



4-6-2013

## Prevention-Oriented Clinic

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Ambani, Zainab; Dunlap, Patricia; and Ho, Suzanna, "Prevention-Oriented Clinic" (2013). *Organizational Dynamics Working Papers*. 21.

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Working Paper #13-02

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### Abstract

Chronic diseases are heavily taxing the American health system. The federal government has implemented new laws, such as the Affordable Care Act (ACA), in order to increase American wellness at no additional cost and to reduce the significant financial burden. Considering the enactment of ACA and cost cutting, it's an opportune time to explore new approaches to delivering high quality patient care before the start of a disease. Preventative health wellness clinics can serve this purpose. However, preventative care clinics are not without challenges. Modifying patients' behaviors have proven to be difficult and no research literature exists to provide an evidence-based approach which has a proven record in changing poor patient habits. However, if focus is placed on patients who are at increased risk for developing a chronic illness and tests favorable for behavior modification, the ideal preventative health clinic may set the stage for improved healthcare outcomes and cost reduction.

### Keywords

healthcare, preventative healthcare

### Comments

Working Paper #13-02

# **Prevention-Oriented Clinic**

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**Final Project Report Submitted in Organizational Dynamics 634-13a**

**April 6, 2013**

## **Abstract**

Chronic diseases are heavily taxing the American health system. The federal government has implemented new laws, such as the Affordable Care Act (ACA), in order to increase American wellness at no additional cost and to reduce the significant financial burden. Considering the enactment of ACA and cost cutting, it's an opportune time to explore new approaches to delivering high quality patient care before the start of a disease. Preventative health wellness clinics can serve this purpose. However, preventative care clinics are not without challenges. Modifying patients' behaviors have proven to be difficult and no research literature exists to provide an evidence-based approach which has a proven record in changing poor patient habits. However, if focus is placed on patients who are at increased risk for developing a chronic illness and tests favorable for behavior modification, the ideal preventative health clinic may set the stage for improved healthcare outcomes and cost reduction.

## **I. Background**

### **a. Patient Protection and Affordable Care Act**

The institution of the Patient Protection and Affordable Care Act (PPACA) of 2010 or Affordable Care Act (ACA) has set the stage for a new paradigm in the delivery of healthcare in the United States (U.S.). Not only the law attempts to ensure every American has health insurance, it also strives to reduce the rising cost of healthcare. To address the rising cost, the ACA outline important preventive services for Americans. The goal is to avoid preventable illnesses and to improve health at no additional cost to the patient. Covered services include screening and counseling for alcohol abuse, blood pressure, diet, obesity, tobacco use, and cholesterol (DHHS, 2013).

In addition to providing benefits to patients, ACA also provides perks for clinicians as well. Of particular interest are benefits relating to preventative care. The creation of new models of care coordination and increase health coverage, opens the door to exploring opportunities in preventative medicine and care. For example, in conjunction with ACA, the American Recovery and Reinvestment Act of 2009's healthcare information technology objectives offer opportunities to receive patient information faster and exchange it electronically with other healthcare providers. Also, with an increase insured population and the desire to bulk up preventative care services, new business models can be entertained (i.e. preventative healthcare and wellness clinics). There is much to be gain from these laws in addition to the excitement of partaking in reducing the astronomical cost of America's healthcare.

### **b. Cost of Healthcare and Top Diseases/Conditions**

To take advantage of the PPACA preventative care benefits, it's noteworthy to review the cost breakdown of salient diseases afflicting America's population today. America's national

health expenditure as a percent of gross domestic product (GDP) has continually increased from 16% in 2005 to a projected 19.8% in 2020 (CMS, 2011). Comparatively, other Organization for Economic Co-operation and Development (OECD) countries averaged 9.5% of GDP (2012). This has raised many concerns for policy makers as they try to curb the costs of healthcare. For example, chronic diseases comprise 75% of healthcare spending (CDC, 2011). Most individuals are at the age of 65 and over, comprising 13% of the U.S. population. However, in 2002, this age population consumed 36% of healthcare expenses (AHRQ, 2006). This prompts the need for better prevention and treatment practices for chronically ill patients. (Please see Appendix A for charts and graphs.)

