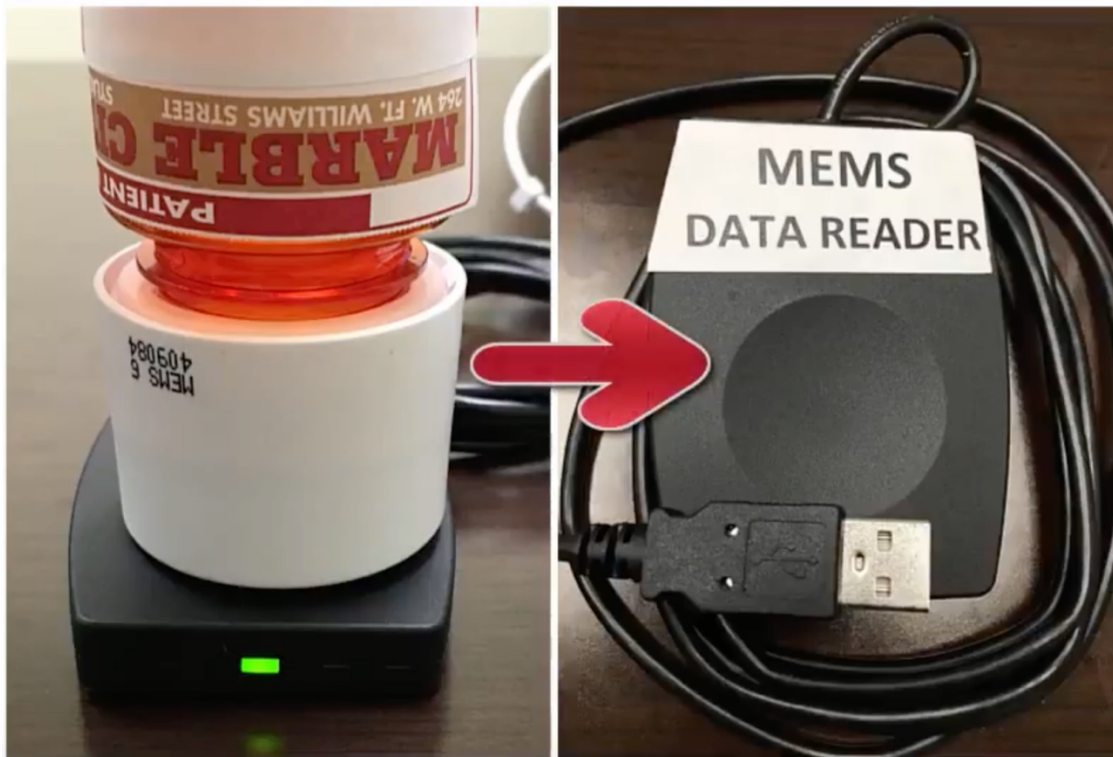
Before we begin you will need the following: Google Chrome web browser, username & password, MEMS data reader, and MEMS vial. Once you have all of those you may begin by navigating to the medAmigo website – www.medamigo.com - and logging in



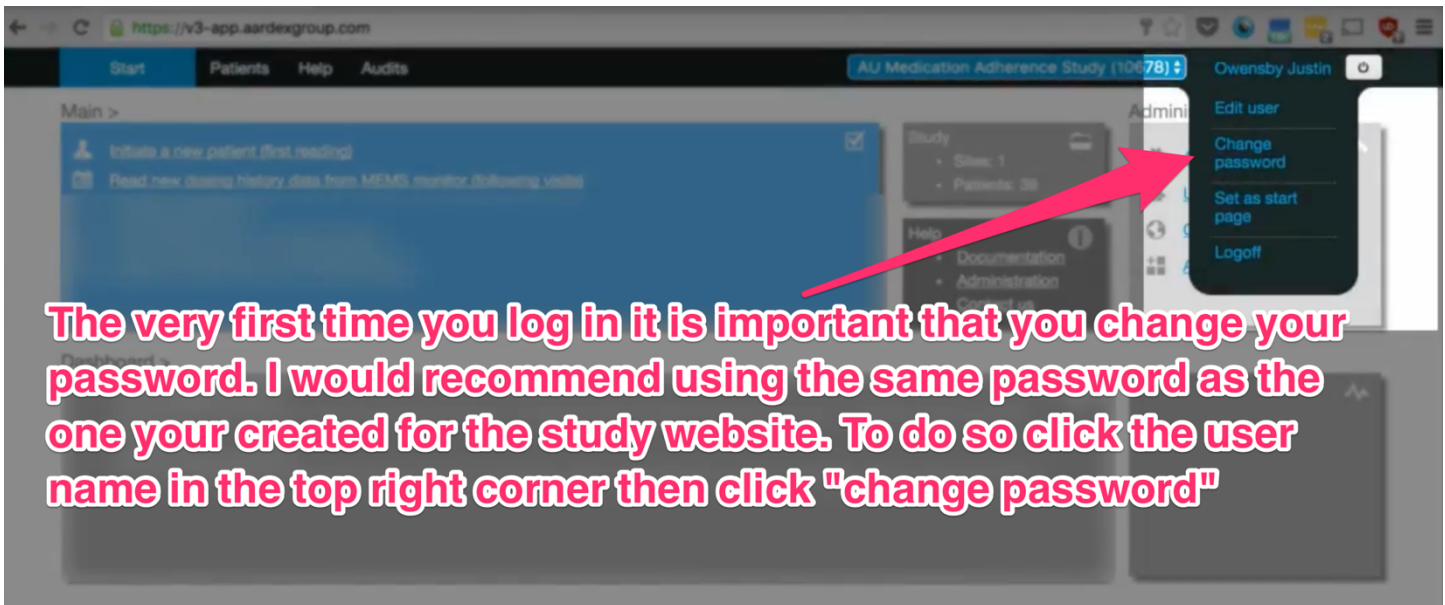
Once plugged in you will see a steady green light on the front of the MEMS data reader



Next, take you MEMS vial, turn it upside down (like you see below), then place it on top of the MEMS data reader. It should sit smoothly on top of the circular groove.



Logging into the medAmigo platform for the first time – PLEASE CHANGE YOUR PASSWORD. I recommend using the same password as the one you created for the study website.



Passwords must contain...

Change your password

Use the form below to change the password.
New passwords are required to be a minimum of 6 characters in length.

Change password : jowensby

Old password

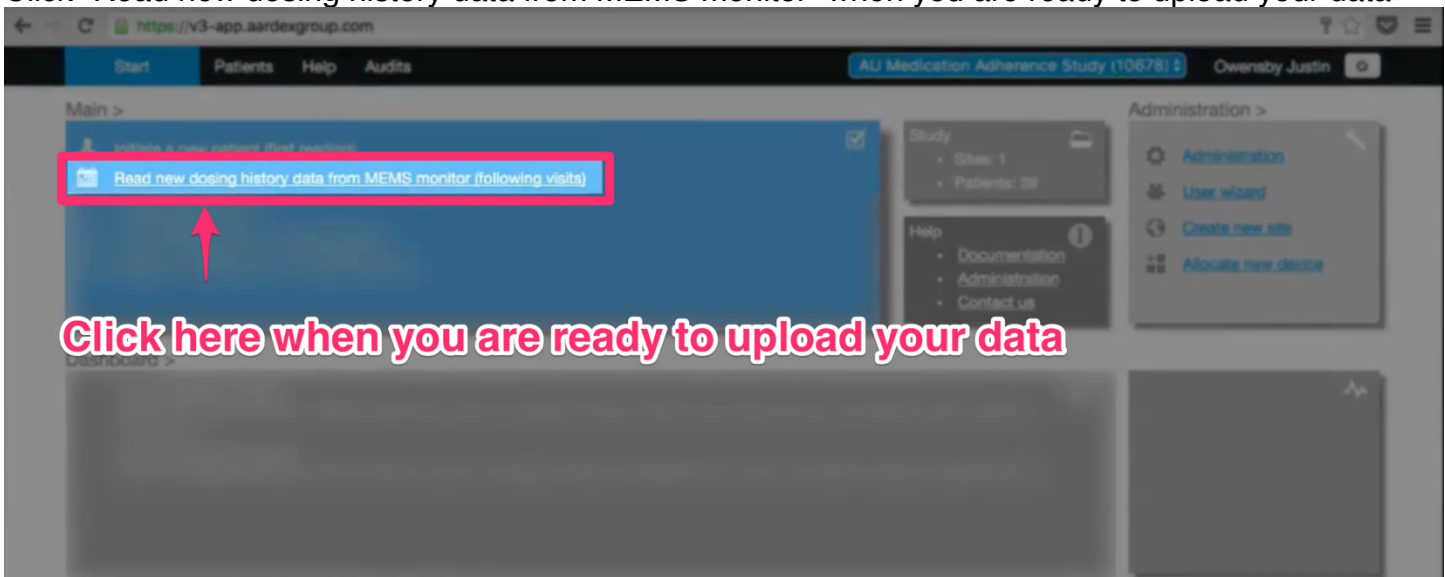
New password

Password confirm

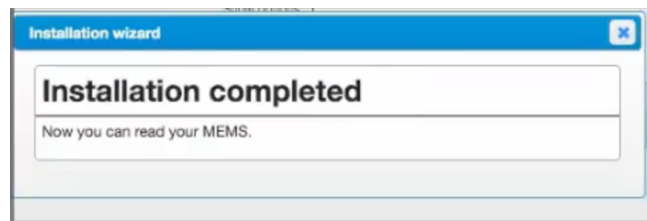
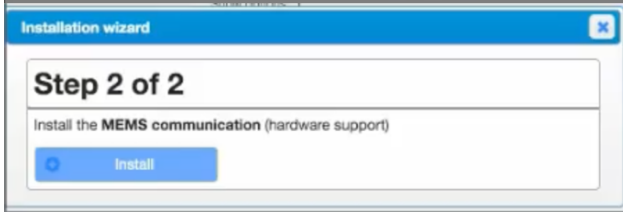
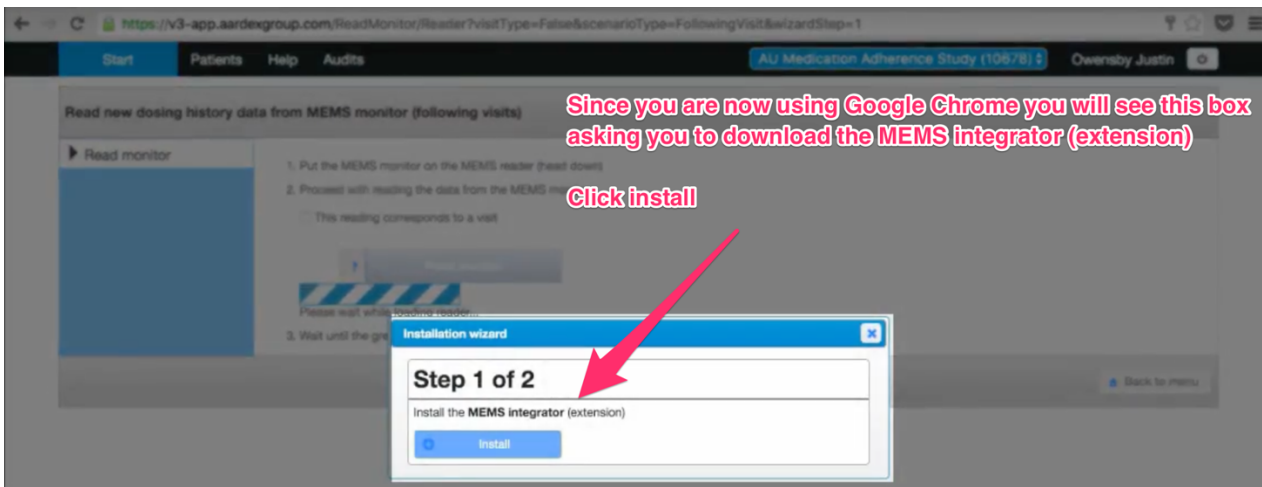
[Update user password](#)

6-15 characters, letters, numbers, or special characters
At least 1 capital letter
At least 1 number

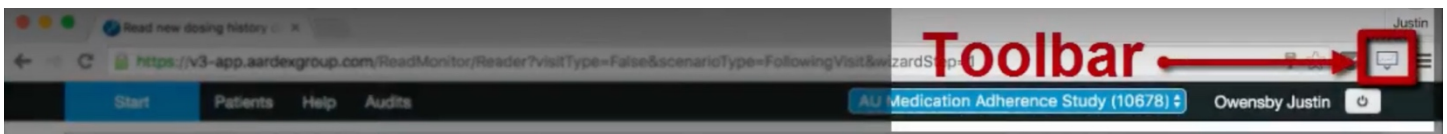
Click "Read new dosing history data from MEMS monitor" when you are ready to upload your data



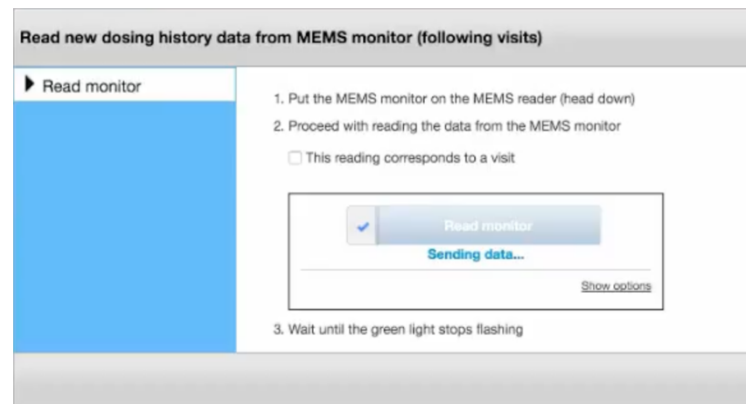
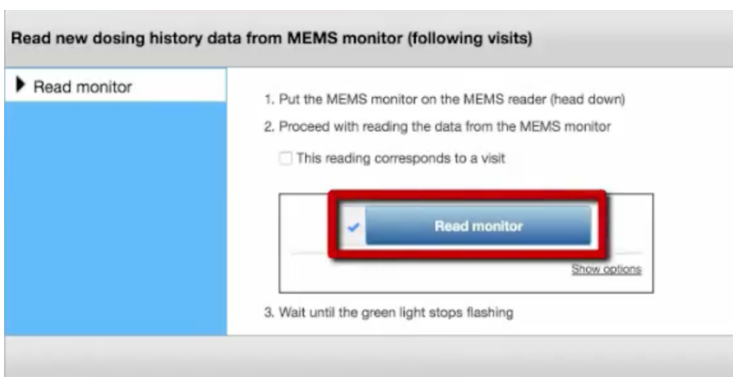
Using Google Chrome you will see this install box. Please click "install" and follow the prompts



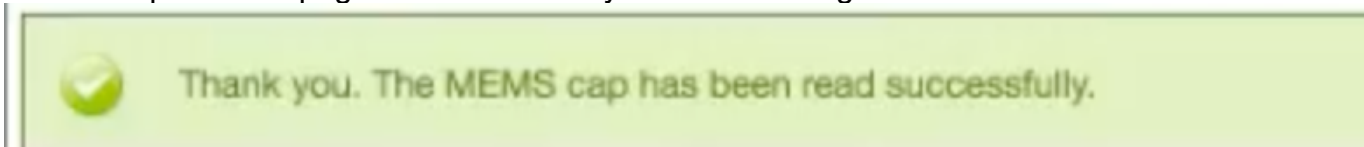
Once completed, notice the new icon in your toolbar. This is the MEMS integrator extension and we will return to this momentarily



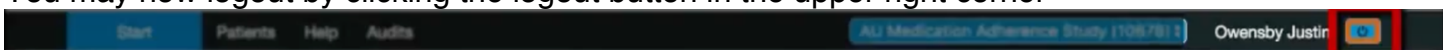
Next, click the blue “read monitor” button and watch the prompts



Once completed the page will refresh and you will see this green box

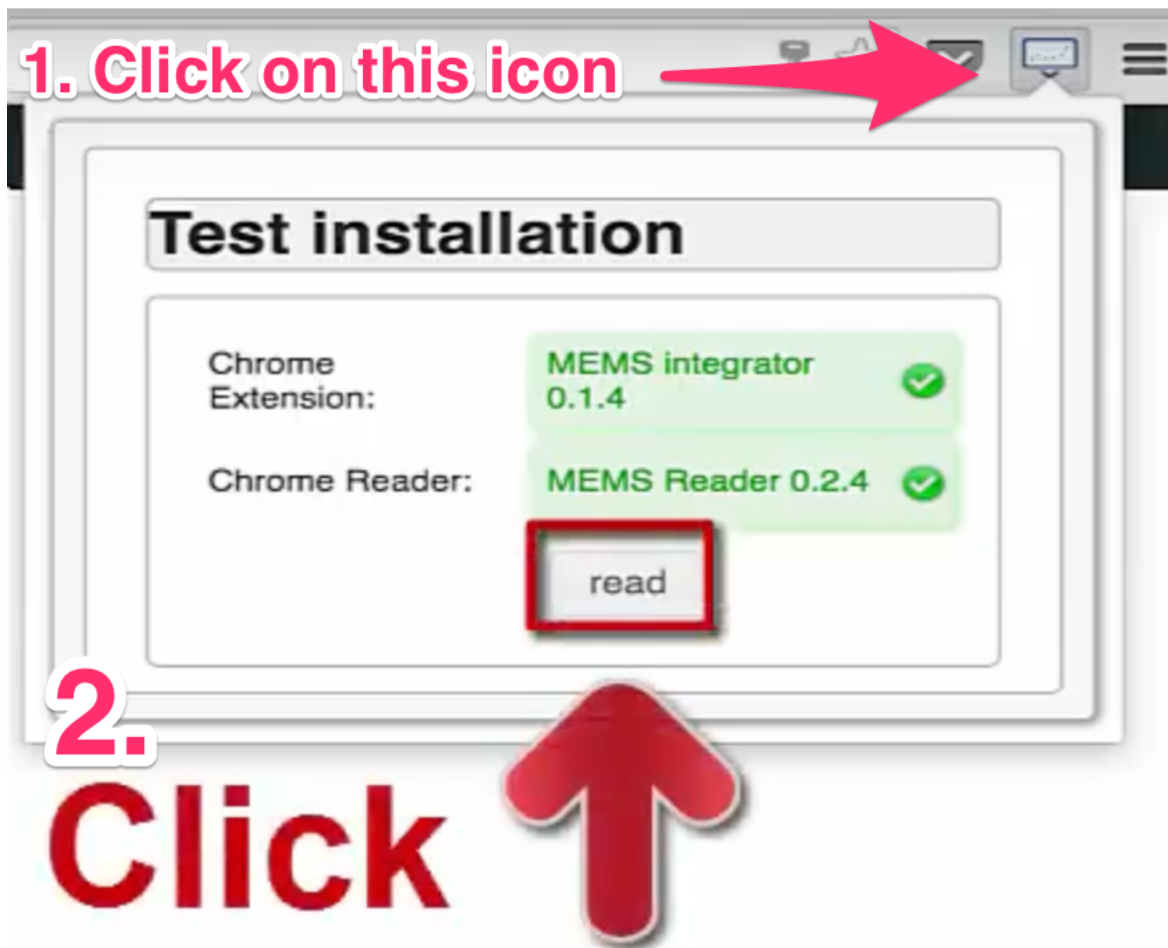
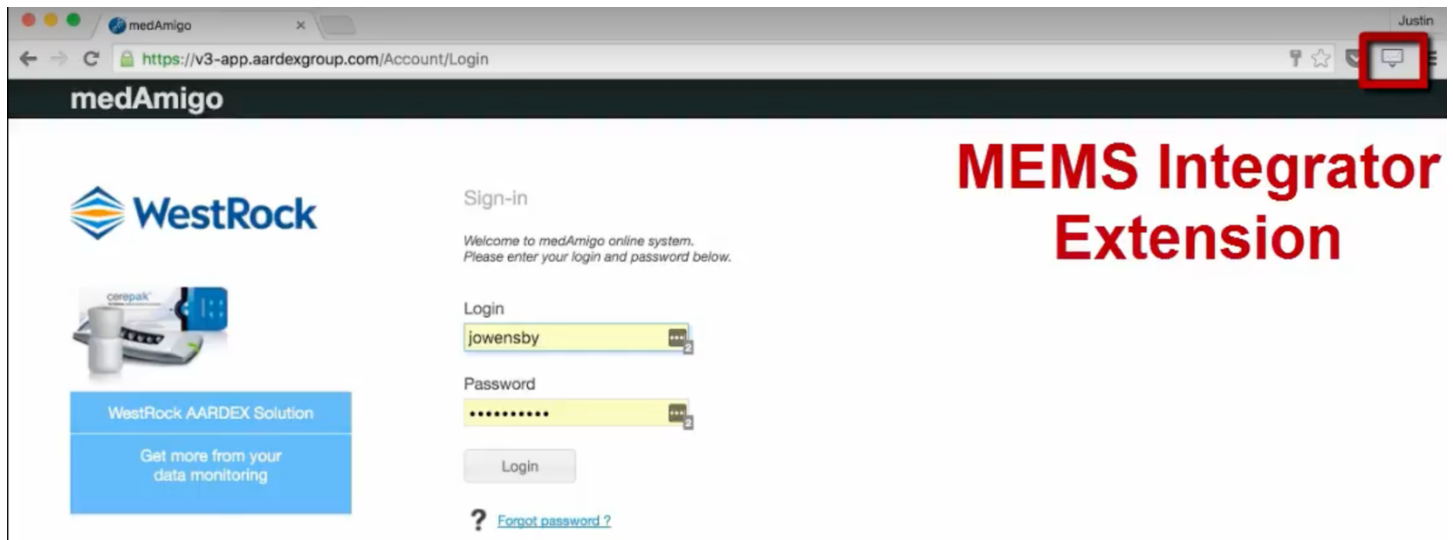


You may now logout by clicking the logout button in the upper right corner

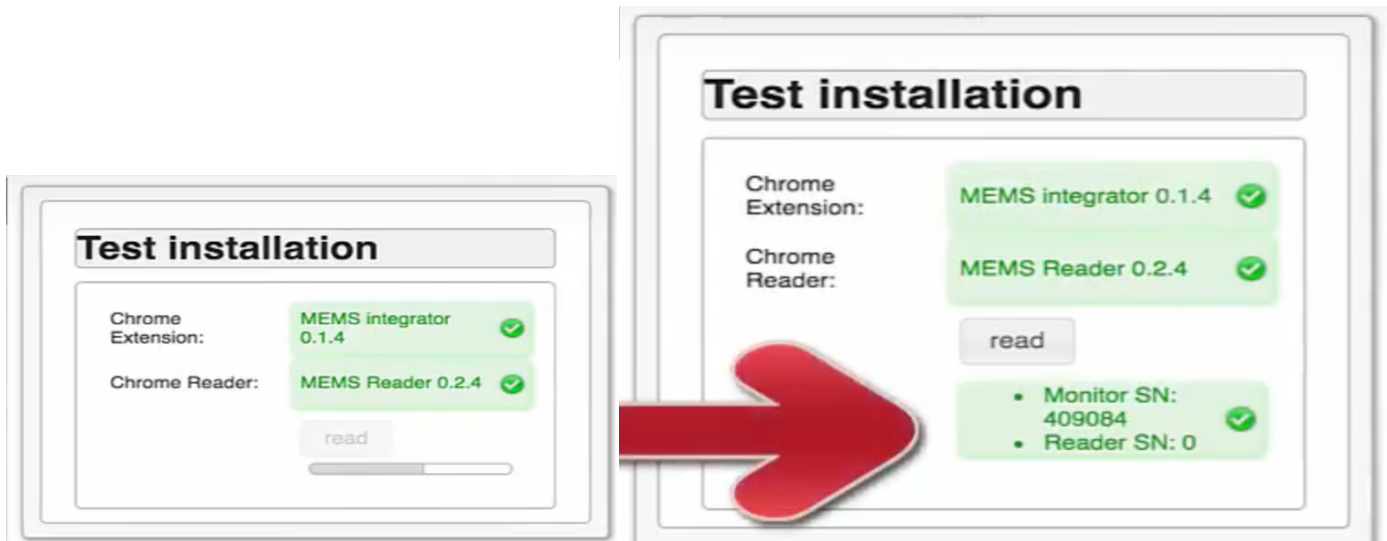


MEMS Integrator Extension

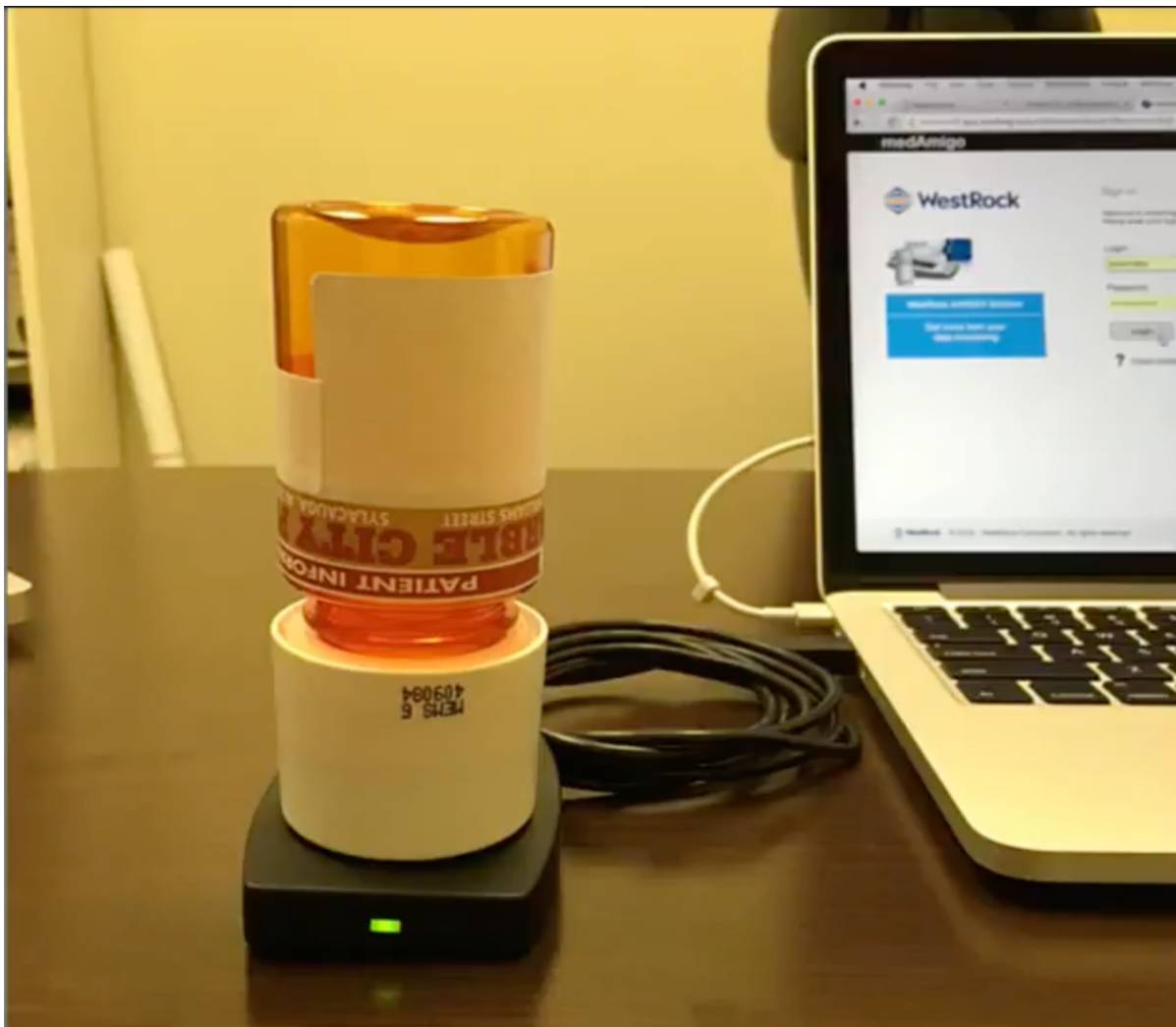
This will now be located in your toolbar. Since you have logged into medAmigo for the first time, changed your password, and installed the MEMS Integrator extension you can upload your data with just TWO CLICKS!



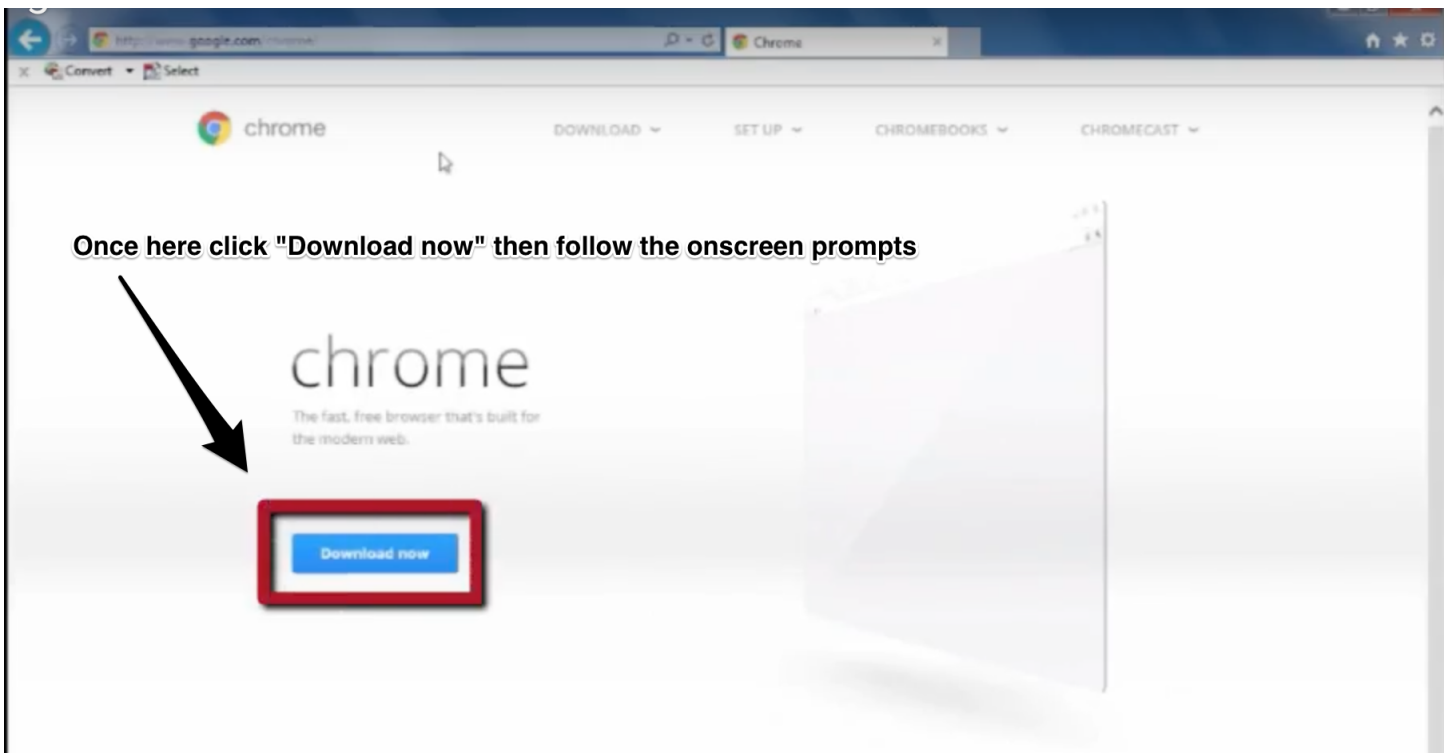
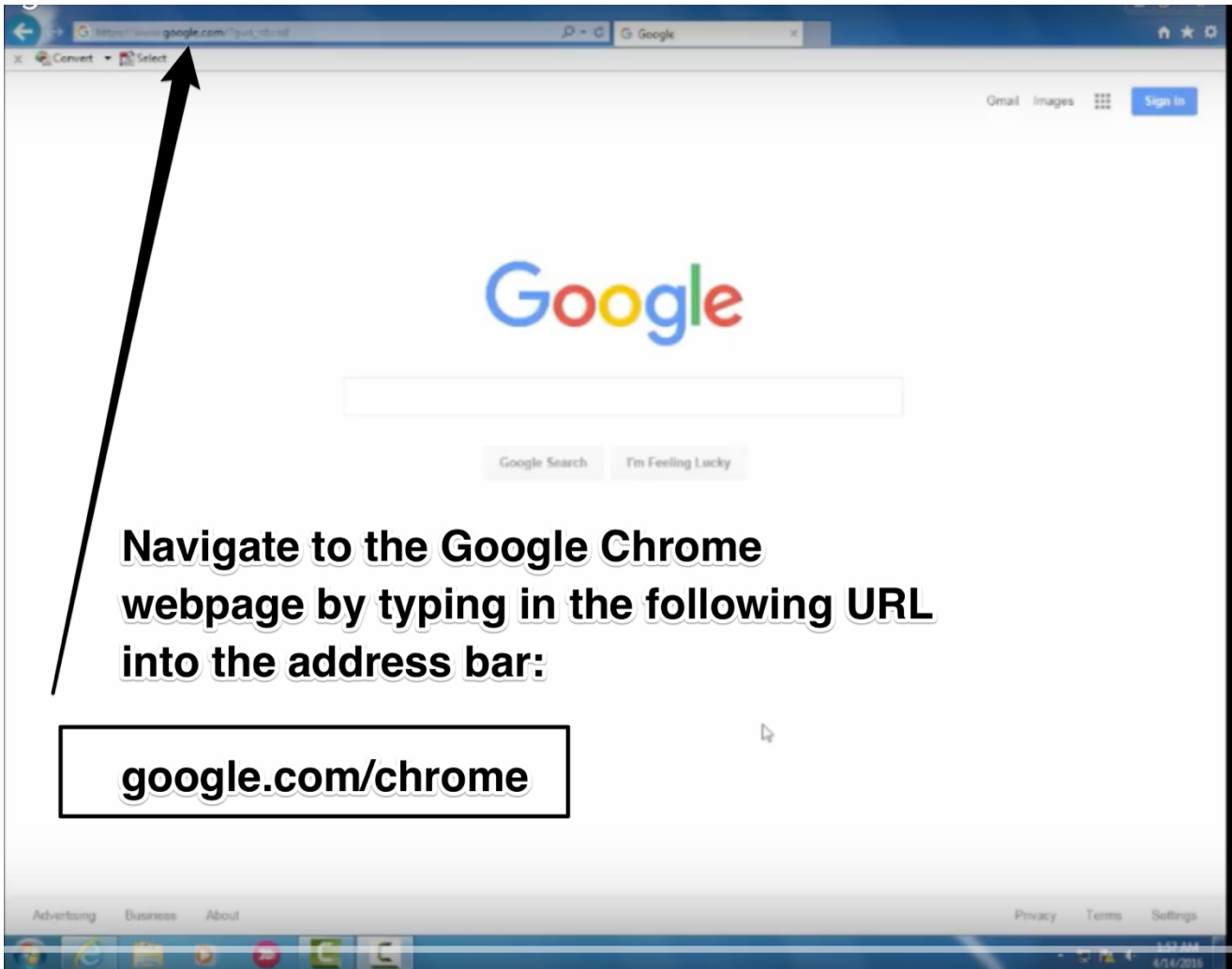
After clicking read you will see a data upload bar. Once complete you will see another green box indicating your data was successfully uploaded.

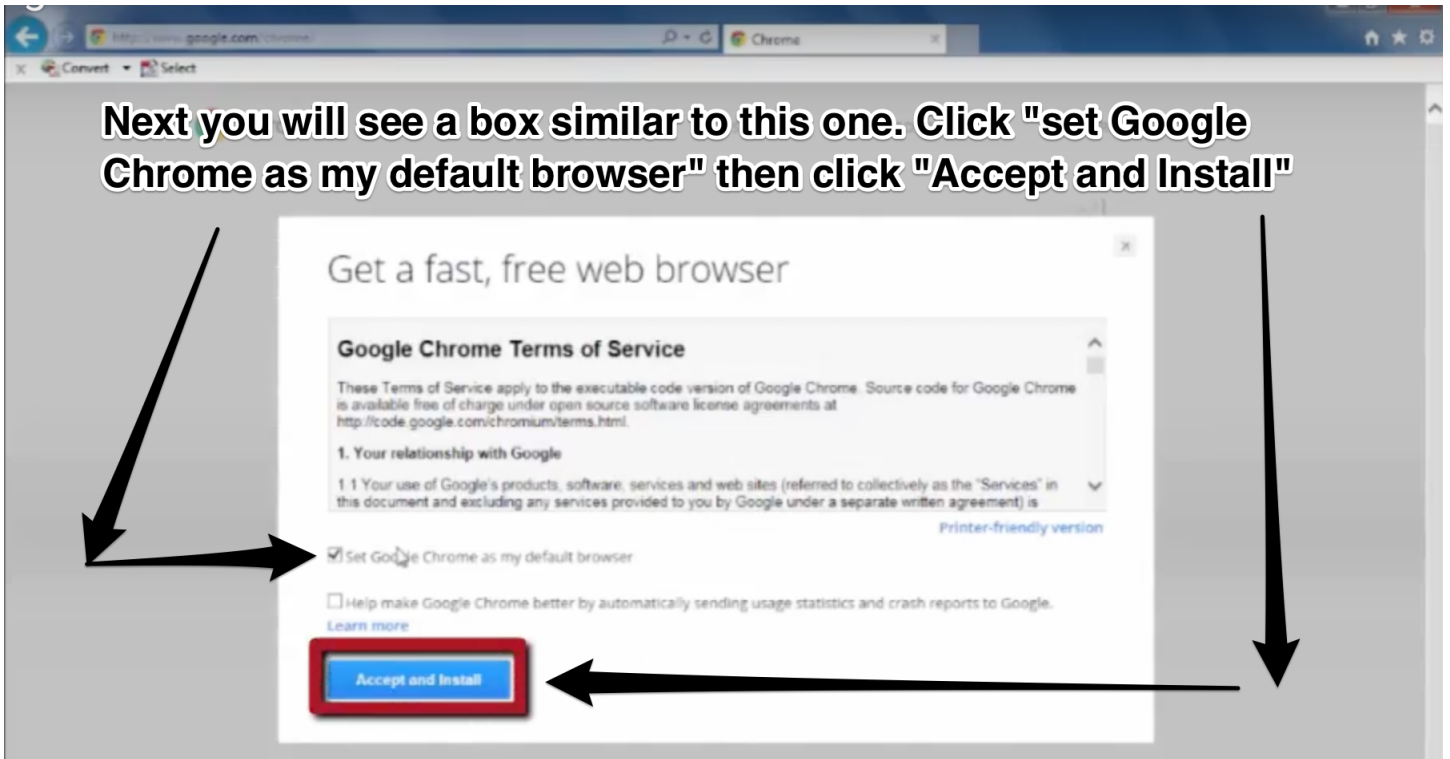


That's it! Just remember that before you use the MEMS Integrator extension you will need to have your MEMS data reader and MEMS vial set up like so:

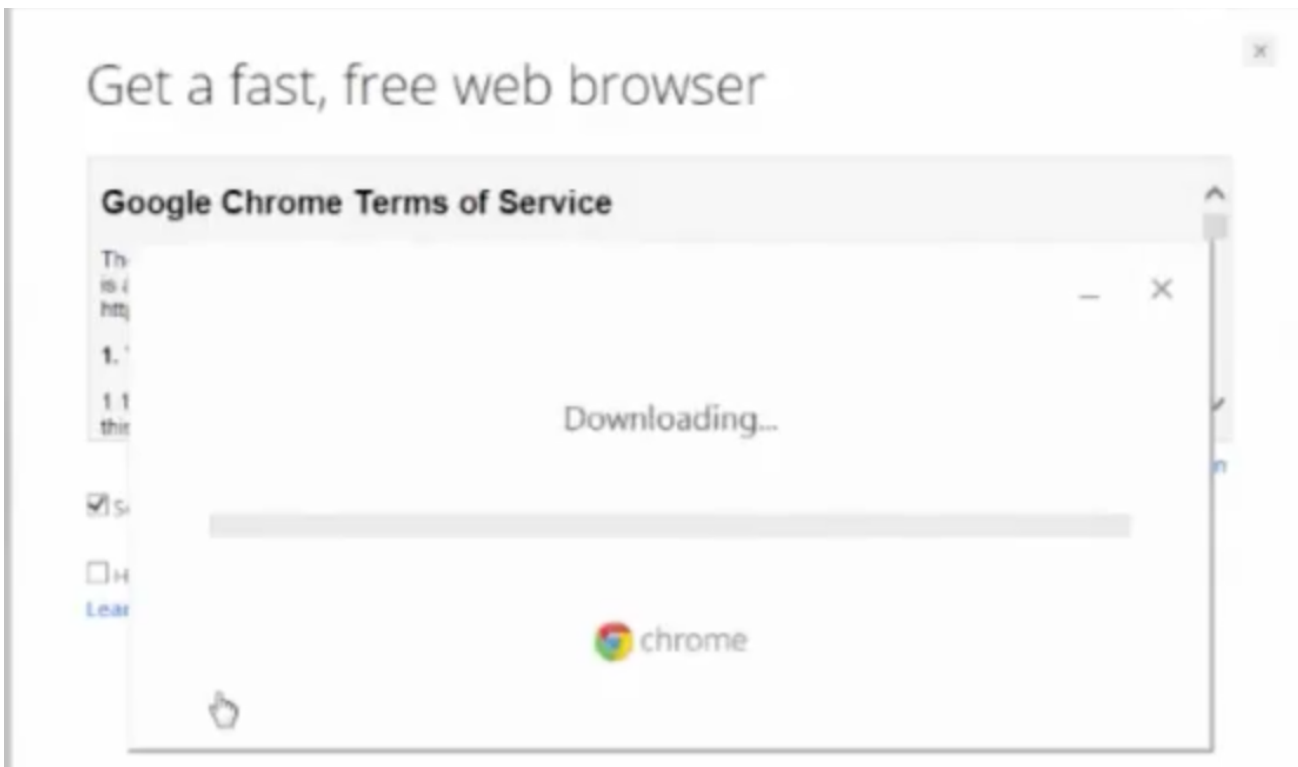


**Appendix C10: Enrollment Materials How to
download Google Chrome**

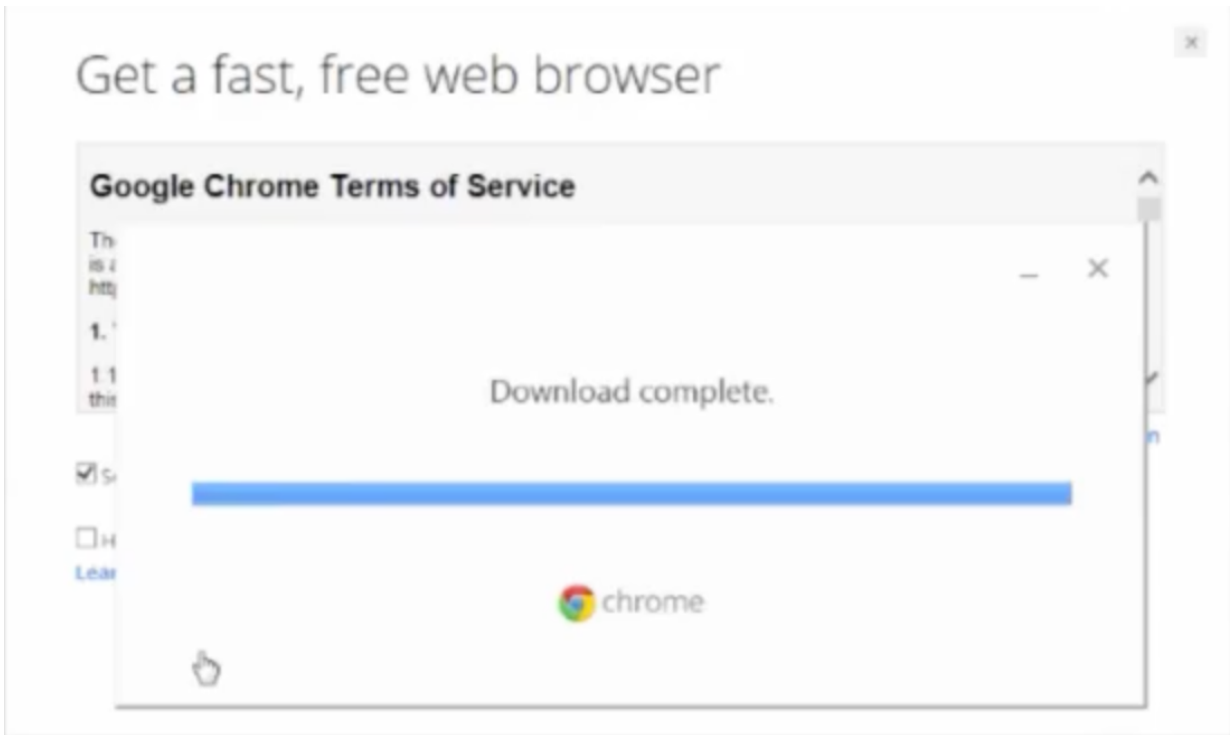




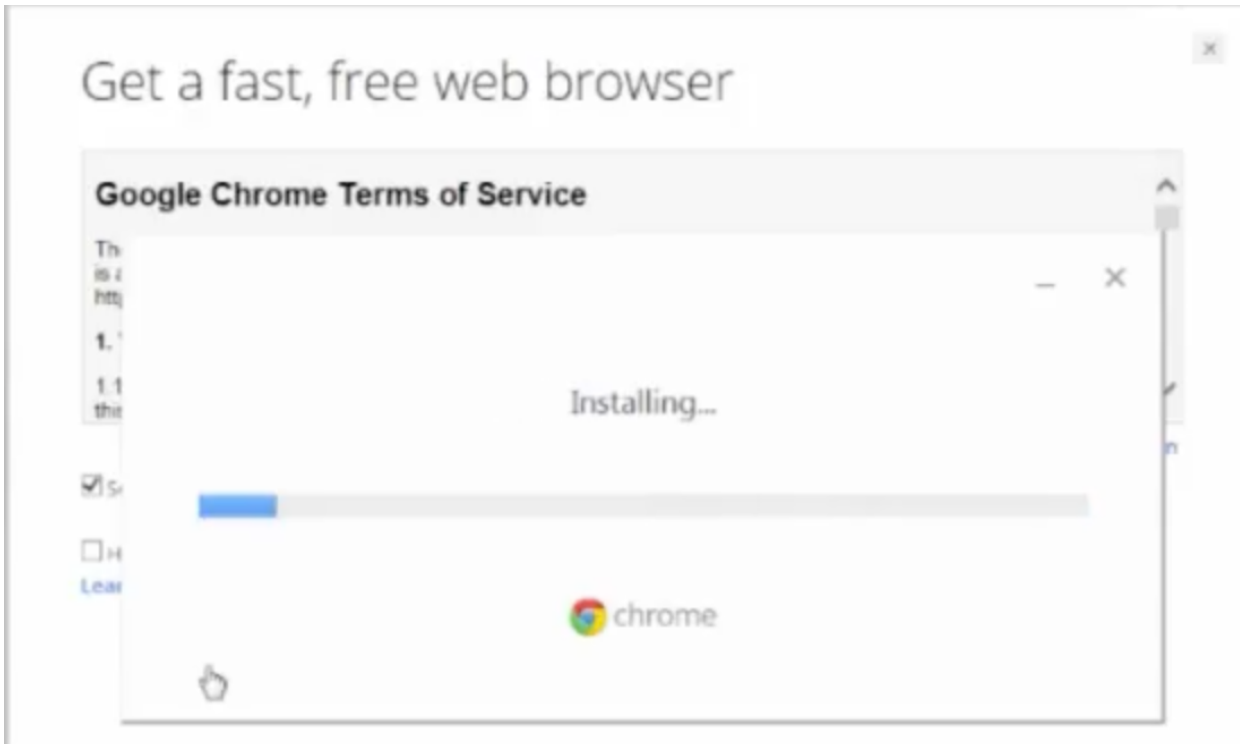
NEXT, simply allow google chrome to download and install. Follow the onscreen prompts.