The top ten most expensive chronic illnesses, in order, are heart conditions, trauma-related disorders, cancer, mental disorders, chronic obstructive pulmonary disease (COPD) including asthma, osteoarthritis, diabetes mellitus (DM), hypertension, back problems, and hyperlipidemia (AHRQ, 2010). Obesity related healthcare costs are closely linked to many of the top ten conditions (Finkelstein, Trogon, Cohen, & Dietz, 2009). For the purposes of our preventative healthcare clinic, we will focus efforts on addressing the current top six chronic diseases/conditions affecting Americans. They are heart disease, stroke, mental disorders, chronic obstructive pulmonary disease (COPD) & asthma, diabetes, and obesity. These diseases are most amenable to lifestyle changes and prevention strategies.

Heart disease and stroke are widespread conditions affecting many Americans and costing the U.S. health system billions of dollars each year. According to an AHRQ panel survey, heart conditions are America's most expensive medical condition, totaling \$107 billion per year (AHRQ, 2010). Heart disease is the leading cause of death for both men and women. The Centers for Disease Control and Prevention (CDC) reports 600,000 people die of heart disease every year (CDC, 2013). Similarly to heart disease, stroke also contributes its share of over burdening America's healthcare. The CDC estimates \$38.6 billion per year is spent on handling patients with this disease (CDC, 2013). Stroke is considered the 4th leading cause of American deaths, killing 130,000 per year (CDC, 2013). The disease is also the leading cause of disability among U.S. adults, and requires a heavy expense.

Mental disorders also add a financial burden to America's health system. In 2010, \$73 million was spent on treating mental disorders. However, for the purpose of the proposed ideal clinic, depression will be the primary focus. Depression has established correlations to other chronic diseases and is the most prevalent mental health illness amongst older adults (Welch, Czerwinski, Ghimire & Bertsimas, 2009). In 2009, \$22.8 billion was spent on the treatment of depression and another \$17 to \$44 billion was spent because of lost workdays. In a given year, 18.8 million adults will suffer from a depressive illness (CDC, 2011). Finally, depression is also the principal cause of the 30,000 suicides occurring each year.

In 2010, \$49.9 billion was spent on managing COPD patients. Of that, over 55% of the cost results from complications such as emergency room visits and hospitalizations. COPD affects 13.1 million US adults, but another 24 million have evidence of impaired lung function. COPD is largely preventable, as smoking is the primary risk factor (causing approximately 85-

90% of COPD deaths). Lag times between tobacco exposure and disease development mean that the prevalence of COPD will continue to rise (American Lung Association, 2011).

In 2007, \$56 billion in total was spent on treating asthma. The disease affects 25.9 million Americans, of which 13.2 million had an asthma attack in 2011. Asthma accounted for an estimated 14.2 million lost work days, and for 2.1 million emergency visits. Although the cause of asthma is not well understood, the ability to prevent exacerbations can result in huge cost savings (American Lung Association, 2012).

Diabetes treatments cost Americans over \$51 billion in 2010. DM is the seventh leading cause of death in the United States and it is the leading cause of kidney failure, lower limb amputations, heart disease and stroke. There are 25.8 million Americans (8.3% of the US population) that have diabetes (NIH, 2010). The mortality rate among people with diabetes is double the rate among non-diabetic people within the same age group (NIH, 2010). The estimated number of Americans who are at risk for diabetes is 79 million. However, only 11% are aware they are at risk for developing DM (Reinberg, 2013).

The sixth disease the proposed clinic will address is obesity. According to data from the National Health and Nutrition Examination Survey, between 2009 and 2010, over 78 million U.S. adults and about 12.5 million U.S. children and adolescents were obese (Ogden et al, 2012). America's Health report (2012) states obesity can result in four common high-cost health problems: Type 2 diabetes, coronary heart disease, stroke, hypertension, and obesity-related cancers. Obesity-related healthcare costs approximately \$117 billion annually. More than one quarter of U.S. healthcare costs are related to physical inactivity, overweight, and obesity. Therefore, it is important to prevent the occurrence of obesity, to prevent further consequences, and to reduce the healthcare cost for preventable health problems.

### **c. Description and Goals for Preventative Healthcare Clinic**

Primary care is key to prevention and treatment of the aforementioned top chronic illnesses but unfortunately, the primary care system is suffering. Phillips & Bazemore (2010) review the history and current situation of primary care in the United States. It has been stated that due to the lack of a primary care centered healthcare system, the U.S. is falling farther behind in population health metrics. Furthermore, there is a huge gap in the U.S. physician workforce for primary care. Most physicians enter into subspecialty residencies because of the desire to land higher paying jobs in urban area hospitals. Still, primary care represents the greatest platform for formal healthcare – totaling 57% of all patient visits. Despite the volume of care, it is estimated to be only 6-7% of total healthcare spending for Medicare beneficiaries. The proposed prevention-oriented clinic captures the opportunity to address primary care needs, improve patient outcomes, implement innovative prevention strategies, and provide an integrative patient-centered solution for patients.