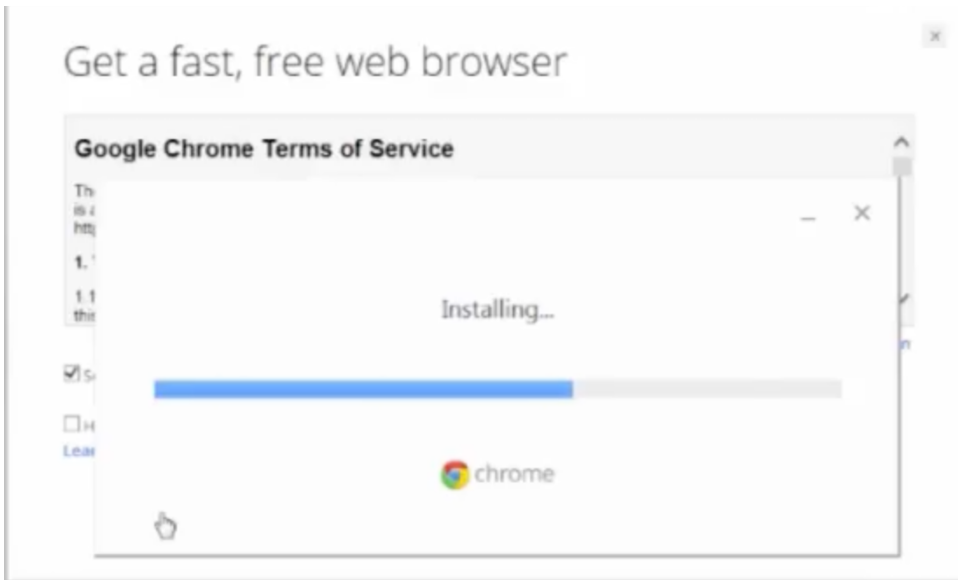
DOWNLOAD COMPLETE. NEXT IT WILL INSTALL



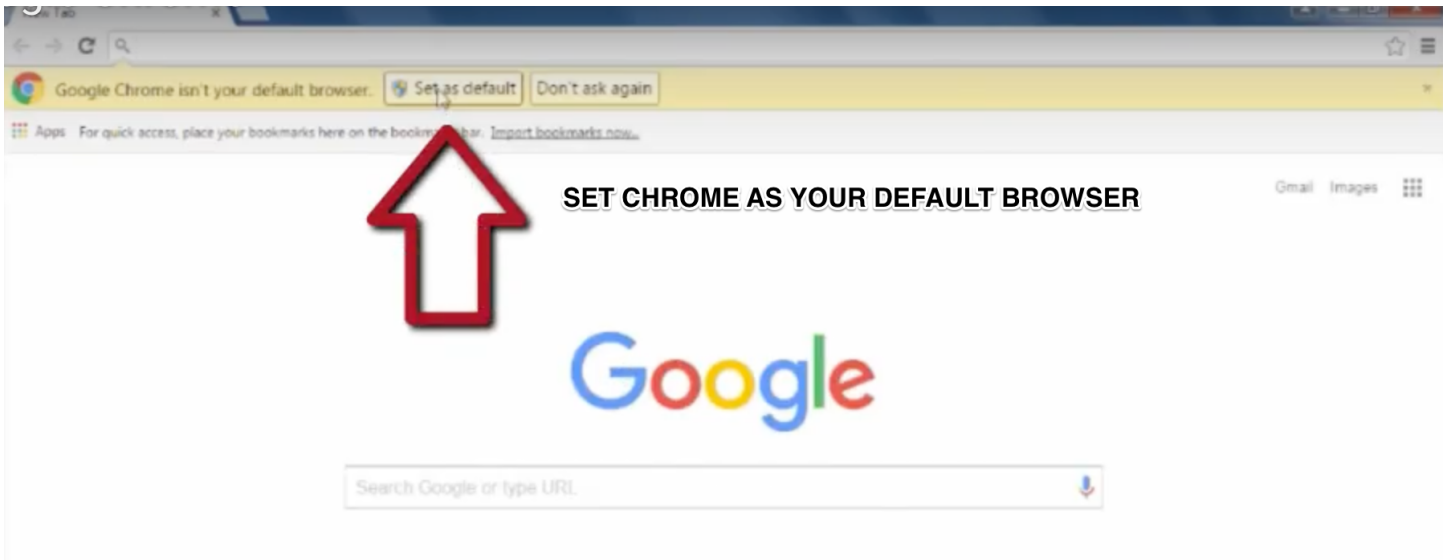
INSTALLING...



INSTALL COMPLETE



REMEMBER TO SET GOOGLE CHROME AS YOUR DEFAULT BROWSER



Appendix C11: Enrollment Materials

Enrollment Video Scripts

Informed consent script

Intro (housekeeping)

- Hello. My name is Justin Owensby and I am a Pharmacist who is currently a graduate student at the Harrison School of Pharmacy at Auburn University.
- I would like to begin by saying thank you for expressing interest in joining my research study.
- During this video I will spend a few minutes talking about the details of the study.
- After that, if you decide you still want to participate then I'll have you to sign the necessary paperwork, get some info from you, train you,
- Then we'll wrap up and can you get your medication.
- Before we begin, you should have a copy of the informed consent form in front of you.
- Please follow along as I go over the details.
- Also, if at anytime you have a question or need further explanation on anything that I go over, please hit the pause button and locate a pharmacy team member. Let's begin...

Intro (informed consent)

- As you know, **you are invited to participate in a research study**
- That's looking at different methods of encouraging patients to taking their medication and how effective those methods are.
- The study is being conducted by me, Dr. Justin Owensby, and it is under the direction of my advisor Dr. Kimberly Garza (she's a pharmacist too and also an assistant professor at the pharmacy school at AU).
- You have been selected as a possible participant
- This is because you are currently taking a medication for either high blood pressure or high cholesterol
- From Marble City Pharmacy and you are 19 years of age or older.
- Also, in order to be in the study you must administer your own medications, meaning you don't rely on someone else to help you ingest your medications
- You must be able to speak and understand English, but its seems that you have that one covered
- You must have access to an email account that you can check at least once per week
- AND you must have access to a computer or a tablet computer that has Internet access.
- Just a heads up, if you plan to use a tablet computer then it must have a USB port.
- To be clear, on the left is a picture of 2 USB connectors and on the right is a picture of a USB receptacle...so if your tablet computer uses these then it will be ok for this study!
- This is important because, if you are selected into one of the incentive groups, this is how you will upload your data to our database.

What will be involved if you participate?

- If you decide to participate in this research study, you will receive either your blood pressure or cholesterol medication in a special electronic pill bottle, called a MEMS vial,
- When opened, the MEMS vial will record the date and time you take each dose of your medication.
- You will take your medication just as you normally would. Please refrain from using pillboxes or other similar dispensers for this medication during this study.
- If you are assigned to an incentive group you will perform a brief data upload each week
- You will do this using a MEMS data reader and a computer or tablet computer with Internet access. Remember, the tablet computer must contain a USB port.
- You will receive refills in the MEMS vial as necessary, and monitoring will continue for a total of 90 days.
- Once you have completed the 90-day study period, you will return the empty MEMS vial and the MEMS data reader (if applicable) to Marble City Pharmacy.
- Even if you have additional pills leftover please bring your MEMS vial back to the pharmacy with the remaining pills in it.
- Upon doing this we will give you a replacement pill bottle containing your remaining pills.
- In addition, you will complete two online surveys, one you will take today and the other you will take in approximately 90 days.
- I'll be sending you an email reminder of when you need to take the second survey.
- Each survey should take about 10-15 minutes to complete and will contain questions related to medication-taking behavior, past medical history,
- and how important different incentives and types of reward structures are to you.
- If you decide to participate, you will be randomly assigned to one of three different study groups
- A control group that I will refer to as the usual care group,
- A financial incentive group, or a social incentive group.

- **If you are placed into the usual care group** you will receive your medication in the special MEMS vial and will continue to take your medication for 90 days as you normally would.
- Those placed into this group will not need to upload their data – we will do it for you once you have returned the MEMS vial back to MCP.

- If you are placed into one of the 2 incentives groups you will receive a MEMS data reader and will upload your data once a week to our database.
- You will do this using either a computer or a tablet computer (that has a USB port) that can access the Internet.

- **If you are placed into the financial incentive group** you will receive opportunities to earn cash prizes for taking your medication as prescribed by your healthcare provider.
- At the beginning of the study you will sign a pledge to take your medication everyday as prescribed by your healthcare provider.

- Upon doing so, you will be given a virtual account containing \$90
- For each day that you miss one or more doses of your medication, your account will be decreased by \$1.
- You'll know this by receiving an email each week that contains a report stating how many days in the past week you took your medication as prescribed by your healthcare provider.
- This weekly email report will state the balance remaining in your virtual account.
- You will also have access to see your current virtual account balance at the study website.
- If you are assigned to this group, you will receive any money you make over the course of the study period in the form of a cash payout at the completion of the 90-day study period
- At that point in time, you must fill out the appropriate paperwork to have the money deposited into your personal banking account.
- In order to claim the money from your virtual account, you must complete all study requirements, including
- Weekly data downloads, completion of the 2 online surveys,
- And you must return the MEMS vial and MEMS data reader to Marble City Pharmacy at the end of the study.

- **If you are placed into the social incentive group**, you will become part of a small online community within MCP
- And will be granted special access to our study website.
- Here, you can view illustrations of your medication-taking behaviors and view those of your online community members as well
- Now, for privacy's sake, we are going to keep your identity anonymous
- We will do this by assigning you a unique identification number and allowing you to choose an avatar as a representation of yourself.
- The avatar you choose, like the ones you are seeing now, will be used to represent your place within the MCP online community.
- There will also be a weekly leader board to allow you to see your place within this online community
- The study website will be updated each week and you will receive weekly email reminders of when updates occur.
- In this group, you will also sign a pledge to take your medication every day as prescribed by your healthcare provider.

- So, whichever group you are placed into, **your total time commitment will be approximately 60 minutes** for the enrollment process today and completion of both online surveys.
- An additional 5 minutes per week will be required from those assigned to an incentive group to perform weekly data uploads.
- Otherwise, you will continue taking your medication just as you normally would over the 90-day study period.

Are there any risks or discomforts?

- The risks for participating are minimal and may include inconvenience due to the required use of the MEMS vial

- (Especially since you can't place your pills into another bottle or use a pillbox)
- Another risk is a possible breach of confidentiality – but we minimize these risks by using unique logins that we give you to link your data from the surveys you do to the data we collect in the MEMS vial –
- You will be assigned a unique ID and you will use this to enter into your surveys.
- So, your name and contact information will be stored completely separate from this information
- The only person who will have your contact information AND your data from taking your medications and surveys will be ME.
- If you have any questions regarding this, please pause the video and locate a pharmacy team member or you may contact me directly.

Are there any benefits to yourself or others?

- If you participate in this study, you can expect to improve your awareness of adherence problems (or problems taking your medications)
- And it may improve the way you take your medication.
- If you are in the financial incentive group you may be able to receive cash incentives for adherence at the end of the study.
- Please note, I cannot promise you that you will receive any or all of the benefits described.

Will you receive compensation for participating?

- Yes you will receive compensation for participation in this study.
- All participants who complete the enrollment process which includes
- Consenting to join this study,
- Watching the brief training/tutorial videos,
- And completing the online survey today
- Will receive a \$10 gift card at the end of enrollment.
- In addition, those who complete all requirements of the study
- And return the MEMS equipment to Marble City Pharmacy at the end of the study
- Will receive an additional \$10 gift card
- AND qualify for cash drawings for a chance to win one of four \$50 gift cards. Chances of winning are 1 in 15.

Are there any costs?

- There are no additional costs to participate – so if you decide to join, any charges you normally incur when getting your prescription filled will still apply, but use of the special MEMS vial is completely free.
- The most important thing to remember is that this research study is voluntary.
- If you choose to enroll, but then **change your mind about participating**, you may withdraw at any time during the study. In doing so, your data can be withdrawn as long as it's identifiable.
- Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, our department - the Department of Health Outcomes Research and Policy, the Harrison School of Pharmacy, or Marble City Pharmacy in any way.

- **Your privacy will be protected.** Rest assured that any information we obtain will remain confidential.
- We may present this information in a professional journal or at professional meetings but will never link that information with your personal information.
- **If you have questions about this study or about your rights as a research participant,** *please press pause and ask them now or you may contact me directly.*
- **Once again, I really appreciate your time and expressed interest in my study.**
- If you don't have any questions OR once your questions have been answered **YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH STUDY. YOUR SIGNATURE on the informed consent form INDICATES YOUR WILLINGNESS TO PARTICIPATE.**
- **Please follow the upcoming on screen prompts for instructions on what to do next.**

Explanation of Usual Care Group + How to Use MEMS Script

- Congratulations – you have been selected into the Usual Care group!
- Over the next few minutes I will go over your role and explain the necessary study requirements.
- If at anytime you have a question or need further explanation on anything, please hit the pause button and locate a pharmacy team member.
- As a member of the UC group, you have a very important role to play. This group serves as the standard from which we will compare the other two groups to see if either incentive has an effect.
- That said, over the next 90 days, you will be taking your medication as prescribed by removing the appropriate number of pills
- From the special MEMS vial that you will receive at the end of enrollment today.
- You will take your medication just as you normally would. Please refrain from using pillboxes or other similar dispensers for this medication during this study.

Using the MEMS vial

- When it is time to take your medication simply press down and then turn the MEMS cap counter-clockwise to remove it from the vial.
- Remove the appropriate number of pills and promptly return the MEMS cap by turning clockwise.
- Each time you open and close the MEMS vial, it registers the date and time of the opening.
- By doing this, the MEMS vial will keep track of the doses you take.
- It will also communicate that information back to us when you return the MEMS vial to the pharmacy for either your refill or at the end of the study.
- [Please be aware that] As the data recorded by the MEMS vial are intended to reflect your medication taking behaviors
- It is very important to not open the MEMS vial unnecessarily... doing so may misrepresent you and your data.
- Also, please do not immerse the MEMS vial in any liquid
- Please do not clean it with detergent or alcohol.
- If your MEMS vial gets dirty you may wipe the exterior with a slightly damp cloth.

Study Requirements

- To complete all study requirements (and therefore be eligible for the gift card and cash drawings at the end of the study),
- You must complete two online surveys – one will be completed today and the other will be emailed to you in approximately 90 days -,
- Receive refills in the MEMS vial as necessary,
- And return the MEMS vial to the pharmacy at the end of the 90-day period.
- Even if you have additional pills leftover please bring your MEMS vial back to the pharmacy with the remaining pills in it.
- Upon doing this we will give you a replacement pill bottle containing your remaining pills.
- This will conclude your participation in the study.
- Please keep in mind that you will have access to all of the videos and training materials that we go over today at our study website.
- Be looking for an email from me later today.

How to Navigate Study Website – UC

- In this video I will be walking you through how to navigate the study website.
- To access the study website, you may either click on the link provided for you in the welcome email or you may type in the URL into the address bar.
 - CWS.auburn.edu/medicationadherence
- To login, click the 'login' button located in the upper right hand corner.
- Next, type in your user name and password. Your user name is the email address that you used when you signed up during enrollment.
- Once completed, click the green login button and you will be directed to your **user information page**.
- In the top left corner, you will see the profile icon that was generated for you. In the center of this page you will see a card that displays the date you began this study and the medication you are taking for this study.
- On the left hand side below your profile icon, you will see 5 different pages that you can access and we will briefly go through each one.
- **[User info]** The first page '**user info**' is the current page we are on and is also your homepage.
- **[Contact Us]** Below that is the '**contact us**' page. If you have any questions, comments, or suggestions about the website or anything else you want us to know you may put that information here and I will get back to you as soon as possible.
- **[Help]** The next page is the '**help**' page. Here you may access all of the training videos and materials that you viewed during the enrollment session. Once clicked, each video or document will open in a new tab (like so). To return to the study website you may either click on the previous tab or you may close the newly opened tab (like so).
- The next page '**how to navigate**' will give you access to this video so that you may re-watch how to navigate the study website.
- The last page is a direct link to the **Marble City Pharmacy** website. Simply click on the logo and you will be directed to their homepage.
- To return to the study website you may either click on the previous tab or you may close the newly opened tab (like so). When you are finished using the study website you may logout by clicking the logout button in the upper right corner.
- This concludes the study website navigation video. Thank you for your time!

Thank you video

- Thank you for choosing to participate in my research study. I am grateful for your support and valuable time that you have offered today.
- This concludes the enrollment process and you are now free to pick-up your medication in the MEMS vial at the pharmacy counter.
- To compensate you for your time, you will be receiving a gift card today when you pick-up your medication.
- Lastly, please be on the lookout later today for a welcome email with the following subject:

Subject: MCP Medication Adherence Study - Welcome!

- If you do not see the welcome email in your inbox, please be sure to check your spam filters.
- If you have not received the welcome email by tomorrow morning please contact me or MCP team member.
- Once again thank you for your time. Have a great day.

Explanation of Financial Incentive Group

- Congratulations – you have been selected into the Financial Incentive group!
- Over the next few minutes I will go over your role and explain the necessary requirements for the study.
- If at anytime you have a question or need further explanation on anything, please hit the pause button and locate a pharmacy team member.
- Also, you will have access to all of the videos and information we are discussing today at the study website. I will be emailing you a link later today.

OK, lets begin.

- Here is the short version of how this group works – Today I will be giving you \$90 into a virtual account in exchange for the promise that you will take your medication everyday for the 90-day study period
- But here is the catch – for everyday that you miss taking your medication you will lose \$1. Ok let me explain the details...
- **Your goal** for this 90-day study period is to take your medication everyday as prescribed by your healthcare provider.
- You will begin this study with a virtual account that contains \$90.
- Each Thursday, you will receive an emailed report stating how many days in the past week you took your medication as prescribed by your healthcare provider.
- For each day that you miss one or more doses of your medication, you will lose \$1 from your virtual account balance.
- For this study, each day will begin at 0300am and will end 24 hours later at 0259am.
- This is to accommodate those who may work late night shifts or simply go to bed past midnight.
- This way, you won't be punished if you take your medication before you go to bed and that time happens to be past midnight.
- Coming back to the weekly emailed report - this report will state the balance remaining in your virtual account.
- You may also check your virtual account balance at the study website.
- At the end of the session today, you will have the opportunity to commit to your medication-taking goal by filling out a commitment contract.
- This pledge will serve as a proclamation of your intention to accomplish your goal
- And it will serve as reminder of what's at stake.

Using the MEMS vial

- When your study period begins and for the following 90 days,
- You will be taking your medication as prescribed by removing the appropriate number of pills from the special MEMS vial that you will receive at the end of enrollment today.
- You will take your medication just as you normally would. However, please refrain from using pillboxes or other similar dispensers for this one medication during this study.

- When it is time to take your medication simply press down and then turn the MEMS cap counter-clockwise to remove it from the vial.
- Remove the appropriate number of pills and promptly return the MEMS cap by turning clockwise.
- Each time you open and close the MEMS vial, it registers the date and time of the opening.
- By doing this, the MEMS vial will keep track of the doses you take and communicate that information back to us when you upload your data every week.

Uploading MEMS Data

- Uploading your data will take less than 5 minutes to do each week and I will walk you through this process in an upcoming video.
- You will do this using a MEMS data reader and a computer or tablet computer with Internet access. Remember, the tablet computer must contain a USB port.
- To be clear, on the left is a picture of 2 USB connectors and on the right is a picture of a USB receptacle...so if your tablet computer uses these then it will be ok for this study!
- Using the MEMS data reader (you will receive this after enrollment), you will be uploading your data to our database once a week on MONDAYS.
- Please do this no later than 0300am on Tuesday morning.
- Once again, the 0300am deadline is to accommodate you night owls and late night workers.
- However if you fail to meet this deadline then your progress will be counted as if all doses of your medication were missed for that week
- And your virtual account balance will be decreased by \$7.
- So for all intents and purposes MONDAYS are the days to upload your data.
- As a friendly reminder, I will send you an email every Monday morning.
- Should we have any difficulty in receiving the information that you have uploaded, we will contact you.
- [Please be aware that] As the data recorded by the MEMS vial are intended to reflect your medication taking behaviors
- It is very important to not open the MEMS vial unnecessarily... doing so may misrepresent you and your data.
- Also, please do not immerse the MEMS vial in any liquid
- Please do not clean it with detergent or alcohol.
- If your MEMS vial gets dirty you may wipe the exterior with a slightly damp cloth.

Study Requirements

- To complete all study requirements
- (And therefore be eligible for the gift card and cash drawings at the end of the study),
- You must complete two online surveys – one will be completed today and the other will be emailed to you in approximately 90 days - ,
- Receive your refills in the MEMS vial as necessary,
- And you must return the MEMS vial and MEMS data reader to MCP at the end of your 90-day study period.

- Even if you have additional pills leftover please bring your MEMS vial back to the pharmacy with the remaining pills in it.
- Upon doing this we will give you a replacement pill bottle containing your remaining pills and this will conclude your participation in the study.
- You will receive any remaining balance from your virtual account in the form of a cash pay-out at the completion of the 90-day study period
- And you must fill out the appropriate paperwork to have the money deposited into your personal banking account.
- Remember, in order to claim the money from your virtual account, you must complete all study requirements and return all MEMS equipment to Marble City Pharmacy.
- In the next video I will show you how to upload your data to our database... thank you for your time and participation.

How to upload MEMS data – medAmigo

- In this video I will explain how to upload your data to the medAmigo platform. Before we begin you will need the following items:
 - Username and password (these will be sent to you in the welcome email after you complete the enrollment session)
 - MEMS Vial
 - MEMS Data Reader (you will receive both of these after the enrollment session)
- To access the medAmigo platform, you may either click on the link provided for you on the study website or you may type in the URL into the address bar.
- Once here you'll need to plug the MEMS data reader into your computer or tablet computer's USB port.
- Once plugged in you will see a steady green light on the front of the MEMS data reader (like this)
- Next - take your MEMS vial, turn it upside down (like this), and place it on top of the MEMS data reader. Make sure to place it directly on top of the circular groove in the center of the data reader.
- Now you may login using the medAmigo username and password that I sent to you in the welcome email. Once completed, click the login button.
- The very first time you login you'll need to change your password. I recommend that you change your medAmigo password to match the password you created for the study website during the enrollment session. You certainly don't have to but if you do then that will be one less password you'll need to keep up with!
- To change your password, click on your user name in the upper right corner. This will display a drop-down menu. Choose "Change Password" and then follow the prompts. Passwords must be between 6 and 15 characters, letters, numbers, or special characters, with at least one capital letter and one number. Once again, I would recommend changing your password to match the password you created for the study website during the enrollment session. When finished, click update password.
- We are now back at the home screen where you may upload your data. To do so click on the link 'read new dosing history data from MEMS monitor'.
- The very first time you do this you may be prompted to install the MEMS integrator extension. If so click install and follow the prompts on the screen.

- Once completed click the blue 'read monitor' button and this will open another box that will show the data upload process.
- Once completed the page will refresh and you will see a green box showing you the data upload was successfully completed.
- You may now logout by clicking the logout button in the upper right corner.
- This concludes the medAmigo data upload video. Thank you for your time!

How to navigate the study website - \$\$\$

- In this video I will be walking you through how to navigate the study website.
- To access the study website, you may either click on the link provided for you in the welcome email or you may type in the URL into the address bar.
 - CWS.auburn.edu/medicationadherence
- To login, click the 'login' button located in the upper right corner.
- Next, type in your user name and password. Your user name is the email address that you used when you signed up during enrollment.
- Once completed, click the green login button and you will be directed to your **homepage**.
- In the top left corner, you will see the profile icon that was generated for you. In the center of this page you will see a card displaying your virtual account balance. Beside that will be another card that displays the date you began this study and another card that displays the medication you are taking for this study.
- On the left side below your profile icon, you will see 6 different pages that you can access and we will briefly go through each one.
- **[Financial]** The first page '**financial**' is the current page we are on and is also your homepage.
- **[Contact Us]** Below that is the '**contact us**' page. If you have any questions, comments, or suggestions about the website or anything else you want us to know you may put that information here and I will get back to you as soon as possible.
- **[Help]** The next page is the '**help**' page. Here you may access all of the training videos and materials that you viewed during the enrollment session. Once clicked, each video or document will open in a new tab (like this). To return to the study website you may either click on the previous tab or you may close the newly opened tab (like so).
- The next page '**how to navigate**' will give you access to this video so that you may re-watch how to navigate the study website.
- The next page is a direct link to the **Marble City Pharmacy** website. Simply click on the logo and you will be directed to their homepage.
- The last page is a direct link to the **medAmigo** website. This is where you will be uploading your data. By clicking here, you will be directed to their homepage where you may login and then upload your data.
- After you have uploaded your data make sure you logout of the medAmigo website by clicking the logout button located in the upper right corner.
- To return to the study website you may either click on the previous tab or you may close the newly opened tab (like so). When you are finished using the study website you may logout by clicking the logout button in the upper right corner.
- This concludes the study website navigation video. Thank you for your time!

Explanation of Social Incentive Group

- Welcome to the **MCP community adherence group!**
- This is the social incentive group and over the next few minutes I will go over your role and explain the necessary requirements for the study.
- If at anytime you have a question or need further explanation on anything, please hit the pause button and locate a pharmacy team member.
- Also, you will have access to all of the videos and information we are discussing today at the study website. I will be emailing you the link later today.

OK lets begin.

- Here is how this group works –You and other study participants have been selected to form a small online community within MCP
 - And have been granted exclusive access to our study website.
 - Here, you can view illustrations of your medication-taking behaviors and view those of your online community members as well.
 - Now, for privacy’s sake, we are going to keep your identity anonymous
 - We will do this by assigning you a unique identification number and allowing you to choose an avatar as a representation of yourself.
 - The avatar you choose, like the ones you are seeing now, will be used to represent your place within the MCP community adherence group.
 - There will also be a weekly leader board to allow you to see your place within this online community
 - Notice the percentages next to the avatars – these numbers will represent how many days of the previous week you have taken your medication as prescribed.
 - To illustrate, by taking your medication everyday you will have achieved 100% adherence for the previous 7 days.
 - However, if you miss 1 day, this will bring you down to 86% adherence for the previous 7 days.
-
- Within this group, you will have an individual medication-taking goal
 - And a community medication-taking goal.
 - Individually your goal is to reach 100% adherence each week by taking your medication everyday as prescribed by your healthcare provider.
 - For every week you accomplish this goal, you will have the opportunity to earn badges that represent your progress over the 90-day study period.
 - The more weeks you accomplish your goal the more opportunities you will have to earn different badges.
 - For your community medication-taking goal, you will have a collective goal of achieving an 80% community medication-taking rate.
 - This is determined by taking the average of everyone’s weekly individual medication-taking rate.
 - If this weekly average is at 80% or higher then a community badge will be unlocked!
 - This is extremely special because it means that everyone in the group is doing their part to achieve this goal.

- That said, your weekly individual adherence plays a very important part in contributing to your groups overall goal.
 - In fact, each week you achieve an individual badge (meaning you reached 100% adherence for the week)
 - You are representing your full support to your group by contributing 100% to the collective community adherence goal!
 - However, each day that you miss one or more doses of your medication, you are showing less support by contributing less to the group...as you can see, the more days that you miss taking your medication the smaller your contribution will be and the harder it will be for your group to reach the community's adherence goal. This is why your weekly individual adherence is very important.
 - Also, keep in mind - as you can see your group member's individual medication-taking behaviors they can also see yours.
 - This information will be updated each week on the study website. Every Thursday, you will receive a weekly email report letting you know that the study website has been updated.
 - On the study website you may check yours and your community's medication adherence rates and see what badges you have earned.
-
- What time will the day begin and end?
 - For this study, each day will begin at 0300am and will end 24 hours later at 0259am.
 - This is to accommodate those who may work late night shifts or simply go to bed past midnight.
 - This way, you won't be punished if you take your medication before you go to bed and that time happens to be past midnight.
-
- At the end of the session today, you will have the opportunity to commit to your medication-taking goal by filling out a commitment contract.
 - This pledge will serve as a proclamation of your intention to accomplish your medication-taking goal and to contribute to your community's goal.

Using the MEMS vial

- When your study period begins and over the following 90 days,
- You will be taking your medication as prescribed by removing the appropriate number of pills from the special MEMS vial that you will receive at the end of enrollment today.
- You will take your medication just as you normally would. However, please refrain from using pillboxes or other similar dispensers for this one medication during this study.
- When it is time to take your medication simply press down and turn the MEMS cap counter-clockwise to remove it from the vial.
- Remove the appropriate number of pills and promptly return the MEMS cap by turning clockwise.
- Each time you open and close the MEMS vial, it registers the date and time of the opening.

- By doing this, the MEMS vial will keep track of the doses you take and communicate that information back to us when you upload your data every week.

Uploading MEMS Data

- Uploading your data will take less than 5 minutes to do each week and I will walk you through this process in an upcoming video.
- You will do this using a MEMS data reader and a computer or tablet computer with Internet access. Remember, the tablet computer must contain a USB port.
- To be clear, on the left is a picture of 2 USB connectors and on the right is a picture of a USB receptacle...so if your tablet computer uses these then it will be ok for this study!
- Using the MEMS data reader (you will receive this after enrollment), you will be uploading your data to our database once a week on MONDAYS.
- Please do this no later than 3am on Tuesday morning.
- Once again, the 3am deadline is to accommodate you night owls and late night workers.
- However if you fail to meet this deadline then your progress will be counted as if all doses of your medication were missed for that week.
- This means that your contribution to the community goal will be 0% and you will be unable to earn any individual badges for that week.
- So for all intents and purposes MONDAYS are the days to upload your data.
- As a friendly reminder, I will send you an email every Monday morning.
- Should we have any difficulty in receiving the information, we will contact you.
- [Please be aware that] As the data recorded by the MEMS vial are intended to reflect your medication taking behaviors
- It is very important to not open the MEMS vial unnecessarily... doing so may misrepresent you and your data.
- Also, please do not immerse the MEMS vial in any liquid
- Please do not clean it with detergent or alcohol.
- If your MEMS vial gets dirty you may wipe the exterior with a slightly damp cloth.

Study Requirements

- To complete all study requirements
- (And therefore be eligible for the gift card and cash drawings at the end of the study),
- You must complete two online surveys – one will be completed today and the other will be emailed to you in approximately 90 days -,
- Receive refills in the MEMS vial as necessary,
- And return the MEMS vial and MEMS data reader to MCP at the end of your 90-day period.
- Even if you have additional pills leftover please bring your MEMS vial back to the pharmacy with the remaining pills in it.
- Upon doing this we will give you a replacement pill bottle containing your remaining pills. This will conclude your participation in the study.
- In the next video I will show you how to upload your data to our database. Thank you for your time and participation.

How to navigate the study website – social incentive group

- In this video I will be walking you through how to navigate the study website.
- To access the study website, you may either click on the link provided for you in the welcome email or you may type in the URL into the address bar.
 - CWS.auburn.edu/medicationadherence
- To login, click the 'login' button located in the upper right corner.
- Next, type in your user name and password. Your user name is the email address that you used when you signed up during enrollment.
- Once completed, click the green login button and you will be directed to the **user information page**.
- In the top left corner, you will see the avatar that you choose to represent yourself. In the center of this page you will see cards that display information about you – such as the date you began this study, the medication you are taking for this study, and the date of your most recent data upload.
- On the left side below your avatar, you will see 7 different pages that you can access and we will briefly go through each one.
- **[Social]** Beginning with the most important page, click '**social**' to view your weekly progress. In the center and across the top you can view the personal badges that you have earned. Below this will be a graph that represents the days of the week that you have taken your medication. You may scroll through and view previous weeks by clicking the arrows located here and here.
- Below this you will see your individual and community medication adherence. Depending on how many days of the week you have taken your medication, the circle graphs below will change colors. This box here indicates the range of percentages (or how often in the previous week you have taken your medication) and what each color represents. For instance, if you took your medication 3 days out of the last 7 then your graph will be red. If you took your medication 7 days out of the last 7 then your graph will be green.
- Below these graphs you can view the badges that your community has earned.
- Scrolling back up to the top and looking to the right you will see the community leaderboard. Notice that the box containing your avatar is highlighted green. As more members join this group this will be helpful when locating your avatar and seeing how you are doing within the community. Lastly, you can view the badges that other members of your community have earned by hovering your mouse over the word 'badges' like this.
- **[User info]** Ok let's move on to the next page below social which is '**user info**'. Hopefully this looks familiar because it's the same page that we started with.
- **[Contact Us]** Moving on to the next page below 'user info' is the '**contact us**' page. If you have any questions, comments, or suggestions about the website or anything else you want us to know you may put that information here and I'll get back to you as soon as possible.
- **[Help]** The next page is the '**help**' page. Here you may access all of the training videos and materials that you viewed during the enrollment session. Once clicked, each video or document will open in a new tab (like this). To return to the study website you may either click on the previous tab or you may close the newly opened tab (like so).

- The next page '**how to navigate**' will give you access to this video so that you may re-watch how to navigate the study website.
- The next page is a direct link to the **Marble City Pharmacy** website. Simply click on the logo and you will be directed to their homepage.
- The last page is a direct link to the **medAmigo** website. This is where you will be uploading your data. By clicking here, you will be directed to their homepage where you may login and upload your data.
- After you have uploaded your data make sure you logout of the medAmigo website by clicking the logout button located in the upper right corner.
- To return to the study website you may either click on the previous tab or you may close the newly opened tab (like so). When you are finished using the study website you may logout by clicking the logout button in the upper right corner.
- This concludes the study website navigation video. Thank you for your time!

How to upload data to the medAmigo platform

- In this video I will explain how to upload your data to the medAmigo platform. Before we begin you will need the following items:
 - Google chrome web browser (If you aren't currently using google chrome as your web browser, instructions on how to download and install it will be included in the welcome email you will receive at the end of the enrollment session)
 - Username and password (these will also be included in the welcome email)
 - MEMS Vial &
 - MEMS Data Reader (you will receive both of these after the enrollment session)
- To access the medAmigo platform, you may either click on the link provided for you in the welcome email or (0:27) you may type in the URL into the address bar.
- Once here you'll need to plug the MEMS data reader into your computer or tablet computer's USB port.
- Once plugged in you will see a steady green light on the front of the MEMS data reader (like this)
- Next - take your MEMS vial, turn it upside down (like this), and place it on top of the MEMS data reader. Make sure to place it directly on top of the circular groove in the center of the data reader.
- Now you may login using the medAmigo username and password that I sent to you in the welcome email. Once completed, click the login button.
- The very first time you login you'll need to change your password. I recommend that you change your medAmigo password to match the password you created for the study website during the enrollment session. You certainly don't have to but if you do then that will be one less password you'll need to keep up with!
- To change your password, click on your user name in the upper right corner. This will display a drop-down menu. Choose "Change Password" and then follow the prompts. Passwords must be between 6 and 15 characters, letters, numbers, or special characters, with at least one capital letter and one number. Once again, I

- would recommend changing your password to match the password you created for the study website during the enrollment session. When finished, click update password. (2:16)
- Now we are at the home screen where you may upload your data. To do so click on the link 'read new dosing history data from MEMS monitor'.
 - The very first time you do this and if you are using google chrome you should be prompted to install the MEMS integrator extension.
 - Click install and follow the prompts on the screen.
 - Once completed notice the new icon in your toolbar. This is the MEMS integrator extension and we will return to this momentarily.
 - Next click the blue 'read monitor' button and this will open another box that will show the data upload process.
 - Once completed the page will refresh and you will see a green box showing you the data upload was successfully completed.
 - You may now logout by clicking the logout button in the upper right corner.
 - Ok coming back to the MEMS integrator extension that you just installed... I will show you how you can upload your data in just 2 clicks.
 - Since you have logged into the medAmigo platform for the first time, have changed your password, and have installed the MEMS integrator extension you may now upload your data by (1) clicking on the icon (like this) and (2) clicking 'read'. After the upload has completed then you will see another green box and checkmark indicating that your data has been uploaded. Simply click outside this box and you are good to go.
 - With the MEMS integrator extension, you won't necessarily need to login to the medAmigo website to upload your data.
 - Just make sure your MEMS vial is positioned upside down on your data reader AND your data reader is plugged into your USB port... then in 2 clicks you can upload your data!
 - This concludes the medAmigo data upload video. If you have any issues that need troubleshooting, please don't hesitate to contact me or you can check out the help section of the study website. The next video will go over navigating the study website. Thank you for your time!
-
- If you are not or if you are unsure then these next steps will walk you through downloading and installing google chrome onto your computer.
 - Begin by navigating to the google chrome webpage by typing in the following URL into the address bar:
 - Google.com/chrome (then hit enter)
 - Next click the blue 'download now' button.
 - This brings up another box – click the blue 'accept and install' button
 - Depending on your computer, this may pull up additional prompts. Click through until google chrome runs through the installation process. Go ahead and set chrome as your default browser so that any future links you receive from me will be viewed in google chrome. Now that you have downloaded and installed google chrome, please move onto the 'how to upload data to medAmigo' video. Thank you for your time!

Appendix D1: Website Enrollment Process (Screenshots)

Please notify a pharmacy team member that you are now ready to sign the consent form.

Pharmacy Team Member: Please Enter Your Passcode below.

Next

Thank you for choosing to participate in this study.

Login Information

Email

Password

Confirm Password

Password must contain: 6-15 characters, at least 1 captial letter, at least 1 number.

Next

Thank you for choosing to participate in this study.

Please select the patient's Cap ID and their medication.

CapID

Medication Types

- High Blood Pressure
- High Blood Pressure Combos
- High Cholesterol
- High Cholesterol Combos

Medication

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Welcome to the Financial Incentive Group

Please click play to watch the video below and learn more about your role in this group.



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Welcome to the Financial Incentive Group

Please click play to watch the video below and learn more about your role in this group.

Upload data to medAmigo platform

<https://v3-app.aardexgroup.com/Account/Login>

medAmigo

MEMS DATA READER

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Contact us | Reader test

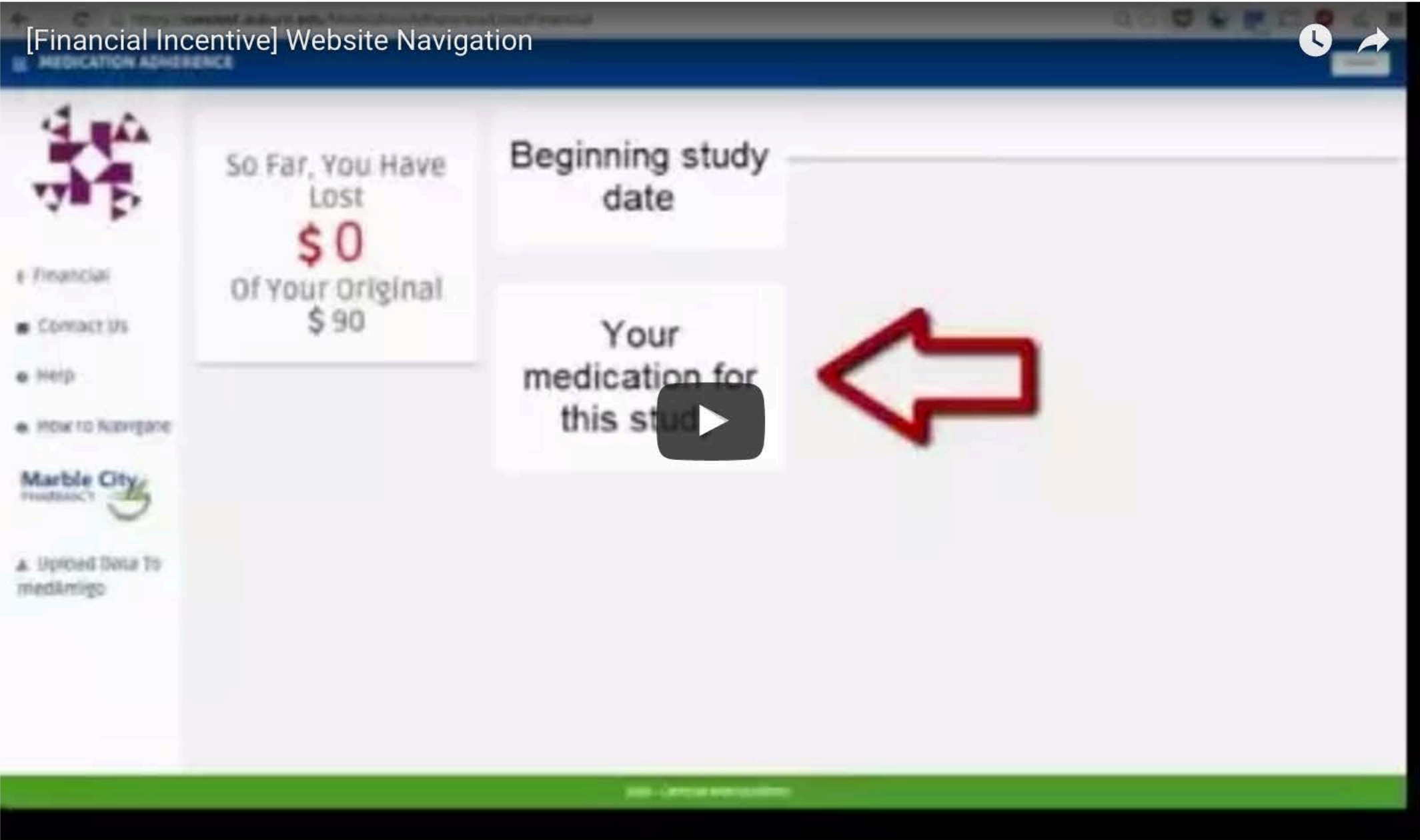
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Welcome to the Financial Incentive Group

How to Navigate This Site

[Click here to watch the video of how to navigate this site!]



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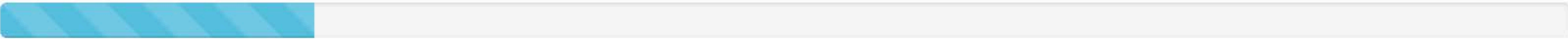


Thank you for agreeing to participate in our study. Please complete the following questionnaire by answering all questions to the best of your ability. Your response will be counted as received when you reach the end of the survey. If you have any questions or concerns, feel free to ask one of the pharmacy team members to assist you.

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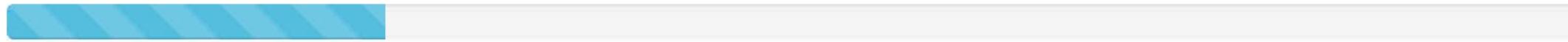
Question 1

In the box below, enter the TOTAL NUMBER of medications you are currently taking on a regular basis. Include any over-the-counter medications, herbal products, and vitamins you are currently taking, as well as prescriptions.

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Question 2

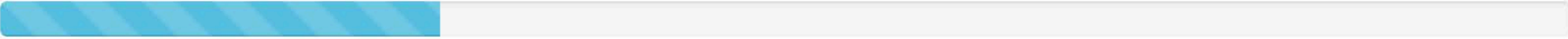
Which medical conditions have you been told you have by your health care provider? Check all that apply.

- Anxiety
- Arthritis
- Asthma
- Blood Clots
- Blood Disorder (e.g., Anemia, Bleeding Problems)
- Cancer
- COPD
- Depression
- Diabetes
- Glaucoma
- Gout
- Heart Disease (e.g., Heart Attack, Heart Failure, Arrhythmias)
- High Blood Pressure
- High Cholesterol
- Kidney Problems
- Liver Problems
- Mental Illness
- Muscle Problems
- Neurological Problems

- Cancer
- COPD
- Depression
- Diabetes
- Glaucoma
- Gout
- Heart Disease (e.g., Heart Attack, Heart Failure, Arrhythmias)
- High Blood Pressure
- High Cholesterol
- Kidney Problems
- Liver Problems
- Mental Illness
- Muscle Problems
- Neurological Problems
- Osteoporosis
- Seizures
- Skin Problems (e.g., Psoriasis, Eczema)
- Sleep Apnea
- Stomach/Intestinal Problems (e.g., Acid Reflux, Irritable Bowl Syndrome, Ulcer)
- Stroke
- Thyroid Problems
- Urinary Problems

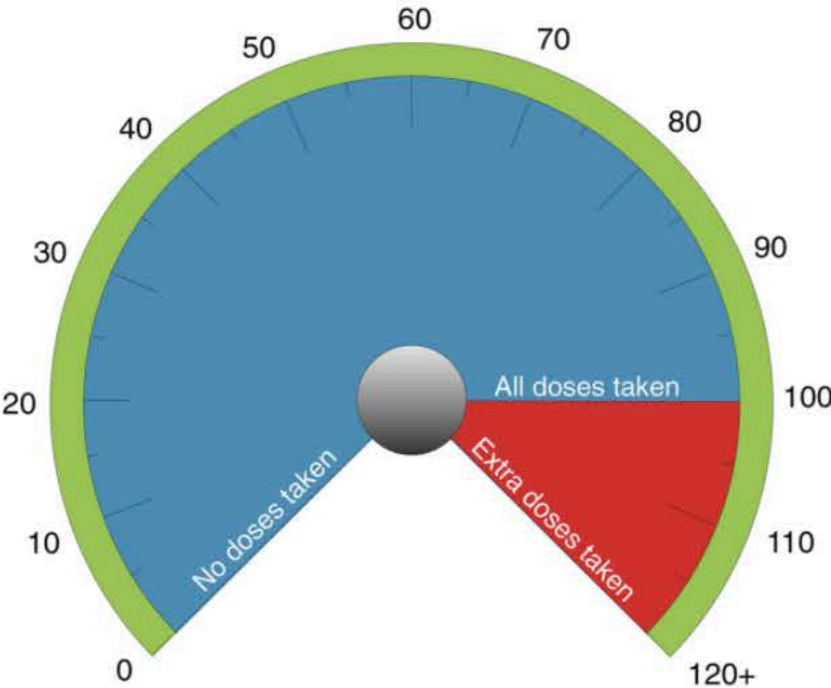
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Question 3

Now, think about the Acebutolol (Sectral) you will receive in the special MEMS pill bottle. Look at the picture below and think about how often you took your dose correctly as prescribed by your healthcare provider over the previous four weeks.



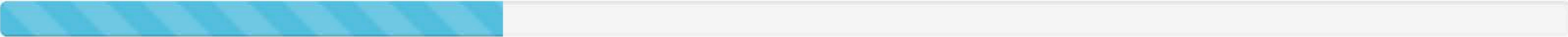
Now choose the number (percentage) from 0 to 120 that best represents how often you took your dose of this medication correctly as prescribed by your healthcare provider OVER THE PREVIOUS FOUR WEEKS. For example, if you have taken all of your medication doses during the previous 4 weeks, you should enter 100 in the box below; if you have taken only half of your medication doses, you should enter 50 in the box below.