In recognition of the benefits of primary care, the increasing costs of healthcare and the shortage of primary care physicians, we suggest a prevention-oriented clinic. This clinic will

target its resources toward populations at highest risk for the six chronic illnesses; having high capability for changing their individual behaviors; and adhering to recommended prevention or treatment guidelines. In this paper, we discuss the current literature on risk assessment for the target diseases and theories on change behavior. We hope to incorporate our findings to create a resource allocation matrix that will serve as a clinical decision support tool to separate patients into cohorts for different levels of intervention.

## **II. Literature Review**

### **a. Heart Disease and Stroke**

Heart disease and stroke risk factors are fairly well known because of organizations such as the American Heart Association (AHA) and federal programs stemming from the Joint Commission. Americans are educated about proven key risk factors contributing toward increasing susceptibility for developing heart disease and stroke (e.g., weight/body mass index (BMI), diet, exercise, blood pressure, alcohol consumption, smoking status, and cholesterol). Short risk assessment questionnaires are found throughout the Internet asking individuals to enter their most recent blood pressure, weight, and cholesterol readings. These tools typically free and calculate the risk scores based on the information entered by the end user. These tools do not serve as diagnosis, but rather educate patients about their risks. However, of particular interest is AHA's website which includes a risk assessment tool as described in addition to their Get with the Guidelines tools for heart disease and stroke. These tools can be utilized for our preventative healthcare clinic. However, Gillespie and Lenz warns, although 70% of strokes and 80% of heart disease are preventable, behavior change is the limiting factor (Gillespie & Lenz, 2011). Therefore, our clinic will need to determine effective behavior modification tools and methodologies which could lead to effective change.

### **b. Mental Illnesses and Depression**

Depression is one of the most prevalent of mental disorders and has strong risk factors for developing other chronic conditions and vice versa (Rubin, 2011). There are many screening tools that are easily accessible and available for general mental illness and depression, but no risk assessment tool for developing mental illness or depression is available. A meta-analysis conducted by Gilbody, Sheldon, & House (2008) suggests that at present early detection does not change primary care treatment or hospital treatment, possibly resulting in little to no change in patient outcomes (O'Connor, Whitlock, Beil, Bradley, & Gaynes, 2009). It may be that early treatment for mental illnesses and depression is not yet well developed, thus early detection has little benefit. Klein, Glenn, Kosty, Seeley, Rhode, & Lewinsohn (2013) found the predictors for depression for young adults were female gender, anxiety disorder before age 18, family history of mood disorder, sexual abuse during childhood, subthreshold depressive symptoms, and poor physical health. Their study acknowledged that a creation of a risk assessment tool is needed and would be of benefit to at-risk youth.

### **c. COPD and Asthma**

The current assessment for COPD is to get the patient history on tobacco smoking, other inhalation exposures (such as occupational dusts or chemicals, air pollution, and/or passive exposure to smoking), and familial tendency for COPD. Genetic testing for alpha-1 antitrypsin deficiency is rare but a significant risk factor for COPD (COPD CPM Workgroup, 2013). The main assessment tools for COPD are to assess the stage of disease or the current patient condition. There are no specific tools developed to assess risk of developing COPD, so clinicians will have to be thorough in their patient history assessments (Ohar, Sadeghnejad, Meyers, Donohue & Bleecker, 2010).

Despite the nearly 22 million people in America being affected by asthma, the etiology of the disease is not well known therefore current research cannot state assuredly what risk factors are the best predictors of disease (Subbarao, Mandhane, & Sears, 2009). It is understood that there is some gene-environment interaction that triggers the disease (Subbarao et al., 2009; Blumenthal, 2012). Some risk factors that have been associated with asthma are: prenatal maternal smoking, prenatal maternal antibiotic use, different types of infant and childhood wheezing, reduced airway/lung function in infancy, childhood antibiotic use, higher levels of immunoglobulin E at birth, infant and childhood exposure to tobacco smoke, particular occupational exposures, and smoking tobacco/marijuana (Subbarao et al., 2009). Asthma triggers and severity varies significantly (Subbarao et al., 2009). This has led researchers to develop assessment tools based on patient reported conditions and lung function tests. The two most prominently used risk assessment tools for asthma exacerbation are the Asthma Control Test (ACT) and the Asthma Control Questionnaire (ACQ) (Jia et al., 2012).