You may enter any number (percentage) between 0 and 120 in the box below. Please do so now.

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Question 4

Think of this ladder as representing where people stand in their communities.

People define community in different ways; please define it in whatever way is most meaningful to you. At the **top** of the ladder are the people who have the highest standing in their community. At the **bottom** are the people who have the lowest standing in their community.

Where would you place yourself on this ladder?

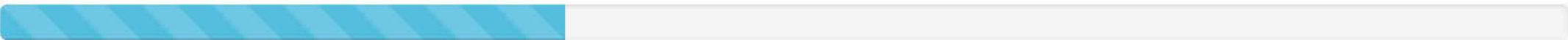
Please select the button that most accurately represents the rung where you think you stand at this time in your life, relative to other people in your community.



- Rung 10 (Highest)
- Rung 9
- Rung 8
- Rung 7
- Rung 6
- Rung 5
- Rung 4
- Rung 3
- Rung 2
- Rung 1(Lowest)

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Question 5

Think of this ladder as representing where people stand in the United States.

At the **top** of the ladder are the people who are the best off - those who have the most money, the most education and the most respected jobs. At the **bottom** are the people who are the worst off - who have the least money, least education, and the least respected jobs or no job. The higher up you are on this ladder, the closer you are to the people at the very top; the lower you are, the closer you are to the people at the very bottom.

Where would you place yourself on this ladder?

Please select the button that most accurately represents the rung where you think you stand at this time in your life, relative to other people in the United States.

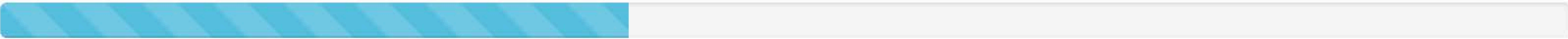


- Rung 10 (Highest)
- Rung 9
- Rung 8
- Rung 7
- Rung 6
- Rung 5
- Rung 4
- Rung 3
- Rung 2
- Rung 1(Lowest)

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Question 6

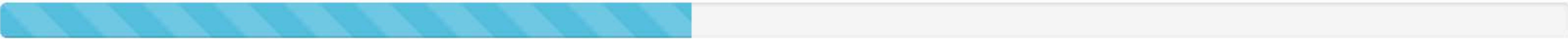
What is the highest level of regular school you have completed?

- No Schooling Completed
- Elementary School
- Junior High School
- High School
- College
- Graduate School

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Question 7

What is the highest degree you have earned?

- High School Diploma or Equivalency (GED)
- Associate Degree (Junior College)
- Bachelor's Degree
- Master's Degree
- Doctorate
- Professional (MD, JD, DDS, etc.)
- Other
- None of the Above (Less Than High School)

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Question 8

Which of the following best describes your current daily activities and/or main responsibilities?

- Working Full-time
- Working Part-Time
- Unemployed or Laid Off
- Looking for Work
- Keeping House or Raising Children Full-Time
- Retired

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Question 9

With regard to your current or most recent job: How much did you earn, before taxes and other deductions, during the past 12 months?

- Less Than \$5,000
- \$5,000 through \$11,999
- \$12,000 through \$15,999
- \$16,000 through \$24,999
- \$25,000 through \$34,999
- \$35,000 through \$49,999
- \$50,000 through \$74,999
- \$75,000 through \$99,999
- \$100,000 and Greater
- Don't Know
- Prefer Not To Answer

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Question 10

How many people are currently living in your household, including yourself?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10+

Of these people, how many are children?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10+

Of these people, how many are adults?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10+

Of these people, how many bring income into the household?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10+

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Question 11

Is the home where you live:

- Owned or Being Bought by You (or Someone in the Household)
- Rented for Money
- Occupied Without Payment of Money or Rent
- Other
- Prefer Not To Answer

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Question 12

Which of these categories best describes your total combined family income for the past 12 months?

This should include income (before taxes) from all sources, wages, rent from properties, social security, disability and/or veteran's benefits, unemployment benefits, workman's compensation, help from relatives (including child payments and alimony), and so on.

- Less Than \$5,000
- \$5,000 through \$11,999
- \$12,000 through \$15,999
- \$16,000 through \$24,999
- \$25,000 through \$34,999
- \$35,000 through \$49,999
- \$50,000 through \$74,999
- \$75,000 through \$99,999
- \$100,000 and Greater
- Don't Know
- Prefer Not To Answer

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Question 13

If you lost all of your current source(s) of household income (your paycheck, public assistance, or other forms of income), how long could you continue to live at your current address and standard of living?

- Less Than 1 Month
- 1 to 2 Months
- 3 to 6 Months
- 7 to 12 Months
- More Than 1 Year
- Prefer Not To Answer

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Question 14

Suppose you needed money quickly, and you cashed in all of your (and your spouse's) checking and savings accounts, and any stocks and bonds. If you added up what you would get, about how much would this amount to?

- Less Than \$500
- \$500 to \$4,999
- \$5,000 to \$9,999
- \$10,000 to \$19,999
- \$20,000 to \$49,999
- \$50,000 to \$99,999
- \$100,000 to \$199,999
- \$200,000 to \$499,999
- \$500,000 and Greater
- Don't Know
- Prefer Not To Answer

If you now subtracted out any debt that you have (credit card debt, unpaid loans including car loans, home mortgage), about how much would you have left?

- Less Than \$500
- \$500 to \$4,999
- \$5,000 to \$9,999
- \$10,000 to \$19,999
- \$20,000 to \$49,999
- \$50,000 to \$99,999
- \$100,000 to \$199,999
- \$200,000 to \$499,999
- \$500,000 and Greater
- Don't Know
- Prefer Not To Answer

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Question 15

What is your sex?

- Male
- Female
- Prefer Not To Answer

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Question 16

Are you of Hispanic, Latino, or Spanish origin?

- No, Not of Hispanic, Latino, or Spanish Origin
- Yes, Mexican, Mexican American, Chicano
- Yes, Puerto Rican
- Yes, Cuban
- Yes, Other Hispanic, Latino, or Spanish Origin
- Prefer Not To Answer

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Question 17

What is your race?

- White
- Black or African American
- American Indian or Alaska Native
- Asian Indian
- Asian (e.g., Chinese, Filipino, Japanese, Korean, Vietnamese, Other Asian)
- Native Hawaiian or Other Pacific Islander
- Prefer Not To Answer

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Question 18

What is your date of birth?

Day Month Year

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Question 19

What is your marital status?

- Single (Never Married)
- Currently Married (or Domestic Partnership)
- Separated, Divorced, or Widowed
- Prefer Not To Answer

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Question 20

Do you use or own a smartphone as your primary mobile phone?

Yes No

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Question 20

Do you use or own a smartphone as your primary mobile phone?

- Yes
- No

What type of smartphone do you use as your primary mobile phone?

- iPhone
- Android (e.g., DROID by Motorola or Samsung Galaxy)
- Windows Phone (e.g., Nokia Lumina or HTC Windows Phone 8X)
- Blackberry
- Other

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Question 21 Marlowe-Crowne Scale (Reynolds's Form C)

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is **True or False** as it pertains to you personally.

1. It is sometimes hard for me to go on with my work if I am not encouraged. True False
2. I sometimes feel resentful when I don't get my way. True False
3. On a few occasions, I have given up doing something because I thought too little of my ability. True False
4. There have been times when I felt like rebelling against people in authority even though I knew they were right. True False
5. No matter who I'm talking to, I'm always a good listener. True False
6. There have been occasions when I took advantage of someone. True False
7. I'm always willing to admit it when I make a mistake. True False
8. I sometimes try to get even rather than forgive and forget. True False
9. I am always courteous, even to people who are disagreeable. True False
10. I have never been irked when people expressed ideas very different from my own. True False
11. There have been times when I was quite jealous of the good fortune of others. True False
12. I am sometimes irritated by people who ask favors of me. True False
13. I have never deliberately said something that hurt someone's feelings. True False

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Question 22 Preference For Incentive-Type

The following questions are aimed at determining how important different incentives and types of reward structures are to you. Please rate how important each of these things are to you, on a scale from 1 to 5, where 1 = not at all important and 5 = extremely important.

Receiving personal gratification from knowing that...

| | 1 | 2 | 3 | 4 | 5 |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Not at all important | Slightly important | Moderately important | Very important | Extremely important |
| ... YOU take your medication everyday as prescribed | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ... OTHERS in your Marble City Pharmacy community know you take your medication everyday as prescribed | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ...Your FAMILY & FRIENDS know you take your medication everyday as prescribed | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ... YOUR PHARMACIST knows you take your medication everyday as prescribed | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Knowing that you take your medication as prescribed **MORE OFTEN THAN...**

| | 1 | 2 | 3 | 4 | 5 |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Not at all important | Slightly important | Moderately important | Very important | Extremely important |
| ...OTHERS in your Marble City Pharmacy community taking similar medications | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ...YOUR FAMILY & FRIENDS taking similar medications | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Knowing that you take your medication as prescribed **LESS OFTEN THAN...**

| | 1 | 2 | 3 | 4 | 5 |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Not at all important | Slightly important | Moderately important | Very important | Extremely important |
| ...OTHERS in your Marble City Pharmacy community taking similar medications | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ...YOUR FAMILY & FRIENDS taking similar medications | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Knowing exactly how you rank, for instance being in the top 10%, in how often you take your medication as prescribed among...

| | 1 | 2 | 3 | 4 | 5 |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Not at all important | Slightly important | Moderately important | Very important | Extremely important |
| ...OTHERS in your Marble City Pharmacy community taking similar medications | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| ...YOUR FAMILY & FRIENDS taking similar medications | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Receiving virtual badges that represent personal milestones for taking your medication everyday as prescribed

| | 1 | 2 | 3 | 4 | 5 |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Not at all important | Slightly important | Moderately important | Very important | Extremely important |
| | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Receiving a small cash payout (e.g., \$1) for every day you take your medication as prescribed

| | 1 | 2 | 3 | 4 | 5 |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | Not at all important | Slightly important | Moderately important | Very important | Extremely important |
| | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Receiving virtual badges that represent personal milestones for taking your medication everyday as prescribed

| 1 | 2 | 3 | 4 | 5 |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Not at all important | Slightly important | Moderately important | Very important | Extremely important |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Receiving a small cash payout (e.g., \$1) for every day you take your medication as prescribed

| 1 | 2 | 3 | 4 | 5 |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Not at all important | Slightly important | Moderately important | Very important | Extremely important |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

The chance to win a large cash payout (e.g., \$50) once a week for taking your medication everyday that week as prescribed

| 1 | 2 | 3 | 4 | 5 |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| Not at all important | Slightly important | Moderately important | Very important | Extremely important |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Previous

Next

Commit to your medication-taking goal

Now it's time to fill out the commitment contract that I mentioned in the videos. This pledge will show your intention to reach your medication-taking goal. It will also serve as a reminder about what is at stake.

Please take a moment and read your pledge. When ready, check the box below to show that you understand the commitment and have made this pledge your own!

Your pledge:

I pledge to take my Acebutolol (Sectral) everyday for 90 days once the study begins.

What's at stake:

Right now you have \$90 in your virtual account. It is all yours. However, each day you miss a dose of Acebutolol (Sectral), you will lose \$1 from your virtual account. This includes failing to upload your data to the website on each Monday.

I understand this commitment and I agree to make this pledge my own

[Previous](#)[Next](#)

Commit to your medication-taking goal

Now it's time to fill out the commitment contract that I mentioned in the videos. This pledge will show your intention to reach your medication-taking goal. It will also serve as a reminder about what is at stake.

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I understand this commitment and I agree to make this pledge my own

Previous

Next

You must agree to the commitment contract.

This concludes the enrollment process. Please watch the video below on what to do next.

Thank you for your participation



The video player displays a white MEMS Vial with 'MEMS 6' printed on its cap. A green text overlay 'MEMS Vial' is positioned at the bottom of the vial. To the right of the vial is a play button icon. Further right is a large black icon representing a gift box with a white ribbon and a dollar sign, symbolizing a reward or financial benefit.

User Info

Appendix D2: Website Enrollment Screenshots

✉ Contact Us



⬆ Upload Data To
medAmigo

Join Us



Yes, I would like to participate in this study.

No, I would not like to participate in this study.

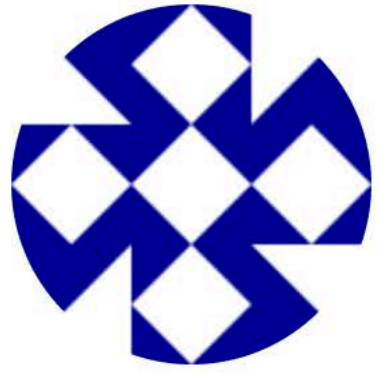
Next

Login

Username

Password





Log In



N/A
Date of last data upload





Your 90-day study period
Medication Period Start: 6/13/2016
Medication Period End: 9/10/2016

Simvastatin
(Zocor)

-  User Info
-  Contact Us
-  Help
-  How to Navigate





-  User Info
-  Contact Us
-  Help
-  How to Navigate



Usual Care Group

On this page you can access all of the training videos and materials that you viewed during the enrollment session.

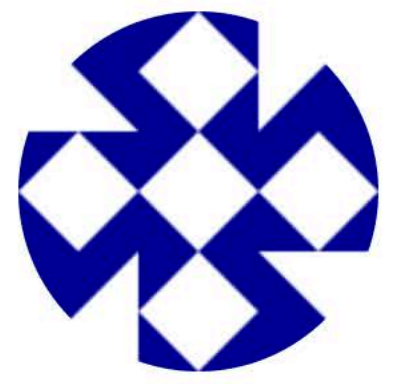
Videos:

- [Informed Consent Video](#)
- [Explanation of the Usual Care Group Video](#)
- [Thank You Video](#)

Documents:

- [Informed Consent](#)

This text will be shown to users in Usual Care Group on their help page.

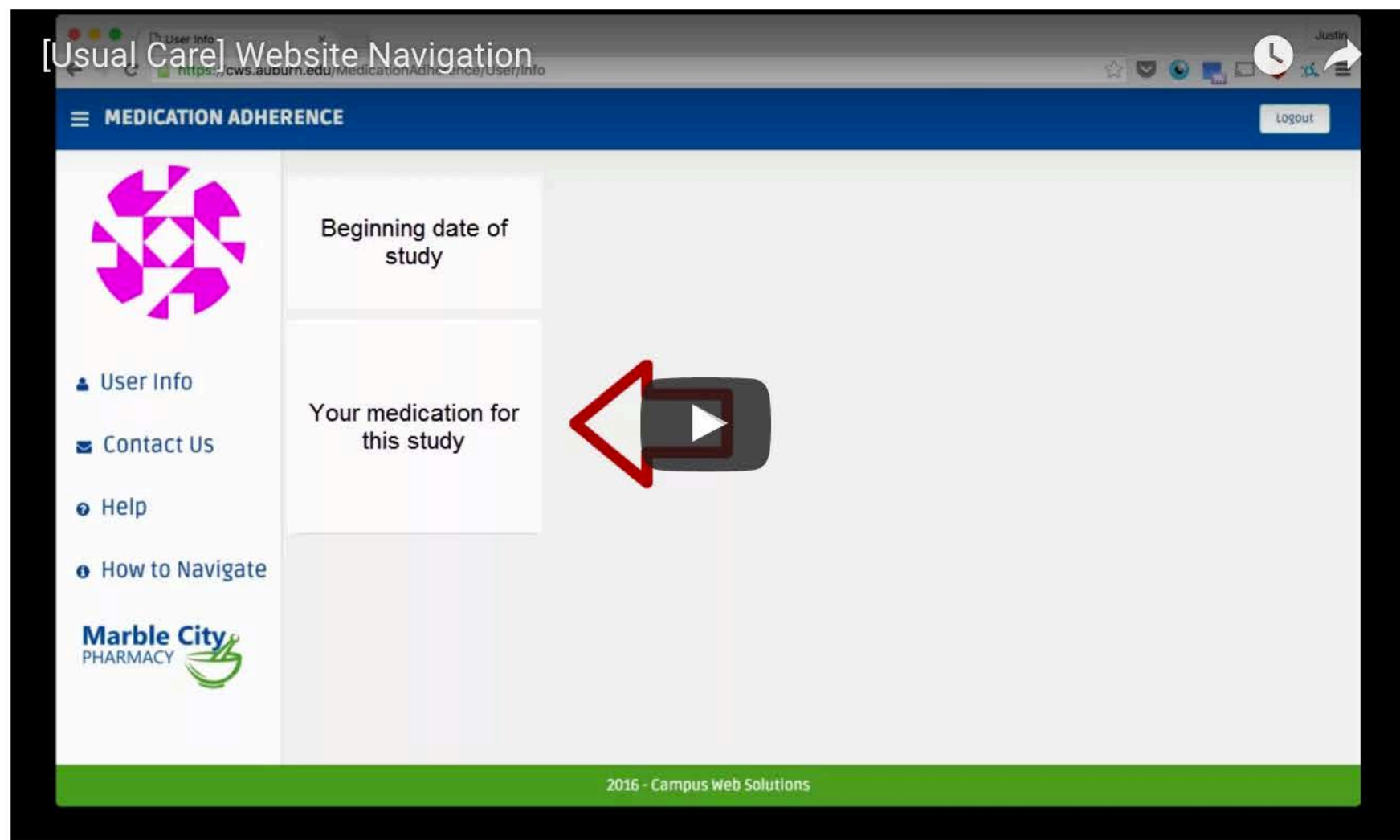


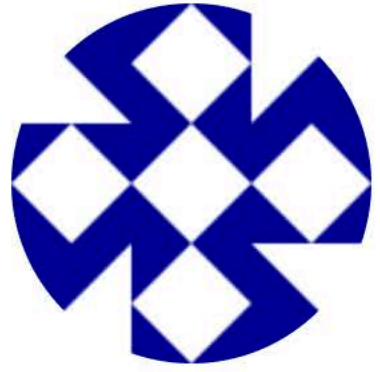
- 👤 User Info
- ✉ Contact Us
- ❓ Help
- 📄 How to Navigate



How to Navigate This Site

[Click here to watch the video of how to navigate this site!]









Contact Us

Enter your message below.

Send!

-  User Info
-  Contact Us
-  Help
-  How to Navigate





\$ Financial

✉ Contact Us

🔗 Help

ℹ How to Navigate



📄 Upload Data To medAmigo

So Far, You Have Lost
\$2
Of Your Original
\$90

Atorvastatin
(Lipitor)

Your 90-day study period
Medication Period Start: 5/9/2016
Medication Period End: 8/6/2016

| Date Missed | Balance |
|-------------|---------|
| 7/6/2016 | \$88.00 |
| 7/10/2016 | \$89.00 |



Financial

Contact Us

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How to Navigate



Upload Data To medAmigo

Financial Incentive Group

On this page you can access all of the training videos and materials that you viewed during the enrollment session.

Videos:

[Informed Consent Video](#)

[Financial Incentive Group Video \(explanation of your group\)](#)

[Thank You Video](#)

Documents:

[Informed Consent](#)

[MEMS]

[medAmigo]

[Java]

[Commitment contract]

This text will be shown to users in Financial Incentive Group on their help page.



9/20/2016
Date of last data upload

Your 90-day study period
Medication Period Start: 5/9/2016
Medication Period End: 8/6/2016

Social

User Info

Contact Us

Help

How to Navigate



Upload Data To medAmigo

Losartan
(Cozaar)

| Date | Time | Success | Date Uploaded |
|-----------|---------|----------|---------------|
| 9/11/2016 | 7:06 AM | Success! | 9/20/2016 |
| 9/10/2016 | 7:23 AM | Success! | 9/20/2016 |
| 9/9/2016 | 7:40 AM | Success! | 9/20/2016 |
| 9/8/2016 | 7:32 AM | Success! | 9/20/2016 |
| 9/7/2016 | 7:42 AM | Success! | 9/20/2016 |
| 9/6/2016 | 7:33 AM | Success! | 9/20/2016 |
| 9/5/2016 | 7:42 AM | Success! | 9/20/2016 |
| 9/4/2016 | 7:06 AM | Success! | 9/20/2016 |
| 9/3/2016 | 7:23 AM | Success! | 9/20/2016 |
| 9/2/2016 | 7:40 AM | Success! | 9/20/2016 |
| 9/1/2016 | 7:32 AM | Success! | 9/20/2016 |
| 8/31/2016 | 7:42 AM | Success! | 9/20/2016 |
| 8/30/2016 | 7:33 AM | Success! | 9/20/2016 |
| 8/29/2016 | 7:42 AM | Success! | 9/20/2016 |
| 8/28/2016 | 7:06 AM | Success! | 9/6/2016 |



Social

User Info

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How to Navigate



Upload Data To medAmigo

Personal Badges



Week 01



Week 02



Week 03



Week 04



Week 05



Week 06



Week 07



Week 08



Week 09



Week 10



Week 3 Streak



Week 6 Streak

Community Leaderboard

1 ¹³ badges 100%



2 ¹³ badges 100%



3 ¹² badges 100%

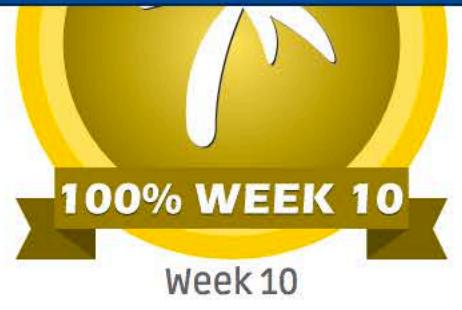




- Social
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- How to Navigate

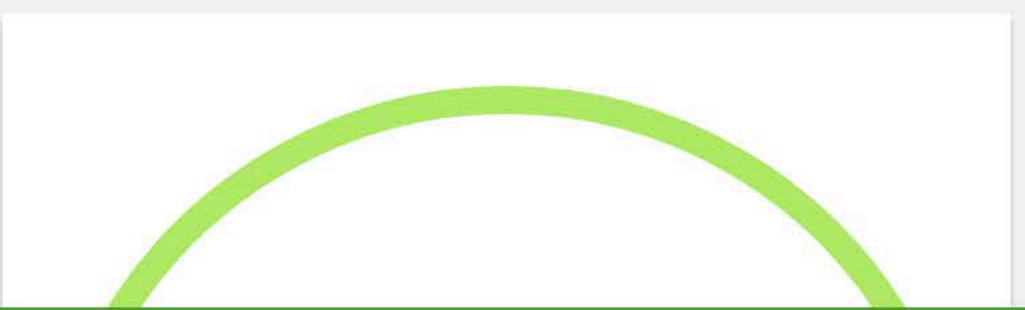
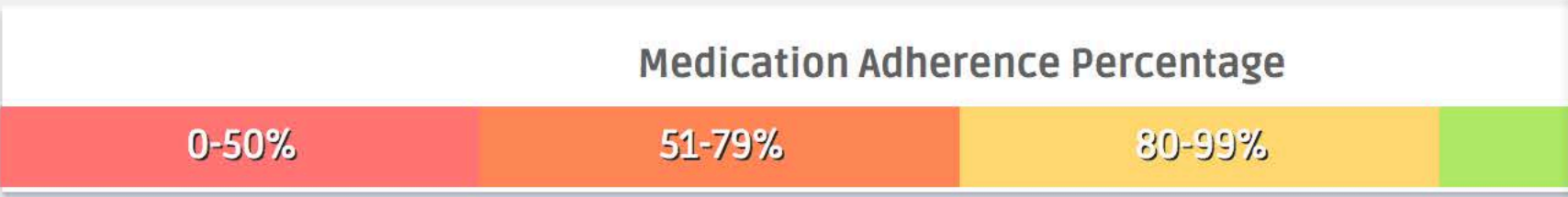


Upload Data To medAmigo



No valid weekly data available

Week of Sunday, June 4, 2017



100% WEEK 1 Week 01

100% WEEK 4 Week 04

100% WEEK 5 Week 05

3 12 badges 100%

4 8 badges 100%

3 badges 50%

6 1 badges 0%



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Upload Data To medAmigo

Personal Badges

| | | | |
|----------------------------|-----------------------------|------------------------------------|------------------------------------|
| 100% WEEK 1 Week 01 | 100% WEEK 2 Week 02 | 100% WEEK 3 Week 03 | 100% WEEK 4 Week 04 |
| 100% WEEK 5 Week 05 | 100% WEEK 6 Week 06 | 100% WEEK 7 Week 07 | 100% WEEK 8 Week 08 |
| 100% WEEK 9 Week 09 | 100% WEEK 10 Week 10 | 3 week streak Week 3 Streak | 6 week streak Week 6 Streak |

Community Leaderboard

| | | | |
|---|-----------|------|--|
| 1 | 13 badges | 100% | |
| 2 | 13 badges | 100% | |
| 3 | 12 badges | 100% | |

Week 9 Streak



Social

User Info

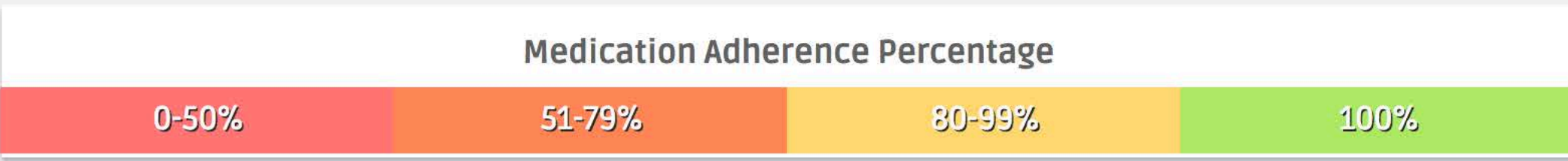
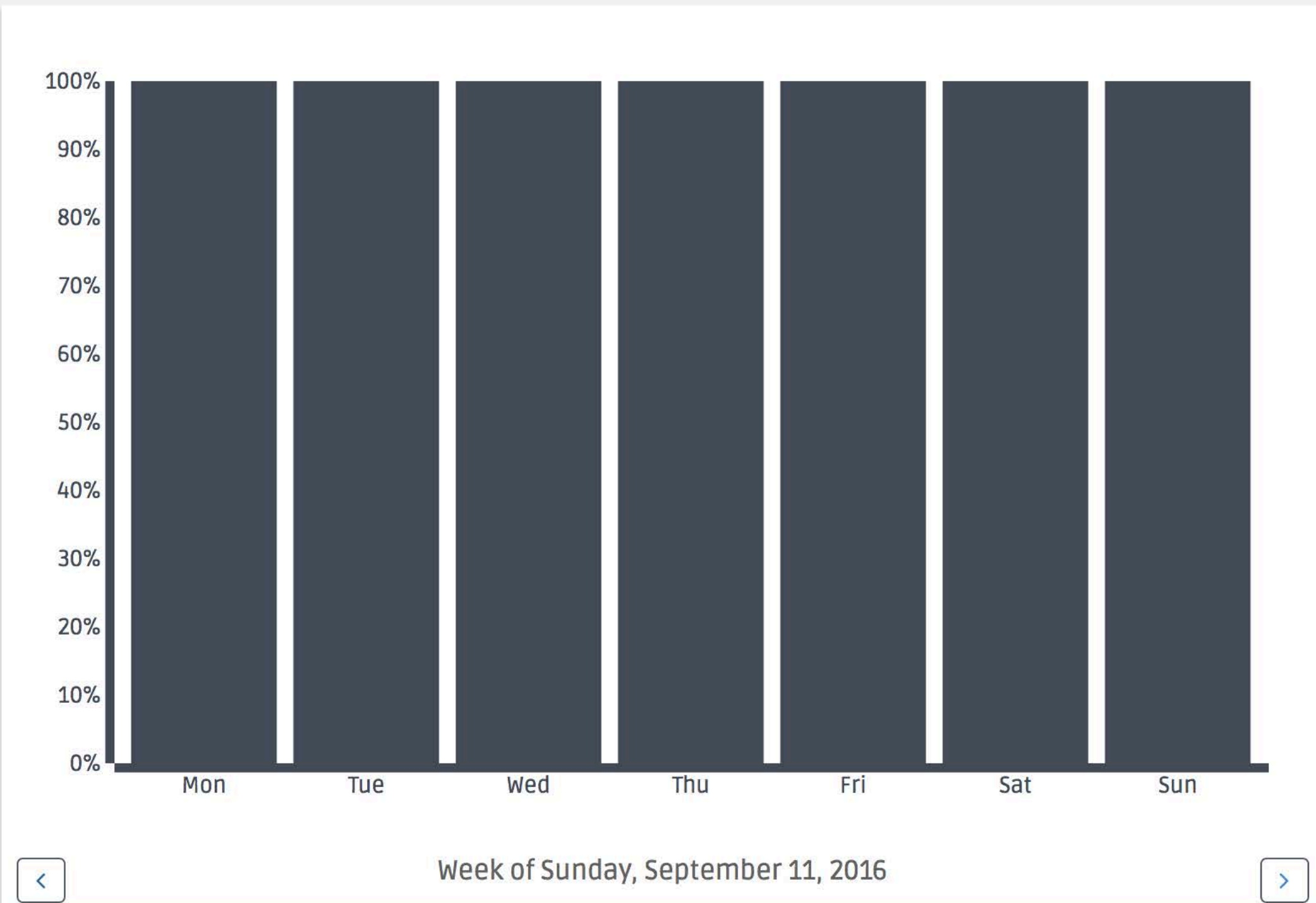
Contact Us

Help

How to Navigate



Upload Data To medAmigo



5 3 badges 50%



6 1 badge 0%





< Week of Sunday, September 4, 2016 >

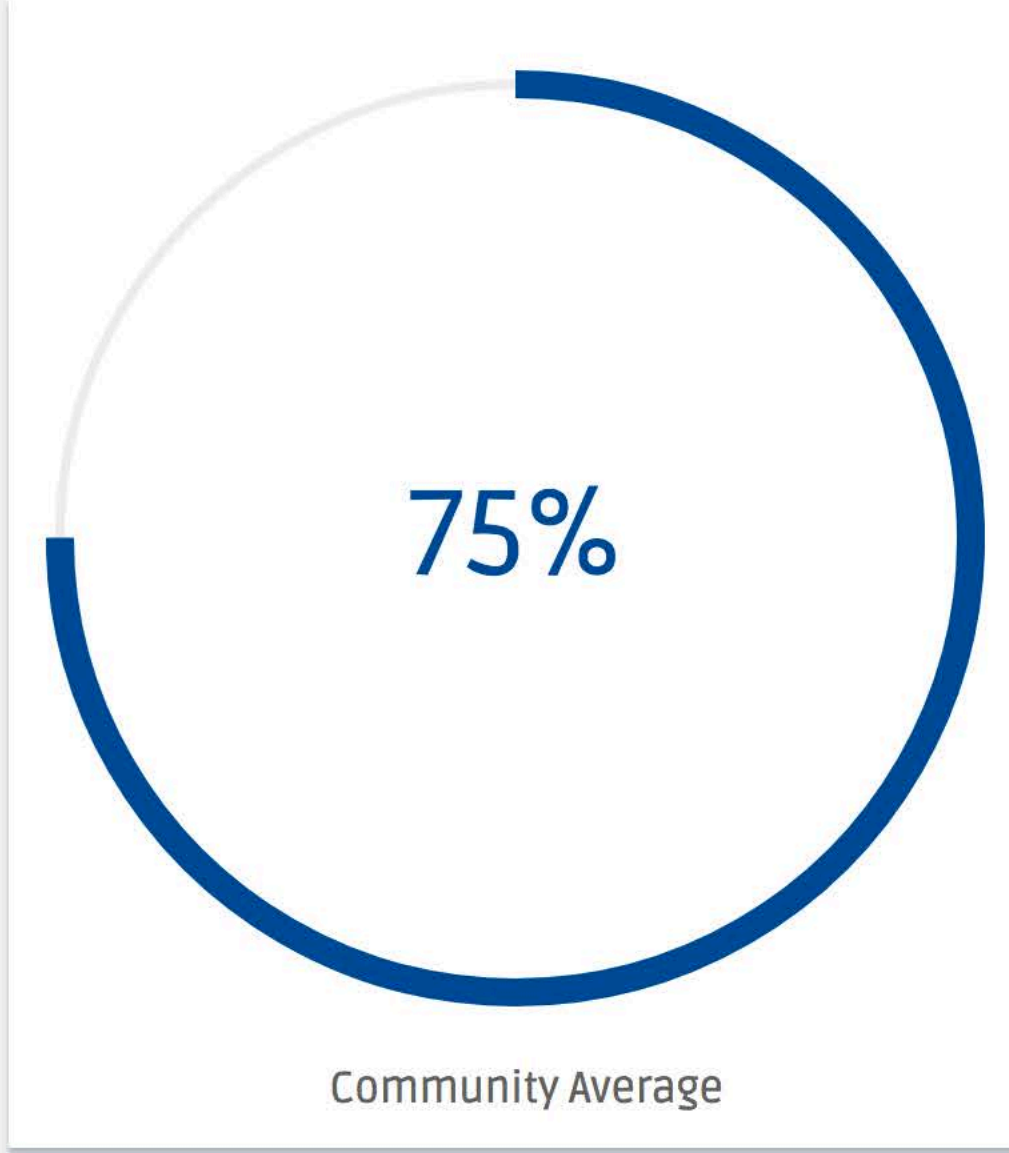
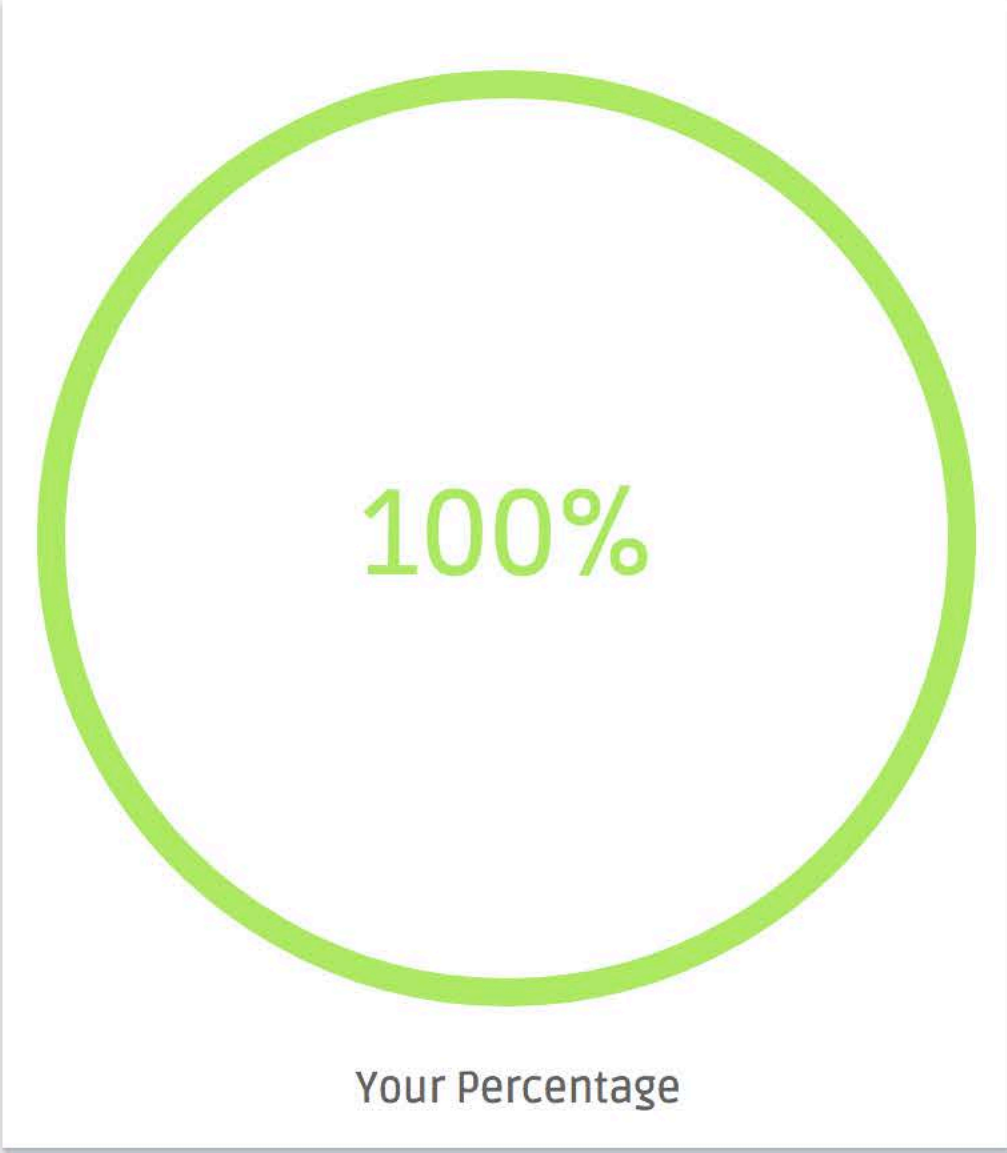
Medication Adherence Percentage



- Social
- User Info
- Contact Us
- Help
- How to Navigate



Upload Data To medAmigo



Community Badges

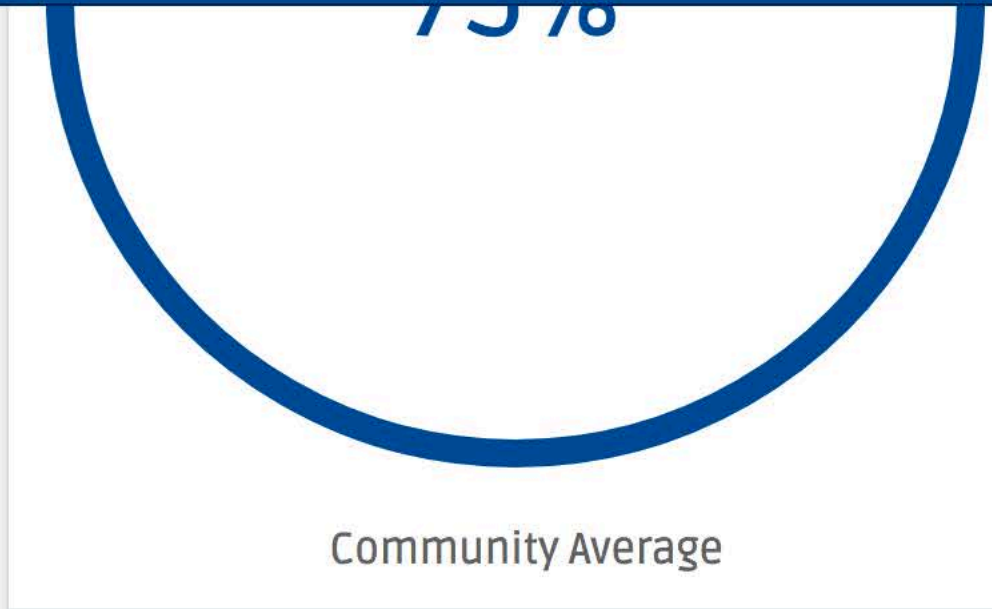




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- Help
- How to Navigate



Upload Data To medAmigo



Community Badges



Week 02



Week 07



Week 08



Week 09



Week 10



Week 3 Streak



- Social
- User Info
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How to Navigate



Upload Data To medAmigo

Marble City Pharmacy Community Adherence Group

On this page you can access all of the training videos and materials that you viewed during the enrollment session.

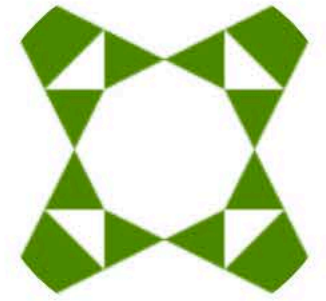
Videos:

- [Informed Consent Video](#)
- [MCP Community Adherence Group Video \(explanation of your group\)](#)
- [Thank You Video](#)

Documents:

- [Informed Consent](#)
- [MEMS]
- [medAmigo]
- [Java]
- [Commitment contract]

This text will be shown to users in Social Incentive Group on their help page.



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- User Info
- Financial
- Admin Tools
- Contact Us
- Help
- How to Navigate
-
- Upload Data To medAmigo

Individual User Badges Community Badges

Update Individual User Badges

Cap ID

| | | |
|----------------------------------|----------------------------------|----------------------------------|
| | | |
| <input type="checkbox"/> Week 01 | <input type="checkbox"/> Week 02 | <input type="checkbox"/> Week 03 |
| | | |
| <input type="checkbox"/> Week 04 | <input type="checkbox"/> Week 05 | <input type="checkbox"/> Week 06 |
| | | |
| <input type="checkbox"/> Week 07 | <input type="checkbox"/> Week 08 | <input type="checkbox"/> Week 09 |
| | | |

Find User Email

Identifier

- Administrators
- -
 -
-

User Categories

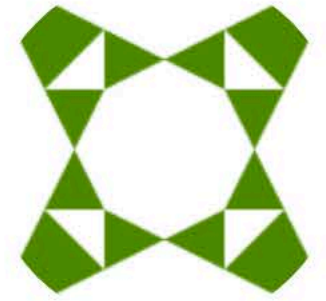
| | | |
|---------------------------|------------|--|
| Social Incentive Group | 7/20 Users | |
| Financial Incentive Group | 3/20 Users | |
| Usual Care Group | 5/20 Users | |

Get User Data

Cap ID

| | |
|-------------------|---------------------------|
| Group | Financial Incentive Group |
| Overall Adherence | 100% |
| Weekly Adherence | 100% |
| Week's Dates | |

| Timestamp | Success Type |
|---------------------|--------------|
| 09/11/2016 08:58 PM | Success |
| 09/10/2016 09:03 PM | Success |
| 09/09/2016 08:55 PM | Success |
| 09/08/2016 09:11 PM | Success |
| 09/07/2016 09:01 PM | Success |
| 09/06/2016 10:35 PM | Success |
| 09/05/2016 09:14 PM | Success |
| 09/04/2016 08:58 PM | Success |
| 09/03/2016 09:03 PM | Success |
| 09/02/2016 08:55 PM | Success |



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- How to Navigate
- Marble City PHARMACY
- Upload Data To medAmigo

Individual User Badges | **Community Badges**

Update Community Badges



Week 01



Week 02



Week 03



Week 04



Week 05



Week 06



Week 07



Week 08



Week 09



Week 10



Week 11



Week 12

Find User Email

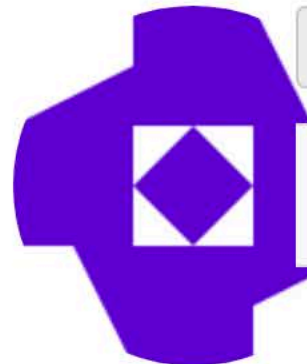
Identifier

- Administrators
- -
 -
-

User Categories

| | | |
|---------------------------|------------|------------------------------------|
| Social Incentive Group | 7/20 Users | <input type="button" value="eye"/> |
| Financial Incentive Group | 3/20 Users | <input type="button" value="eye"/> |
| Usual Care Group | 5/20 Users | <input type="button" value="eye"/> |

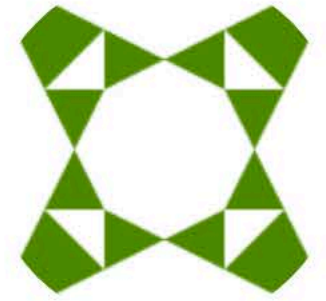
Get User Data



Cap ID

| | |
|-------------------|---------------------------|
| Group | Financial Incentive Group |
| Overall Adherence | 100% |
| Weekly Adherence | 100% |
| Week's Dates | |

| Timestamp | Success Type |
|---------------------|--------------|
| 09/11/2016 08:58 PM | Success |
| 09/10/2016 09:03 PM | Success |
| 09/09/2016 08:55 PM | Success |
| 09/08/2016 09:11 PM | Success |
| 09/07/2016 09:01 PM | Success |
| 09/06/2016 10:35 PM | Success |
| 09/05/2016 09:14 PM | Success |
| 09/04/2016 08:58 PM | Success |
| 09/03/2016 09:03 PM | Success |
| 09/02/2016 08:55 PM | Success |



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- Admin Tools
- Contact Us
- Help
- How to Navigate
-
- Upload Data To medAmigo

Week 04

Week 05

Week 06

Week 07

Week 08

Week 09

Week 10

Week 11

Week 12

Week 13

Week 3 Streak

Week 6 Streak

Week 9 Streak

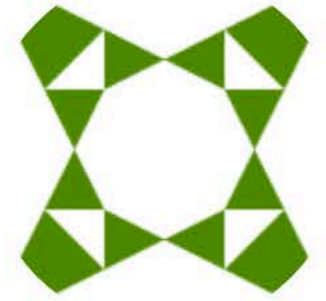
Week 12 Streak

User Categories

| | | |
|---------------------------|------------|--|
| Social Incentive Group | 7/20 Users | |
| Financial Incentive Group | 3/20 Users | |
| Usual Care Group | 5/20 Users | |

| | |
|---------------------|---------|
| 09/11/2016 08:58 PM | Success |
| 09/10/2016 09:03 PM | Success |
| 09/09/2016 08:55 PM | Success |
| 09/08/2016 09:11 PM | Success |
| 09/07/2016 09:01 PM | Success |
| 09/06/2016 10:35 PM | Success |
| 09/05/2016 09:14 PM | Success |
| 09/04/2016 08:58 PM | Success |
| 09/03/2016 09:03 PM | Success |
| 09/02/2016 08:55 PM | Success |

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-
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| | | |
|--|---|--|
| <input type="checkbox"/> Week 04 | <input type="checkbox"/> Week 05 | <input type="checkbox"/> Week 06 |
| <input type="checkbox"/> Week 07 | <input type="checkbox"/> Week 08 | <input type="checkbox"/> Week 09 |
| <input type="checkbox"/> Week 10 | <input type="checkbox"/> Week 11 | <input type="checkbox"/> Week 12 |
| <input type="checkbox"/> Week 13 | <input type="checkbox"/> Week 3 Streak | <input type="checkbox"/> Week 6 Streak |
| <input type="checkbox"/> Week 9 Streak | <input type="checkbox"/> Week 12 Streak | <input type="checkbox"/> Back on Track |

[Save Individual Badges](#)

User Categories

| | | |
|---------------------------|------------|--|
| Social Incentive Group | 7/20 Users | |
| Financial Incentive Group | 3/20 Users | |
| Usual Care Group | 5/20 Users | |

| | |
|---------------------|---------|
| 09/09/2016 08:55 PM | Success |
| 09/08/2016 09:11 PM | Success |
| 09/07/2016 09:01 PM | Success |
| 09/06/2016 10:35 PM | Success |
| 09/05/2016 09:14 PM | Success |
| 09/04/2016 08:58 PM | Success |
| 09/03/2016 09:03 PM | Success |
| 09/02/2016 08:55 PM | Success |

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Appendix E1: Baseline Survey

Introduction

Thank you for agreeing to participate in our study. Please complete the following questionnaire by answering all questions to the best of your ability. Your response will be counted as received when you reach the end of the survey. If you have any questions or concerns, feel free ask one of the pharmacy team members to assist you.

Identifier & Study Medication

<Unique identifier – tech will input this for the baseline survey>

<Study medication – tech will input this for the baseline survey>

Medications and Chronic Conditions

Question 1. In the box below, enter the TOTAL NUMBER of medications you are currently taking on a regular basis. Include any over-the-counter medications, herbal products, and vitamins you are currently taking, as well as prescriptions.