### **d. Diabetes**

There are several screening methods for type 2 diabetes, such as oral glucose tolerance test (OGTT), hemoglobin A1c (HbA1C), fasting plasma glucose (FPG), family history of diabetes (FHD), and body mass index (BMI). Some of these tests are expensive and time consuming. Norberg et al (2006) examined the effective and more accurate screening methods, and found that the combination of HbA1c, FPG and BMI are effective in screening for individuals at risk of future clinical diagnosis of type 2 diabetes, while the OGTT or FHD is not necessary (Norberg et al, 2006). The Finnish Diabetes Risk Score (FINDRISC) is a well-established tool and recommended for evaluation of the risk of Type 2 diabetes. The FINDRISC tool includes assessing the biomedical marker and the diabetes risk genetic marker. A study by Wang, Stancáková, Kuusisto, and Laakso shows that biochemical markers, but not genetic markers, improve the identification of previously undiagnosed type 2 diabetes (Wang et al., 2010). The Canadian Task Force on Preventive Healthcare conducted a study to identify a screening model that predicts high risk of future Type 2 diabetes and is useful in clinical practice. The study shows that management of other cardiovascular risk factors, such as dysglycemia, during diabetes risk screening is required. The examiner should consider obesity, physical inactivity, tobacco use, hypertension, and dyslipidemia in individuals with diabetes to give better prediction



about the likelihood of developing diabetes in the future (CMAJ, 2012). (See figure 11-14 in Appendix B.)

### **e. Obesity**

Obesity has its own set of risk factors, but is also a major risk factor of other diseases such as diabetes, heart disease, stroke, hypertension and cancer (America's Health, 2012). One projection model from the Robert Wood Johnson Foundation (Healthy Americans, 2012) suggests that if obesity rates continue on their track, the number of new cases of type 2 diabetes, coronary heart disease and stroke could increase 10 times between 2010 and 2020—and double again by 2030. Obesity could contribute to more than 6 million new cases of Type 2 diabetes, 5 million new cases of coronary heart disease and stroke, and more than 400,000 new cases of cancer in the next two decades. However, if the average BMI is reduced by five percent, the number of cases would decrease dramatically and would save up to \$81.7 billion (Healthy Americans, 2012).

Some risk factors for obesity include genetics, inactivity, unhealthy diet, family lifestyle, smoking, certain medications, socioeconomic status, and other medical problems (Hebebrand & Hinney, 2009). Several studies recommend using the body mass index (BMI) as a reliable tool in screening overweight and obesity (NHLBI, 1998). (See figure 15 in Appendix B.) (Please see Table 1 in Appendix C for comparison of risk assessment tools.)

## **III. Findings**

### **a. Preventative Healthcare Clinics**

A Google search turned up limited number of Preventative Care clinics in existence today (i.e., Born Preventative Health Care Clinic, Samsun Clinic). The fascinating fact about this search is California appeared to be well represented. For example, their Preventative Medical Center of Marin clinic provides some clues to the success of such clinics and the population needs. The center was founded by Dr. Elson M. Haas in 1984. His center blends traditional western and eastern therapies. It is evident his clinic is promoting wellness and attempting to prevent illness. Dr. Haas appears to be very successful, having authored several books and conducted speaking engagements throughout the country. The Marin Center provides services for managing chronic diseases/conditions such as asthma, hypertension, and diabetes (PMCM) in addition to wellness.

It is unclear whether the center uses behavior and risk assessment tools as part of their patient care practices. The idea of utilizing behavior modification and risk assessment tools may set our clinic apart from the competition in addition to achieving greater results with getting patients to remain compliant and vigilant.

### **b. Prevention Theory**

According to Leavell and Clark (1965) the classifications of preventative strategies are:

- 1) Primary prevention are behaviors that maximize well-being and to avoid disease. The person does not have any diagnosable diseases is not in any high risk group. For example, A person exercises 3 times a week and meditates regularly to maintain health and manage stress.
- 2) Secondary prevention are behaviors that forestall the risk factor into developing into a serious disease. The person has a diagnosable risk factor, but not a definitive disease that will cause direct harm. For example, A person eats low cholesterol foods because currently has elevated cholesterol levels and takes statin medications. But this person would not immediately develop disease nor does the disease really affect their functioning.
- 3) Tertiary prevention is to prevent the progression of a disease. The person has a disease that affects their functioning and now are taking steps to slow progression, prevent complications, and death. For example, a person has developed cancer and now goes to all chemotherapy appointments on time, as scheduled, and follows all instructions to prevent infections.