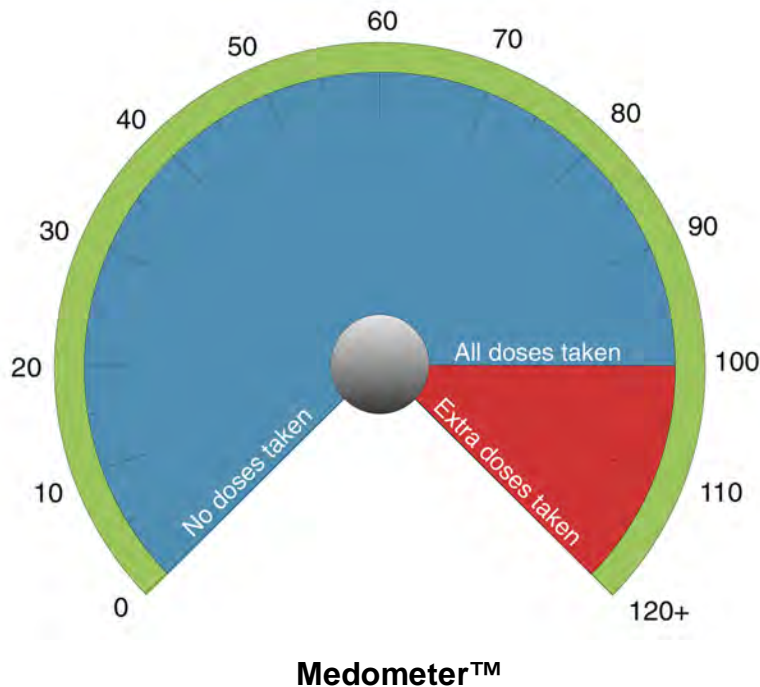
<Text box>

Question 2. Which medical conditions have you been told you have by your health care provider? Check all that apply.

| | | | | |
|------------------|--|---------------------|---|--|
| Anxiety | Arthritis | Asthma | Blood clots | Blood disorder (e.g., anemia, bleeding problems) |
| Cancer | COPD | Depression | Diabetes | Glaucoma |
| Gout | Heart disease (e.g., heart attack, heart failure, arrhythmias) | High blood pressure | High cholesterol | Kidney problems |
| Liver problems | Mental illness | Muscle problems | Neurological problems | Osteoporosis |
| Seizures | Skin problems (e.g., psoriasis, eczema) | Sleep apnea | Stomach/intestinal problems (e.g., acid reflux, irritable bowl syndrome, ulcer) | Stroke |
| Thyroid problems | Urinary problems | | | |

Medication Adherence (Medometer)

Question 3. Now, think about the medication you will receive in the special MEMS pill bottle. Look at the picture below and think about how often you took your dose correctly as prescribed by your healthcare provider OVER THE PREVIOUS FOUR WEEKS.



Now **choose the number (percentage) from 0 to 120 that best represents how often you took your dose of this medication correctly as prescribed by your healthcare provider OVER THE PREVIOUS FOUR WEEKS.** For example, if you have taken all of your medication doses during the previous 4 weeks, you should enter 100 in the box below; if you have taken only half of your medication doses, you should enter 50 in the box below.

You may enter any number (percentage) between 0 and 120 in the box below. Please do so now.

<text box>

Sociodemographics

Question 4.

Think of this ladder as representing where people stand in their communities.

People define community in different ways; please define it in whatever way is most meaningful to you. At the **top** of the ladder are the people who have the highest standing in their community. At the **bottom** are the people who have the lowest standing in their community.

Where would you place yourself on this ladder?

Please place a large "X" on the rung where you think you stand at this time in your life, relative to other people in your community.



Question 5.

Think of this ladder as representing where people stand in the United States.

At the **top** of the ladder are the people who are the best off – those who have the most money, the most education and the most respected jobs. At the **bottom** are the people who are the worst off – who have the least money, least education, and the least respected jobs or no job. The higher up you are on this ladder, the closer you are to the people at the very top; the lower you are, the closer you are to the people at the very bottom.

Where would you place yourself on this ladder?

Please place a large "X" on the rung where you think you stand at this time in your life, relative to other people in the United States.



Question 6. What is the highest level of regular school you have completed? (Check one.)

- No schooling completed
- Elementary School
- Junior High School
- High School
- College
- Graduate School

Question 7. What is the highest degree you earned? (Check one.)

- High school diploma or equivalency (GED)
- Associate degree (junior college)
- Bachelor's degree
- Master's degree
- Doctorate
- Professional (MD, JD, DDS, etc.)
- Other
- None of the above (less than high school)

Question 8. Which of the following best describes your current main daily activities and/or responsibilities?

- Working full time
- Working part-time
- Unemployed or laid off
- Looking for work
- Keeping house or raising children full-time
- Retired

Question 9. With regard to your current or most recent job activity:

How much did you earn, before taxes and other deductions, during the past 12 months?

- Less than \$5,000
- \$5,000 through \$11,999
- \$12,000 through \$15,999
- \$16,000 through \$24,999
- \$25,000 through \$34,999
- \$35,000 through \$49,999
- \$50,000 through \$74,999
- \$75,000 through \$99,999
- \$100,000 and greater

- Don't know
- Prefer not to answer

Question 10. How many people are currently living in your household, including yourself?

- <Dropdown menu> Number of people
- <Dropdown menu> Of these people, how many are children?
- <Dropdown menu> Of these people, how many are adults?
- <Dropdown menu> Of the adults, how many bring income into the household?

Question 11. Is the home where you live:

- Owned or being bought by you (or someone in the household)?
- Rented for money?
- Occupied without payment of money or rent?
- Other
- Prefer not to answer

Question 12. Which of these categories best describes your total combined family income for the past 12 months?

This should include income (before taxes) from all sources, wages, rent from properties, social security, disability and/or veteran's benefits, unemployment benefits, workman's compensation, help from relatives (including child payments and alimony), and so on.

- Less than \$5,000
- \$5,000 through \$11,999
- \$12,000 through \$15,999
- \$16,000 through \$24,999
- \$25,000 through \$34,999
- \$35,000 through \$49,999
- \$50,000 through \$74,999
- \$75,000 through \$99,999
- \$100,000 and greater
- Don't know
- Prefer not to answer

Question 13. If you lost all your current source(s) of household income (your paycheck, public assistance, or other forms of income), how long could you continue to live at your current address and standard of living?

- Less than 1 month
- 1 to 2 months
- 3 to 6 months
- 7 to 12 months
- More than 1 year
- Prefer not to answer

Question 14a. Suppose you needed money quickly, and you cashed in all of your (and your spouse's) checking and savings accounts, and any stocks and bonds. If you added up what you would get, about how much would this amount to?

- Less than \$500
- \$500 to \$4,999
- \$5,000 to \$9,999
- \$10,000 to \$19,999
- \$20,000 to \$49,999
- \$50,000 to \$99,999
- \$100,000 to \$199,999
- \$200,000 to \$499,999
- \$500,000 and greater
- Don't know
- Prefer not to answer

Question 14b. If you now subtracted out any debt that you have (credit card debt, unpaid loans including car loans, home mortgage), about how much would you have left?

- Less than \$500
- \$500 to \$4,999
- \$5,000 to \$9,999
- \$10,000 to \$19,999
- \$20,000 to \$49,999
- \$50,000 to \$99,999
- \$100,000 to \$199,999
- \$200,000 to \$499,999
- \$500,000 and greater
- Don't know
- Prefer not to answer

Question 15. What is your sex?

- Male
- Female
- Prefer not to answer

Question 16. Are you of Hispanic, Latino, or Spanish origin?

- No, not of Hispanic, Latino, or Spanish origin
- Yes, Mexican, Mexican Am., Chicano
- Yes, Puerto Rican
- Yes, Cuban
- Yes, another Hispanic, Latino, or Spanish origin
- Prefer not to answer

Question 17. What is your race? (Please select all that apply)

- White
- Black or African American
- American Indian or Alaska Native
- Asian Indian
- Asian (e.g., Chinese, Filipino, Japanese, Korean, Vietnamese, Other Asian)
- Native Hawaiian or Other Pacific Islander
- None of the above
- Prefer not to answer

Question 18. What is your date of birth? (please use format: MM/DD/YYYY)

Question 19. What is your marital status?

- Single (never married)
- Currently married (or domestic partnership)
- Separated, divorced, or widowed
- Prefer not to answer

Question 20. Do you use or own a smartphone as your primary mobile phone?

- Yes
- No (If no, please skip the next question)

Question 21. What type of smartphone do you use as your primary mobile phone?

- iPhone
- Android (e.g., DROID by Motorola or Samsung Galaxy)
- Windows Phone (e.g., Nokia Lumina or HTC Windows Phone 8X)
- Blackberry
- Other

Marlowe-Crowne Scale (Reynolds's Form C)

Question 22. Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is **True or False** as it pertains to you personally.

1. It is sometimes hard for me to go on with my work if I am not encouraged.
2. I sometimes feel resentful when I don't get my way.
3. On a few occasions, I have given up doing something because I thought too little of my ability.
4. There have been times when I felt like rebelling against people in authority even though I knew they were right.
5. No matter who I'm talking to, I'm always a good listener.
6. There have been occasions when I took advantage of someone.
7. I'm always willing to admit it when I make a mistake.
8. I sometimes try to get even rather than forgive and forget.
9. I am always courteous, even to people who are disagreeable.
10. I have never been irked when people expressed ideas very different from my own.
11. There have been times when I was quite jealous of the good fortune of others.
12. I am sometimes irritated by people who ask favors of me.
13. I have never deliberately said something that hurt someone's feelings.

Preference for Incentive-type

Question 23. The following questions are aimed at determining how important different incentives and types of reward structures are to you. Please rate how important each of these things are to you, on a scale from 1 to 5, where 1 = not at all important and 5 = very important.

| | Not at all Important | Slightly Important | Moderately Important | Important | Very Important |
|---|----------------------|--------------------|----------------------|-----------|----------------|
| <p>Receiving personal gratification from knowing that...</p> <p>-You know you take your medication everyday as prescribed</p> <p>-Others in your Marble City Pharmacy community know you take your medication everyday as prescribed</p> <p>-Your family & friends know you take your medication everyday as prescribed</p> <p>-Your Pharmacist knows you take your medication everyday as prescribed</p> | | | | | |
| <p>Knowing that you take your medication as prescribed more often than...</p> <p>-Others in your Marble City Pharmacy community taking similar medications</p> <p>-Family & friends taking similar medications</p> | | | | | |
| <p>Knowing that you take your medication as prescribed less often than...</p> <p>-Others in your Marble City Pharmacy community taking similar medications</p> <p>-Family & friends taking similar medications</p> | | | | | |
| <p>Knowing exactly how your rank, for instance being in the top 10%, in how often you take your medication as prescribed among...</p> <p>- Others in your Marble City Pharmacy community taking similar medications</p> | | | | | |

| | | | | | |
|---|--|--|--|--|--|
| -Family & friends taking similar medications | | | | | |
| Receiving virtual badges that represent personal milestones for taking your medication everyday as prescribed | | | | | |
| Receiving a small cash payout (e.g., \$1) for every day you take your medication as prescribed | | | | | |
| The chance to win a large cash payout (e.g., \$50) once a week for taking your medication everyday that week as prescribed | | | | | |

Appendix E2: Follow-up Survey

Introduction

Thank you again for agreeing to participate in our study. Please complete the following questionnaire by answering all questions to the best of your ability. Your response will be counted as received when you reach the end of the survey. If you have any questions or concerns, feel free to contact me or one of the pharmacy team members to assist you.

Identifier & Study Medication

<Unique identifier – tech will input this for the baseline survey>

<Study medication – tech will input this for the baseline survey>

Medications and Chronic Conditions

Question 1. In the box below, enter the TOTAL NUMBER of medications you are currently taking on a regular basis. Include any over-the-counter medications, herbal products, and vitamins you are currently taking, as well as prescriptions.

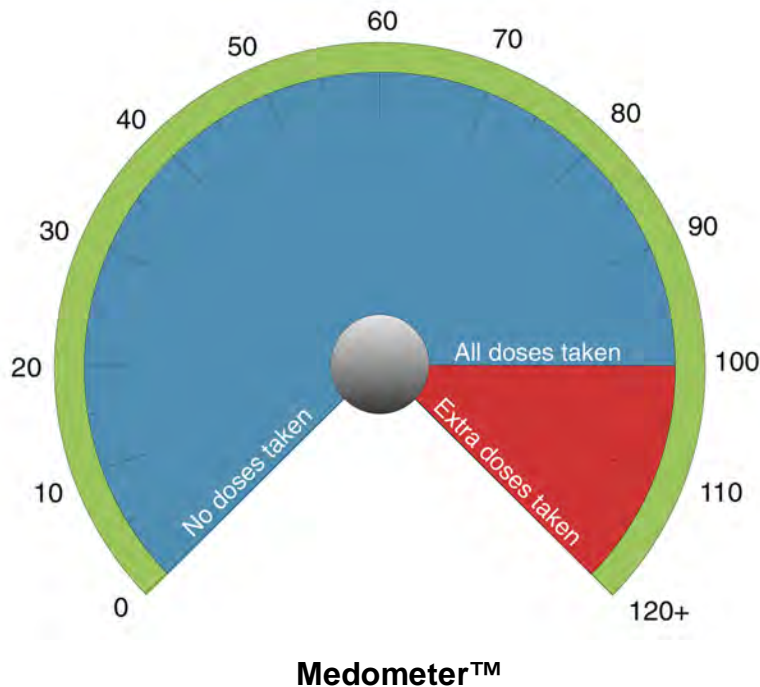
<Text box>

Question 2. Which medical conditions have you been told you have by your health care provider? Check all that apply.

| | | | | |
|------------------|--|---------------------|--|--|
| Anxiety | Arthritis | Asthma | Blood clots | Blood disorder (e.g., anemia, bleeding problems) |
| Cancer | COPD | Depression | Diabetes | Glaucoma |
| Gout | Heart disease (e.g., heart attack, heart failure, arrhythmias) | High blood pressure | High cholesterol | Kidney problems |
| Liver problems | Mental illness | Muscle problems | Neurological problems | Osteoporosis |
| Seizures | Skin problems (e.g., psoriasis, eczema) | Sleep apnea | Stomach/intestinal problems (e.g., acid reflux, irritable bowel syndrome, ulcer) | Stroke |
| Thyroid problems | Urinary problems | | | |

Medication Adherence (Medometer)

Question 3. Now, think about the medication you received in the special MEMS pill bottle. Look at the picture below and think about how often you took your dose correctly as prescribed by your healthcare provider OVER THE PREVIOUS FOUR WEEKS.



Now **choose the number (percentage) from 0 to 120 that best represents how often you took your dose of this medication correctly as prescribed by your healthcare provider OVER THE PREVIOUS FOUR WEEKS.** For example, if you have taken all of your medication doses during the previous 4 weeks, you should enter 100 in the box below; if you have taken only half of your medication doses, you should enter 50 in the box below.

You may enter any number (percentage) between 0 and 120 in the box below. Please do so now.

<text box>

Sociodemographics

Question 4.

Think of this ladder as representing where people stand in their communities.

People define community in different ways; please define it in whatever way is most meaningful to you. At the **top** of the ladder are the people who have the highest standing in their community. At the **bottom** are the people who have the lowest standing in their community.

Where would you place yourself on this ladder?

Please place a large "X" on the rung where you think you stand at this time in your life, relative to other people in your community.



Question 5.

Think of this ladder as representing where people stand in the United States.

At the **top** of the ladder are the people who are the best off – those who have the most money, the most education and the most respected jobs. At the **bottom** are the people who are the worst off – who have the least money, least education, and the least respected jobs or no job. The higher up you are on this ladder, the closer you are to the people at the very top; the lower you are, the closer you are to the people at the very bottom.

Where would you place yourself on this ladder?

Please place a large "X" on the rung where you think you stand at this time in your life, relative to other people in the United States.



Question 6. Which of the following best describes your current main daily activities and/or responsibilities?

- Working full time
- Working part-time
- Unemployed or laid off
- Looking for work
- Keeping house or raising children full-time
- Retired

Question 7. How many people are currently living in your household, including yourself?

- <Dropdown menu> Number of people
- <Dropdown menu> Of these people, how many are children?
- <Dropdown menu> Of these people, how many are adults?
- <Dropdown menu> Of the adults, how many bring income into the household?

Question 8. Is the home where you live:

- Owned or being bought by you (or someone in the household)?
- Rented for money?
- Occupied without payment of money or rent?
- Other
- Prefer not to answer

Question 9. What is your sex?

- Male
- Female
- Prefer not to answer

Question 10. Are you of Hispanic, Latino, or Spanish origin?

- No, not of Hispanic, Latino, or Spanish origin
- Yes, Mexican, Mexican Am., Chicano
- Yes, Puerto Rican
- Yes, Cuban
- Yes, another Hispanic, Latino, or Spanish origin
- Prefer not to answer

Question 11. What is your race? (Please select all that apply)

- White
- Black or African American
- American Indian or Alaska Native
- Asian Indian

- Asian (e.g., Chinese, Filipino, Japanese, Korean, Vietnamese, Other Asian)
- Native Hawaiian or Other Pacific Islander
- None of the above
- Prefer not to answer

Question 12. What is your date of birth? (please use format: MM/DD/YYYY)

Question 13. What is your marital status?

- Single (never married)
- Currently married (or domestic partnership)
- Separated, divorced, or widowed
- Prefer not to answer

Question 14. Do you use or own a smartphone as your primary mobile phone?

- Yes
- No (If no, please skip the next question)

Question 15. What type of smartphone do you use as your primary mobile phone?

- iPhone
- Android (e.g., DROID by Motorola or Samsung Galaxy)
- Windows Phone (e.g., Nokia Lumina or HTC Windows Phone 8X)
- Blackberry
- Other

Marlowe-Crowne Scale (Reynolds's Form C)

Question 16. Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is **True** or **False** as it pertains to you personally.

1. It is sometimes hard for me to go on with my work if I am not encouraged.
2. I sometimes feel resentful when I don't get my way.
3. On a few occasions, I have given up doing something because I thought too little of my ability.
4. There have been times when I felt like rebelling against people in authority even though I knew they were right.
5. No matter who I'm talking to, I'm always a good listener.
6. There have been occasions when I took advantage of someone.
7. I'm always willing to admit it when I make a mistake.
8. I sometimes try to get even rather than forgive and forget.
9. I am always courteous, even to people who are disagreeable.
10. I have never been irked when people expressed ideas very different from my own.
11. There have been times when I was quite jealous of the good fortune of others.
12. I am sometimes irritated by people who ask favors of me.
13. I have never deliberately said something that hurt someone's feelings.

Preference for Incentive-type

Question 17. The following questions are aimed at determining how important different incentives and types of reward structures are to you. Please rate how important each of these things are to you, on a scale from 1 to 5, where 1 = not at all important and 5 = very important.

| | Not at all Important | Slightly Important | Moderately Important | Important | Very Important |
|---|----------------------|--------------------|----------------------|-----------|----------------|
| <p>Receiving personal gratification from knowing that...</p> <p>-You know you take your medication everyday as prescribed</p> <p>-Others in your Marble City Pharmacy community know you take your medication everyday as prescribed</p> <p>-Your family & friends know you take your medication everyday as prescribed</p> <p>-Your Pharmacist knows you take your medication everyday as prescribed</p> | | | | | |
| <p>Knowing that you take your medication as prescribed more often than...</p> <p>-Others in your Marble City Pharmacy community taking similar medications</p> <p>-Family & friends taking similar medications</p> | | | | | |
| <p>Knowing that you take your medication as prescribed less often than...</p> <p>-Others in your Marble City Pharmacy community taking similar medications</p> <p>-Family & friends taking similar medications</p> | | | | | |
| <p>Knowing exactly how your rank, for instance being in the top 10%, in how often you take your medication as prescribed among...</p> <p>- Others in your Marble City Pharmacy community taking similar medications</p> | | | | | |

| | | | | | |
|---|--|--|--|--|--|
| - Family & friends taking similar medications | | | | | |
| Receiving virtual badges that represent personal milestones for taking your medication everyday as prescribed | | | | | |
| Receiving a small cash payout (e.g., \$1) for every day you take your medication as prescribed | | | | | |
| The chance to win a large cash payout (e.g., \$50) once a week for taking your medication everyday that week as prescribed | | | | | |

Appendix F: Marble City Pharmacy Permission Letter



Marble City Health Mart Pharmacy

01.22.2016

HEALTH MART
PHARMACY

Justin Owensby
PharmD, PhD Candidate, Health Outcomes Research and Policy
Auburn University Harrison School of Pharmacy
020 James E. Foy Hall, Auburn University, AL 36849

Owners:

Re: Letter of Support for Proposed Research Project

Jared Johnson, PHARM.D.

Dear Dr. Owensby,

Jared@marblecitypharmacy.com

Jacob Johnson, PHARM.D.

Jared@marblecitypharmacy.com

As co-owners of Marble City Pharmacy, a study site for the proposed research, we are pleased to write a letter in full support for the study proposed by you and your research team in the Department of Health Outcomes Research and Policy within Auburn University's Harrison School of Pharmacy (AUHSOP). Our pharmacy serves approximately 6,050 patients and fills an average of 425 prescriptions per day. Marble City Pharmacy is a progressive pharmacy that provides a full menu of pharmacy services, including medication therapy management evaluations, medication monitoring services, medication dispensing, and free medication delivery. The pharmacy is staffed by full-time pharmacists, lead technicians, supporting technicians, fourth year pharmacy students, cashiers, and delivery drivers. As part of our role in the proposed research, we will identify patients who have active prescriptions for medications for hypertension and/or hyperlipidemia as candidates for this study. The recruitment and consent of these patients will be integrated into the daily operations of the pharmacy, and staff would be trained on the study protocol (a fourth-year student pharmacist would be assigned to the project) so everyone would be engaged in assisting you with achieving your desired sample size. Eligible patients will be identified using pharmacy records and recruitment will be accomplished using a combination of methods, including mailed letters, phone calls, and active recruiting at the point of care. Consenting and training videos (including use of MEMS vial and, if applicable, uploading of data to study website) will be made available for participants to view on site, which will reduce the pharmacy staff time required for each enrollment, and ensure fidelity in how the information is communicated. During the 90-day follow-up period, the pharmacy will refill the study medication(s) in the MEMS vial and collect the MEMS vial (including MEMS data reader if applicable) at the conclusion of the study.

264 W. FORT WILLIAMS ST
SYLACAUGA, ALABAMA 35150

TELEPHONE:

256-245-4446

FAX:

256-245-4484

www.marblecitypharmacy.com

Marble City Pharmacy is an ideal site for this project because we have the resources necessary to fulfill the needs of the proposed study in terms of patient recruitment, enrollment, and dispensing of study drug. In addition, our pharmacy serves a diverse population in a rural area in our state. Sylacauga, the town in which we are located, has a total population of approximately 12,864 (17% over the age of 65, 35% minority, and 27% with income below poverty level). In addition, our patients are engaged and loyal to using our pharmacy. The pharmacists, students, and technicians at Marble City Pharmacy will support you and your team in patient recruitment, consent, enrollment, and data collection as outlined in this proposal.

Sincerely,

Jared Johnson, PharmD
Co-Owner of Marble City Pharmacy

Jacob Johnson, PharmD
Co-Owner of Marble City Pharmacy

Appendix G: Phase II Telephone Recruitment Script and Verbal Informed Consent

Semi-structured Interviews

Request for Modification 16-009 MR 1602

Information Script

Telephone Recruitment Script and Verbal Informed Consent

Hello. This is Dr. Justin Owensby and I want to thank you for participating and completing my research study titled, “Commitment Contracts: Leveraging Behavioral Economics-based Interventions for Medication Adherence”. As you may recall you were in the [usual care or financial incentive or social incentive] group of the study. I am calling to see if you would be interested in participating in a 30-minute ‘exit interview’ regarding your experiences and perceptions of your participation in my study.