### **c. Behavior Modification and Tools**

Our literature review showed that there are some commonly used behavior change theories used by researchers and practitioners in designing intervention programs for some cases such as obesity, hypertension, DM type 2 (Gillespie & Lenz, 2011). Behavior change theories help us understand individuals' behaviors and design the intervention program. (Hildebrand, 2010). The most applied model is the Transtheoretical Model and Stages of Change. There are only a limited number of change behavior assessment tools that have been developed from these theories, as it is difficult to create questions specific for disease types that consistently prove valid, sensitive and specific.

However, a non-traditional tool to consider for heart and stroke patients is genetic susceptibility testing. Vassy, et al. (2013) discussed this tool for assessing patients' tendencies to change behaviors if they are identified as high risk for developing heart disease and/or diabetes. Their study particularly honed into the young adult population (between 25 and 30 years old). Although possibly promising, the study's results were mixed and therefore, did not provide solid evidence that young adults may be motivated to change if they are identified as high risk. Despite this issue, the tool can be used to assess a younger generation for disease development for our proposed health clinic (Vassy et al., 2013). The best times to start developing good habits is to start early. If individuals are taught at a young age about the importance of diet, physical activity, and not smoking, this can contribute to lowering the total numbers of patients affected by heart disease/stroke. (Please see Table 2 and Table 3 in Appendix C for list of behavior change theories and assessment tools.)

## **IV. Recommendations**

### **a. Overall Assessment**

Patient reported outcome (PRO) surveys have been used in research to obtain a quick but thorough understanding of the patient's health condition. We reviewed several health PRO surveys and the most thoroughly developed, technologically advanced, and easiest to use for patients would be QOLIX which is developed by the John Ware Group.

### **b. Heart Disease, Stroke, Diabetes, and Obesity**

The recommended risk assessment for heart disease or stroke is the simple questionnaires provided by American Heart Association (AHA). DM and obesity also share similar risk factors and are themselves risk factors for heart disease and stroke therefore the questionnaire from the AHA is the recommended risk assessment tool. If the patient is between the ages of 25-30 year old, the genetic susceptibility testing tool may be reasonable considering these patients may be more willing to change if they discover he/she is at risk for a deadly and/or debilitating disease. Primary prevention for these diseases involves diet and exercise (Reinberg, 2013). Secondary prevention are screening tools, and tertiary would be disease management guidelines provided by the AHA, and American Diabetes Association, which would also involve following a healthy diet, regular exercise, and medication regime (AACE, 2011). The recommended screening tools for DM are HbA1c blood tests. The recommended screening tools for both heart disease and stroke are to use the tools provided by the AHA's Get with the Guidelines for HF/Stroke and AHA's short heart disease risk calculator. AHA's website has a wealth of information on heart disease and stroke. The knowledge should be leveraged when caring for our clinic patients. There is no need to reinvent the wheel because their effectiveness have been proven and repeatedly used throughout the medical community. (See Figure 16, 17 in Appendix B.)

### **c. Mental Illnesses and Depression**

Overall the easiest to use, most studied, and cheapest depression screening tool is the Patient Health Questionnaire-2 (PHQ-2). It only has 2 items, free to use, easy to score, studied in primary care settings, and has proven to be sensitive, valid, and specific. The recommended screening tool for overall mental health is the M3 Checklist, it has also been studied in primary care settings and is free to use. There is not enough knowledge to create primary prevention strategies other than physical activity and healthy diet, for secondary prevention would be the use of these screening tools, and tertiary prevention also requires more research to determine how to prevent mental illness complications. (See Figure 18 in Appendix B.)

### **d. COPD and Asthma**

Research in developing a scoring system to measure risk of developing COPD would be helpful to clinicians. Primary prevention would involve smoking cessation programs, as smoking is the primary risk factor for developing COPD. Screening those who smoke frequently with

stage testing could be used as a secondary prevention. Tertiary prevention would include close monitoring of symptoms with staging, and adherence to COPD disease management program. It is not suggested to screen patients for COPD that do not have a history of smoking or other risk factors as studies have shown a high false-positive result from spirometry testing in those over the age of 70 (US Preventive Services Task Force, 2008). Management of disease and exacerbations should follow GOLD recommendations as they are the most up to date, most supported by research, and represent the standard of care (GOLD, 2013). (See Figure 19 in Appendix B.)

Current understanding of asthma does not identify the cause of the disease, associations of prenatal, infant, and childhood exposures to controllable behaviors are important considerations for primary prevention. Tertiary prevention would include risk assessment for asthma attacks. The NHLBI do not make specific recommendations on which asthma exacerbation risk assessment to use. All the questionnaires are easy to administer and the meta-analysis review for the ACT and ACQ reveal similar validity (Jia et al., 2012). The major difference would be that the ACQ was developed specifically for clinical use and therefore would be our recommendation as the risk assessment for tertiary prevention strategies. Recent studies have shown promise in the value of exhaled nitric oxide as predictor of loss of control of asthma but further investigation of feasibility and costs to implement in a primary care clinic before would be needed before recommendations for its use could be made (Ozier, Girodet, Bara, Tunon de Lara, Marthan, & Berger, 2011). (See Figure 20 in Appendix B.)

## **V. Application to the Design of the Preventative Healthcare Clinic**

### **a. Recommended Behavior Modification Models and Tools**

University of Rhode Island Change Assessment Scale (URICA) was the only scale one that was not disease specific and considered the four stages of change as described by the transtheoretical model of change – precontemplation, contemplation, action, and maintenance. Many change behavior scales were tailored to substance use or addictions patients and not well studied for other health behavior changes. Therefore we recommend the URICA scale. Gillespie & Lenz (2011) suggest that the data from completed questionnaires should be used by the clinical staff to determine which behaviors to address first, help set patient-driven goals, determine what the patient is not interested in changing, and to help determine the participant's stage of readiness to consistently participate in a behavior. (See Figure 21 in Appendix B.)

Although in our literature review we were unable to find any tools that assess social environment as predictors of change, many chronic illnesses are affected by socioeconomic factors. It would be prudent for clinicians to understand the socioeconomic barriers that prevent behavior change.

### **b. Proposed Clinic High Level Definition Model**

Level	Sections	Purpose or Function
1	Greeter & Triage (at clinic entrance)	Greet each patient, listen to his or her need, capture chief concern/complaint, and explain next step(s). For new patients, guide him/her to registration computer terminals. Established patients will be registered upon greeting the client. This is staffed by one unit secretary that can also flex to the family room if needed. (Estimated time less than 2 minutes.)
2	Family Room (center of the clinic)	This area is the patient registration, waiting area, and education area. New patients will complete full registration including contact, past and current medical information, reason for visit, and insurance at the computer terminals. The family room will have 6-8 computers around a center table for registration and learning material. Established patients can quickly update their information if needed. This is staffed by one unit secretary that can also flex to the Greeter/Triage area if needed. (Estimated 5-10 minutes for established patients, 10-15 minutes for new patients.)
3	Level 1 Assessment (desk with privacy partitions) x 2	For new clients only. A Licensed Practical Nurse (LPN) will give an overview of the clinic, the scope of practice, services, and costs. The patients will take the QOLIX online assessment and URICA. The LPN will review the results with the patients and evaluate the patient's needs in relation to the results. The LPN will escort patient with all the results to a private exam room for the level 2 assessment. This is staffed by 2 LPNs. (Estimated 15 minutes.)
4	Level 2 Assessment (private exam rooms) x 3	For new clients only. The RN will complete (1) detailed disease specific assessments for staging and screening. Depending on the results from the QOLIX of what diseases clients are at risk for will determine the number of assessments that needs to be completed by the RN. The RN will also complete (2) basic physical exam such as vital signs, blood glucose (at risk diabetes), height, weight, calculate BMI, waist circumference, and other necessary measurements. RN will also (3) calculate care plan resources dependent upon client's URICA score and risk score mapped onto the resource allocation matrix. If risk score not available, then use QOLIX score. This is staffed by 3 RNs. (Estimated 20-30 minutes.)
5	Care Planning Team	For new clients, dependent upon the resource allocation matrix, the appropriate individualized care plan will be created and then

	(same private exam rooms as Level 2 Assessments) x 3	<p>reviewed with the client by the care team. Dependent upon the results the care team may consist of a Nurse Practitioner(NP) and/or a Physiotherapist (PT) and/or a Registered Dietician (RD) and/or Social Worker (SW) and/or other alternative therapy practitioners. They may also refer patients to specialists for further disease management. The physician will work collaboratively with the three teams. With established patients, their role will be more supervisory as the care planning team will mainly be responsible for the client's care management. The care team will also schedule the next appointment if needed. (Estimated 20-30 minutes). This is staffed by 3 teams.</p> <p>For established patients, the care team member(s) will review client progress and current reported condition/concerns. Not every appointment will require the entire care team. The care plan will be adjusted as needed. (Estimated 10-20 minutes.)</p>
		<p>The cycle time for new clients is estimated between 60-90 minutes. The cycle time for return clients is estimated between 20-30 minutes.</p>

Prevention requires holistic and integrated treatment for patients thus it is important to have easy access to the other necessary services for prevention. These include a fitness studio for activity promotion, pharmacy and related medical devices, foods that promote healthy eating, and areas for relaxation and mental wellness. Ideally these services would be operated in conjunction with the clinic to provide a “one-stop shop” center for clients. The diagram below would be ideal to provide easy access to related healthy behaviors other than medical assessments. (Please see Appendix D for clinic map and high level process map.)