-As a usual care group participant, I am interested in learning more about your overall thoughts of this study, your motivations for joining, and would greatly value your feedback on areas where I may improve this study.

-As a financial incentive group participant, I am interested in learning more about your overall thoughts of this study, your motivations for joining, your thoughts regarding the financial incentive, your experience with the study website, and would greatly value your feedback on areas where I may improve this study.

-As a social incentive group participant, I am interested in learning more about your overall thoughts of this study, your motivations for joining, your thoughts regarding the social incentive, your experience with the study website, and would greatly value your feedback on areas where I may improve this study.

The interview will be audio recorded and the audio files will be transcribed with no identifiable information included and will be destroyed after transcription. As a reminder this study has received IRB approval and your previous consent (document) contains information about who to contact if you have any concerns about being a research participant. If you decide to participate you will receive a \$25 gift card.

NO thank you: Thank you for your time and participation in my study.

NOT RIGHT NOW: When is the best time to call you back?

YES: Great. Before we begin I would like to go over some details about this interview so that you may make an informed decision about participating.

If you have any questions as we go along, please feel free to let me know. All exit interviews will be recorded using a digital voice recorder and your identity will remain confidential throughout all points of the study. The purpose of this interview is to explore and learn more

about your overall experience with this study. Your participation is voluntary and you may decline to answer any question or you may end the interview at any time. If you decide to participate then you will receive a \$25 gift card.

What questions can I answer for you now that I've gone over the basics?

Would you like to continue with the exit interview?

NO thank you: Thank you for your time and participation in my study.

YES: Great. I will now start recording this conversation. Let's begin...

Questions for semi-structured interviews:

[All participants]

- What was your experience with the study?
- Tell me how we can improve this study?
- What were your motivations for participating?
 - Would you participate again?
 - How would you go about asking one of your friends, family members, or peers to sign up?
- Tell me about your experience with the special medication vial (MEMS vial)?
- Do you think your behaviors would have been different if you were given an incentive? What incentive?

[Financial Incentive Participants]

- Tell me about your experience as a financial incentive participant
 - To what extent did the financial incentive prompt you to take your medication?
 - When you remember to take your medication how often did you think about the money in your virtual account?
- Tell me your thoughts about the financial incentive itself -
 - Prompt discussion regarding preference for *type* of financial incentive
 - Preference for receiving a financial incentive in the form of a daily cash payout, weekly lottery, or other?
 - How much money per day is enough to trigger reminder?
- If you could choose a non-monetary prizes as a reward for taking your medication what would it be and why?
- What was your experience with the study website?
 - Tell me how we can improve this?
 - Tell me about your experience with uploading your data to the study website?

- What role (if any) did the commitment contract you signed at the beginning of the study play in you taking your medication every day?

[Social Incentive Participants]

- Tell me about your experience as a social incentive participant
 - To what extent did the social incentive prompt you to take your medication?
 - When you remember to take your medication how often did you think about the other members in your group?
- To what extent did the group dynamic play in you taking your medication every day?
 - Prompt discussion on preference for *type* of social incentive
 - What aspect of the social incentive did you prefer?
 - Social comparison v. competition (via leaderboard)
 - Intimate partner v. family v. friends v. peers v. strangers
- What was your experience with the study website?
 - Tell me how we can improve this?
 - How often (if any) did you
 - Visit the study website?
 - Check out your rank in the leaderboard?
 - Note your adherence compared to the groups?
 - View your badges?
 - Tell me about your experience with uploading your data to the study website?
- What role (if any) did the commitment contract you signed at the beginning of the study play in you taking your medication every day?

Appendix H: Phase II IRB Stamped Informed Consent



HARRISON SCHOOL OF PHARMACY
DEPARTMENT OF HEALTH OUTCOMES RESEARCH AND POLICY

(NOTE: DO NOT SIGN THIS DOCUMENT UNLESS AN IRB APPROVAL STAMP WITH CURRENT DATES HAS BEEN APPLIED TO THIS DOCUMENT.)

**INFORMED CONSENT
for a Research Study entitled
“Defining and Exploring the Role of Social Incentives for Health Behavior Change:
Focus Groups”**

You are invited to participate in a research study to explore the role of social incentives for health behavior change. The study is being conducted by Justin Owensby, graduate student, under the direction of Kimberly Garza, assistant professor in the Auburn University Department of Health Outcomes Research and Policy. The purpose of the study is to understand the social factors that may motivate behavioral change. You were selected as a possible participant because you receive your medications from the Auburn University Employee Pharmacy and are 19 years of age or older. In order to be eligible for the study, you must administer your own medications and be able to speak and understand English.

What will be involved if you participate? If you decide to participate in this research study, you will be asked to participate in one focus group session at the Harrison School of Pharmacy. We will invite 8 to 10 people to meet together to discuss their experiences with social factors in regards to healthful behavior. The discussion topics include discussing social incentives (in general), current and past experience with social incentives for healthful behaviors, use of mobile technology (e.g., smartphones), use of medication-taking apps, and future recommendations on using social incentives. You will complete a 15 minute survey at the beginning of the session. The survey will consist of questions related to past medical history, demographic information, and how important different incentives and types of reward structures are to you. A member of the research team will help guide the discussion. The focus group will last about 90 minutes and we will audiotape the discussion to make sure that it is recorded accurately. You must agree to be audiotaped to participate in the focus group.

Are there any risks or discomforts? The risks involved in participating in the study are minimal. The possibility of a breach of confidentiality cannot be completely eliminated. While unlikely, there is a chance that another member of the focus group may reveal something about another member they learned in the discussion. All focus group members will be asked to respect the privacy of other group members. You may choose not to answer any discussion question and you can stop your participation in the focus group at any time.

Are there any benefits to yourself or others? While participants may not receive a direct benefit from participating in this research, some people find sharing their stories and/or perceptions to be a valuable experience. Participants are likely to raise self-awareness regarding social incentives and healthful activities.

Participant’s Initials _____

The Auburn University Institutional
Review Board has approved this
Document for use from
02/12/2017 to 02/11/2018
Protocol # 17-039 EP 1702

Will you receive compensation for participating? Participants will be compensated for participation in the study. Participants will be fed dinner and compensated with a \$10 gift card for their time (approximately 90 minutes).

Are there any costs? There are not costs to participate.

If you change your mind about participating, you can withdraw at any time during the study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the Department of Health Outcomes Research and Policy, the Harrison School of Pharmacy, or the Auburn University Employee Pharmacy.

Your privacy will be protected. Any information obtained in connection with this study will remain confidential. Information obtained through your participation may be published in a professional journal or presented at a professional meeting. Your name will not be used in publications or presentations that result from this study. To keep your information safe, the audio file of the focus group will be placed in a locked file cabinet until a written word-for-word copy of the discussion has been created and then it will be erased. The researchers will enter study data on a computer that is password-protected and uses special coding to protect the information.

If you have questions about this study, please ask them now or contact Justin Owensby by phone at 334-246-0882 or e-mail at owensjk@auburn.edu. A copy of this document will be given to you to keep.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334)-844-5966 or e-mail at IRBadmin@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH STUDY. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE.

020 JAMES E. FOY HALL
282 WEST THACH CONCOURSE
AUBURN, AL 36849

TELEPHONE:
334-844-5152

FAX:
334-844-8307

Participant's signature Date

Printed Name

Investigator obtaining consent Date

Printed Name

Co-Investigator Date

Printed Name

The Auburn University Institutional Review Board has approved this Document for use from 02/12/2017 to 02/11/2018 Protocol # 17-039 EP 1702

Participant's Initials _____

Appendix I: Phase II Recruitment Scripts and Materials

Recruitment: Flyer

Are you interested in participating in a focus group to discuss interesting ways of doing healthy habits and healthy behaviors?

If so, Dr. Justin Owensby, pharmacist and graduate student at the Harrison School of Pharmacy, is looking for AU Employee Pharmacy patients who would like to share their ideas and hear from others about the social factors that motivate you to do healthful behaviors. This can be anything from walking with a co-worker, choosing to eat more nutritious foods with a friend, or even using a family member to help stay accountable with taking daily medications. We are interested in hearing from YOU.

This study is for employees who are 19 years of age or older and fill their medications at the AU employee pharmacy. It involves participating in a focus group session and will last approximately 90 minutes.

Dinner will be provided and participants will receive a \$10 gift card at the end.

Interested? Please contact Dr. Justin Owensby at 334.246.0882 or by email at owensjk@auburn.edu or contact the AUEP at 334.844.8938

The Auburn University Institutional
Review Board has approved this
Document for use from
02/12/2017 to 02/11/2018
Protocol # 17-039 EP 1702

Recruitment: Flyer

Are you interested in participating in a focus group to discuss interesting ways of doing healthy habits and healthy behaviors?

If so, Dr. Justin Owensby, pharmacist and graduate student at the Harrison School of Pharmacy, is looking for AU Employee Pharmacy patients who would like to share their ideas and hear from others about the social factors that motivate you to do healthful behaviors. This can be anything from walking with a co-worker, choosing to eat more nutritious foods with a friend, or even using a family member to help stay accountable with taking daily medications. We are interested in hearing from YOU.

This study is for employees who are 19 years of age or older and fill their medications at the AU employee pharmacy. It involves participating in a focus group session and will last approximately 90 minutes.

The focus group will take place at the Harrison School of Pharmacy in room [#] on [Month, Day, Year] from [Time].

Dinner will be provided and participants will receive a \$10 gift card at the end.

Interested? Please contact Dr. Justin Owensby at 334.246.0882 or by email at owensjk@auburn.edu or contact the AUEP at 334.844.8938

The Auburn University Institutional
Review Board has approved this
Document for use from
02/20/2017 to 02/11/2018
Protocol # 17-039 EP 1702

Recruitment: Facebook post

Are you interested in participating in a focus group to discuss interesting ways of doing healthy habits and healthy behaviors?

If so, Dr. Justin Owensby, pharmacist and graduate student at the Harrison School of Pharmacy, is looking for AU Employee Pharmacy patients who would like to share their ideas and hear from others about the social factors that motivate you to do healthful behaviors. This can be anything from walking with a co-worker, choosing to eat more nutritious foods with a friend, or even using a family member to help stay accountable with taking daily medications. We are interested in hearing from YOU.

This study is for employees who are 19 years of age or older and fill their medications at the AU employee pharmacy. It involves participating in a focus group session and will last approximately 90 minutes.

The focus group will take place at the Harrison School of Pharmacy in room [#] on [Month, Day, Year] from [Time].

Dinner will be provided and participants will receive a \$10 gift card at the end.

Interested? Please contact Dr. Justin Owensby at 334.246.0882 or by email at owensjk@auburn.edu or contact the AUEP at 334.844.8938

Recruitment: E-mail

Subject: [AU Employee Pharmacy] Focus Group Invitation

Dear Patient:

Are you interested in participating in a focus group to discuss interesting ways of doing healthy habits and healthy behaviors?

If so, Dr. Justin Owensby, pharmacist and graduate student at the Harrison School of Pharmacy, is looking for AU Employee Pharmacy patients who would like to share their ideas and hear from others about the social factors that motivate you to do healthful behaviors. This can be anything from walking with a co-worker, choosing to eat more nutritious foods with a friend, or even using a family member to help stay accountable with taking daily medications. We are interested in hearing from YOU.

This study is for employees who are 19 years of age or older and fill their medications at the AU employee pharmacy. It involves participating in a focus group session and will last approximately 90 minutes.

The focus group will take place at the Harrison School of Pharmacy in room [#] on [Month, Day, Year] from [Time].

Dinner will be provided and participants will receive a \$10 gift card at the end.

Interested? Please contact Dr. Justin Owensby at 334.246.0882 or by email at owensjk@auburn.edu or you may contact the AUEP at 334.844.8938 or by simply responding to this e-mail.

Recruitment: Follow-up E-mail

Subject: [AU Employee Pharmacy] Focus Group Invitation

Dear Patient:

This is a follow-up email regarding the focus group invitation you received last week. We wanted to ensure that you received the invitation and ask if you have any questions about the upcoming focus group session. A copy of the recruitment flyer is attached to this e-mail for your review. If you have any questions, or are interested in joining, please contact Dr. Justin Owensby at 334.246.0882 or by email at owensjk@auburn.edu or you may contact the AUEP at 334.844.8938 or by simply responding to this e-mail.

[attach flyer]

Recruitment: phone call (script)

“Hi Mr./Mrs./Ms. [last name]. This is Dr. Justin Owensby and I am a pharmacist and current graduate student at the Harrison School of Pharmacy. I am working with the AU Employee Pharmacy to find patients who are willing to participate in a focus group to discuss interesting ways doing healthy habits and healthy behaviors. You may have received an email about this in the previous weeks and if so I wanted to follow-up to answer any questions you may have.

If the patient says they didn't receive it or didn't read it:

“Do you mind if I take a few minutes to tell you about the study?” If the patient says, “yes,” I would proceed to read from the approved recruitment letter to the patient and begin to ask screening questions where appropriate.

“Are you interested in participating in a focus group to discuss interesting ways of doing healthy habits and healthy behaviors?”

I am currently looking for AU Employee Pharmacy patients who would like to share their ideas and hear from others about the social factors that motivate you to do healthful behaviors. This can be anything from walking with a co-worker, choosing to eat more nutritious foods with a friend, or even using a family member to help stay accountable with taking daily medications. I am interested in hearing from YOU.”

“Does this sound like something you may be interested in learning more about?” -If patient says “no” then I will thank them for their time.-If patient says, “yes”:

(Please note the portion of the script below will also be used when patients call the pharmacy and want more information or express interest in joining)

“Great. Would you like me to go over some more details of the study now or would you like me to send you these details (as an email or in the mail)?”-If patient would like the details as an email then I will obtain the email address and confirm the patients understanding that study specific information will be sent to this email address.

-If patient would like the details sent through the mail then the I will confirm the mailing address on file and confirm the patients understanding that study specific information will be sent to the given address.

-If patient would like to hear study details over the phone then I will read from the following:

“This study is for employees who are 19 years of age or older and fill their medications at the AU employee pharmacy. It involves participating in a focus group session and will last approximately 90 minutes.

The focus group will take place at the Harrison School of Pharmacy in room [#] on [Month, Day, Year] from [Time].

Dinner will be provided and participants will receive a \$10 gift card at the end.”

“Do you have any questions for me or do you think you might want to participate in this study?”If the patient says “no” to questions and “no” to the invitation to participate then I will thank them for their time.

If the patient says, “yes,” to the invitation to participate then I will proceed to schedule an appointment for enrollment.

Recruitment: Voicemail script (when participants directly call Justin Owensby's research phone number)

Hello. This is Dr. Justin Owensby with Auburn University's Harrison School of Pharmacy. Thank you for expressing interest in my research study. Please leave your name, number, and a detailed message about yourself and I will get back to you as soon as possible. Have a great day!

Recruitment: Flyer

Are you interested in participating in a focus group to discuss interesting ways of doing healthy habits and healthy behaviors?

If so, Dr. Justin Owensby, pharmacist and graduate student at the Harrison School of Pharmacy, is looking for AU Employee Pharmacy patients who would like to share their ideas and hear from others about the social factors that motivate you to do healthful behaviors. This can be anything from walking with a co-worker, choosing to eat more nutritious foods with a friend, or even using a family member to help stay accountable with taking daily medications. We are interested in hearing from YOU.

This study is for employees who are 19 years of age or older and fill their medications at the AU employee pharmacy. It involves participating in a focus group session and will last approximately 90 minutes.

The focus group will take place at the Harrison School of Pharmacy in room [#] on [Month, Day, Year] from [Time].

Dinner will be provided and participants will receive a \$10 gift card at the end.

Interested? Please contact Dr. Justin Owensby at 334.246.0882 or by email at owensjk@auburn.edu or contact the AU EP at 334.844.8938

Recruitment: Facebook post

Are you interested in participating in a focus group to discuss interesting ways of doing healthy habits and healthy behaviors?

If so, Dr. Justin Owensby, pharmacist and graduate student at the Harrison School of Pharmacy, is looking for AU Employee Pharmacy patients who would like to share their ideas and hear from others about the social factors that motivate you to do healthful behaviors. This can be anything from walking with a co-worker, choosing to eat more nutritious foods with a friend, or even using a family member to help stay accountable with taking daily medications. We are interested in hearing from YOU.

This study is for employees who are 19 years of age or older and fill their medications at the AU employee pharmacy. It involves participating in a focus group session and will last approximately 90 minutes.

The focus group will take place at the Harrison School of Pharmacy in room [#] on [Month, Day, Year] from [Time].

Dinner will be provided and participants will receive a \$10 gift card at the end.

Interested? Please contact Dr. Justin Owensby at 334.246.0882 or by email at owensjk@auburn.edu or contact the AUEP at 334.844.8938

Recruitment: E-mail

Subject: [AU Employee Pharmacy] Focus Group Invitation

Dear Patient:

Are you interested in participating in a focus group to discuss interesting ways of doing healthy habits and healthy behaviors?

If so, Dr. Justin Owensby, pharmacist and graduate student at the Harrison School of Pharmacy, is looking for AU Employee Pharmacy patients who would like to share their ideas and hear from others about the social factors that motivate you to do healthful behaviors. This can be anything from walking with a co-worker, choosing to eat more nutritious foods with a friend, or even using a family member to help stay accountable with taking daily medications. We are interested in hearing from YOU.

This study is for employees who are 19 years of age or older and fill their medications at the AU employee pharmacy. It involves participating in a focus group session and will last approximately 90 minutes.

The focus group will take place at the Harrison School of Pharmacy in room [#] on [Month, Day, Year] from [Time].

Dinner will be provided and participants will receive a \$10 gift card at the end.

Interested? Please contact Dr. Justin Owensby at 334.246.0882 or by email at owensjk@auburn.edu or you may contact the AUEP at 334.844.8938 or by simply responding to this e-mail.

Recruitment: Follow-up E-mail

Subject: [AU Employee Pharmacy] Focus Group Invitation

Dear Patient:

This is a follow-up email regarding the focus group invitation you received last week. We wanted to ensure that you received the invitation and ask if you have any questions about the upcoming focus group session. A copy of the recruitment flyer is attached to this e-mail for your review. If you have any questions, or are interested in joining, please contact Dr. Justin Owensby at 334.246.0882 or by email at owensjk@auburn.edu or you may contact the AUEP at 334.844.8938 or by simply responding to this e-mail.

[attach flyer]

Recruitment: phone call (script)

“Hi Mr./Mrs./Ms. [last name]. This is Dr. Justin Owensby and I am a pharmacist and current graduate student at the Harrison School of Pharmacy. I am working with the AU Employee Pharmacy to find patients who are willing to participate in a focus group to discuss interesting ways doing healthy habits and healthy behaviors. You may have received an email about this in the previous weeks and if so I wanted to follow-up to answer any questions you may have.

If the patient says they didn't receive it or didn't read it:

“Do you mind if I take a few minutes to tell you about the study?” If the patient says, “yes,” I would proceed to read from the approved recruitment letter to the patient and begin to ask screening questions where appropriate.

“Are you interested in participating in a focus group to discuss interesting ways of doing healthy habits and healthy behaviors?”

I am currently looking for AU Employee Pharmacy patients who would like to share their ideas and hear from others about the social factors that motivate you to do healthful behaviors. This can be anything from walking with a co-worker, choosing to eat more nutritious foods with a friend, or even using a family member to help stay accountable with taking daily medications. I am interested in hearing from YOU.”

“Does this sound like something you may be interested in learning more about?” -If patient says “no” then I will thank them for their time.-If patient says, “yes”:

(Please note the portion of the script below will also be used when patients call the pharmacy and want more information or express interest in joining)

“Great. Would you like me to go over some more details of the study now or would you like me to send you these details (as an email or in the mail)?”-If patient would like the details as an email then I will obtain the email address and confirm the patients understanding that study specific information will be sent to this email address.

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“Do you have any questions for me or do you think you might want to participate in this study?”If the patient says “no” to questions and “no” to the invitation to participate then I will thank them for their time.

If the patient says, “yes,” to the invitation to participate then I will proceed to schedule an appointment for enrollment.

Appendix J: Semi-structured Interview & Focus Group Question Guides

Semi-structured interview question guide

For all participants

What was your experience with the study?

Tell me how we can improve this study?

What were your motivations for participating?

- Would you participate again?
- How would you go about asking one of your friends, family members, or peers to sign up?

Tell me about your experience with the special medication vial (MEMS vial)?

Do you think your behaviors would have been different if you were given an incentive? What incentive?

For financial incentive participants

Tell me about your experience as a financial incentive participant

- To what extent did the financial incentive prompt you to take your medication?
- When you remember to take your medication how often did you think about the money in your virtual account?

Tell me your thoughts about the financial incentive itself

- Prompt discussion regarding preference for *type* of financial incentive
- Preference for receiving a financial incentive in the form of a daily cash payout, weekly lottery, or other?
- How much money per day is enough to trigger reminder?

If you could choose a non-monetary prizes as a reward for taking your medication what would it be and why?

What was your experience with the study website?

- Tell me how we can improve this?
- Tell me about your experience with uploading your data to the study website?

What role (if any) did the commitment contract you signed at the beginning of the study play in you taking your medication every day?

For social incentive participants

Tell me about your experience as a social incentive participant

- To what extent did the social incentive prompt you to take your medication?
- When you remember to take your medication how often did you think about the other members in your group?

To what extent did the group dynamic play in you taking your medication every day?

- Prompt discussion on preference for *type* of social incentive
- What aspect of the social incentive did you prefer?
 - Social comparison v. competition (via leaderboard)
 - Intimate partner v. family v. friends v. peers v. strangers

What was your experience with the study website?

- Tell me how we can improve this?
- How often (if any) did you:
 - Visit the study website?

- Check out your rank in the leaderboard?
 - Note your adherence compared to the groups?
 - View your badges?
 - Tell me about your experience with uploading your data to the study website?
- What role (if any) did the commitment contract you signed at the beginning of the study play in you taking your medication every day?

Focus group question guide

Section 1: Defining social incentives

[Opening question] What is a healthy habit or health behavior that you are working on or would like to start working on?

[Asked to write the following down before answering] When you think of a motivation or reason that may be social in nature for wanting to do a healthy habit or behavior, what comes to mind?

Section 2: Experience with social incentives for healthful behaviors

What other social factors might motivate you to maintain a healthy lifestyle?

- It sounds like being in formal programs like this kind of motivates you as well. Does anybody else have thoughts on that, or experience with a program like that that's been beneficial in any way?
- What do y'all think makes a good accountability partner?
- Is there any other social factor, just broadly speaking, that we may have missed, that may motivate you to maintain a healthy lifestyle?

Section 3: Barriers/facilitators to using social incentives

Think back to the last time you wanted to make a change related to your health. It may have been a change in what you eat, your weight, smoking, exercise habits, or medication-taking behaviors.

What kind of barriers or roadblocks did you run into?

Which of these mentioned was most influential?

What helped you or would have helped you in changing this behavior and overcoming barriers?

What role did or could other people have played in your success, changing this behavior?

What other social factors could have helped or motivated you in changing this behavior?

Section 4: Ownership and use of mobile technology and apps

Assess ownership and type of smartphone

What role does your phone play in helping you maintain a healthy lifestyle?

- Facilitate discussion regarding apps (e.g., “tell me about the apps you use in this regard”) and try to relate the “social incentives” in these apps to medication-taking behaviors

When it comes to maintaining a healthy lifestyle, what role (if any) does technology play in keeping you accountable?

Section 5: Recommendations and resources likely to use

While listening to the following scenario think about YOUR medication-taking behavior. Suppose you have been told by your doctor that your “levels” need to be improved and she has now prescribed you a medication-taking app.

- [Asked to write the following down before answering] What features would this app have to have make sure you are successful? Write these down then & in a moment we will discuss.
- What “social” features would you like to have in the app?
- What features do you think you wouldn’t like in this app?

We are trying to help people make healthy changes to their lifestyle. What advice do you have for us?