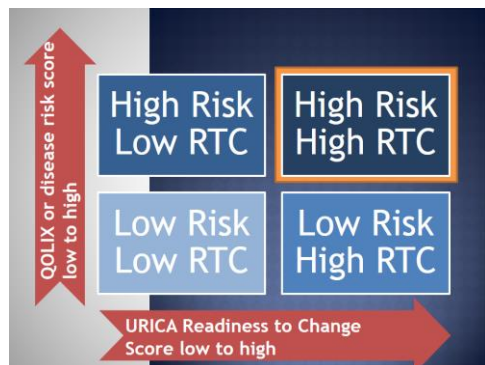


Clinic map in relation to other services

### Resource Allocation Matrix

As stated in earlier, the goal of this paper is to devise a clinical decision support tool to aid clinicians in placing patients in cohorts to maximize effectiveness by determining how to allocate

limited resources. The resource allocation matrix below combines the URICA change behavior assessment and the QOLIX or specific disease risk score to determine who are the most at risk and who are most amenable to change. This cohort would require the focus of resources to prevent disease development and high healthcare costs for the future.



Resource allocation matrix

### c. Rationale

In the attempt to apply our knowledge from the literature review and class material into a prevention-oriented clinic, we needed to design a process and space that limited waste whilst still accomplishing the layers of assessments. The initial assessment of a new patient is a lengthy process, but we did try to limit the use of resources by assigning tasks to the least skilled person possible, leaving only the complex disease management to the case team. In our design the physician oversees many case teams so as not to rely too heavily on physicians, as there is a large primary care physician shortage. For return patients, the process is fairly straightforward with easy greet and registration process, then onto see the care team, with possible wait time at the family room with the educational material.

## VI. Conclusion

In conclusion, with the enactment of ACA, the landscape for preventative medicine is transforming. This is an ideal time to explore new approaches to care delivery and bring preventative care to the forefront. Current data shows that the majority of spending is directed to disease management, while there is less than 1 % going to preventative care. Chronic diseases consume a large portion of the healthcare budget, but this can be avoided by early detection and providing good preventative care for individuals at risk. The need to allocate resources wisely and ethically requires the assessment of two aspects when interviewing a new client, risk and compliance. Individuals who are at risk and show high level of changeability should receive the most resources. If a client has low level of readiness, education would be provided and the client would be reassessed. The overall aim is to improve the health of our community; we believe our clinic will set a new paradigm for preventative and wellness care clinics.

## References

- Agency for Healthcare Research and Quality. *Total Expenses and Percent Distribution for Selected Conditions by Type of Service: United States, 2010*. [Medical Expenditure Panel Survey Household Component Data. Generated interactively.] (April 02, 2013). Retrieved from [http://meps.ahrq.gov/data\\_stats/tables\\_compendia\\_hh\\_interactive.jsp?\\_SERVICE=MEPSSocket0&\\_PROGRAM=MEPSPGM.TC.SAS&File=HCFY2010&Table=HCFY2010\\_CNDXP\\_C&Debug=](http://meps.ahrq.gov/data_stats/tables_compendia_hh_interactive.jsp?_SERVICE=MEPSSocket0&_PROGRAM=MEPSPGM.TC.SAS&File=HCFY2010&Table=HCFY2010_CNDXP_C&Debug=)
- American Association of Clinical Endocrinologists. Medical guidelines for clinical practice for developing a diabetes mellitus comprehensive review. (2011), *Endocrinologist Practice*, 17, (2), 1-53.
- American Association of Diabetes. Diabetes risk test. Retrieved from <http://www.diabetes.org/diabetes-basics/prevention/diabetes-risk-test/risk-test-flyer-2012.pdf>
- American Heart Association. The life's simple™7 action plan. Retrieved from <http://mylifecheck.heart.org/PledgePage.aspx?NavID=5&CultureCode=en-US>
- American Lung Association. *Asthma in adults fact sheet*. (October 2012). Retrieved from <http://www.lung.org/lung-disease/asthma/resources/facts-and-figures/asthma-in-adults.html#1>
- American Lung Association. *Chronic obstructive pulmonary disease (COPD) fact sheet*. (February 2011). Retrieved from <http://www.lung.org/lung-disease/copd/resources/facts-figures/COPD-Fact-Sheet.html>
- Baranowski, T., Cullen, K.W., Nicklas, T., Thompson, D., Baranowski, J. (2003). Are current health behavioral change models helpful in guiding prevention of weight gain efforts? *Obesity Research*, 11, 23s-43s.
- Beck, A. T., Ward, C., & Mendelson, M. (1961). Beck depression inventory (BDI). *Arch Gen Psychiatry*, 4(6), 561-571.
- Bjelland, I., Dahl, A. A., Haug, T. T., & Neckelmann, D. (2002). The validity of the Hospital Anxiety and Depression Scale-An updated literature review. *Journal of psychosomatic research*, 52(2), 69-78.
- Blumenthal, M. N. (2012). Genetic, epigenetic, and environmental factors in asthma and allergy. *Annals of Allergy, Asthma & Immunology*, 108(2), 69-73.
- Canadian Task Force on Preventive Health Care. (2012). Recommendations on screening for type 2 diabetes in adults. *Canadian Medical Association*, 184 (15), 1687- 96. Retrieved April 1<sup>st</sup>, 2013 from <http://www.cmaj.ca/content/184/15/1687.full.pdf>
- Celli, B. R., Cote, C. G., Marin, J. M., Casanova, C., Montes de Oca, M., Mendez, R. A., ... & Cabral, H. J. (2004). The body-mass index, airflow obstruction, dyspnea, and exercise capacity index in chronic obstructive pulmonary disease. *New England Journal of Medicine*, 350(10), 1005-1012.
- Center for Disease Control and Prevention. (2011). National diabetic fact sheet. Retrieved from [http://www.cdc.gov/diabetes/pubs/pdf/ndfs\\_2011.pdf](http://www.cdc.gov/diabetes/pubs/pdf/ndfs_2011.pdf)
- Center for Medicare. *National Health Expenditure Projections 2010-2020*. (July 2011). Retrieved from <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/downloads/proj2010.pdf>
- Centers for Disease Control and Prevention (CDC). (Updated March 2013). *Stroke facts*. Retrieved from <http://www.cdc.gov/stroke/facts.htm>



- Centers for Disease Control and Prevention. (April 2011). *Rising health care costs are unsustainable*. Retrieved from <http://www.cdc.gov/workplacehealthpromotion/businesscase/reasons/rising.html>
- Centers for Disease Control and Prevention. (Updated March 2013). *Heart disease facts*. Retrieved from <http://www.cdc.gov/heartdisease/facts.htm>
- Centers for Disease Control and Prevention. *Depression*. (Updated May 2011). Retrieved from <http://www.cdc.gov/workplacehealthpromotion/implementation/topics/depression.html>
- Cross-Disorder Group of the Psychiatric Genomics Consortium. (2013). Identification of risk loci with shared effects on five major psychiatric disorders: a genome-wide analysis. *The Lancet, early online publication, 28 February 2013*.
- Cuijpers, P., Smits, N., Donker, T., Have, M. T., & Graaf, R. D. (2010). Screening for mood and anxiety disorders with the five-item, the three-item, and the two-item Mental Health Inventory. Department of Health and Human Services (DHHS). (2013). *Clinicians and the affordable care act*. Retrieved from <http://www.healthcare.gov/law/information-for-you/clinicians.html>
- Department of Health and Human Services (DHHS). (2013). *Preventive care*. Retrieved from <http://www.healthcare.gov/law/features/rights/preventive-care/index.html>
- Devol, R. & Bedroussian, A. Milken Institute. (2007). *An unhealthy America: the economic burden of chronic disease – charting a new course to save lives and increase productivity and economic growth*. Retrieved from <http://www.milkeninstitute.org/healthreform/pdf/AnUnhealthyAmericaExecSumm.pdf>
- Ebell, M. H. (2008). Screening instruments for depression. *Am Fam Physician, 78*(2), 244-246.
- Field, C. A., Adinoff, B., Harris, T. R., Ball, S. A., & Carroll, K. M. (2009). Construct, concurrent and predictive validity of the URICA: Data from two multi-site clinical trials. *Drug and alcohol dependence, 101*(1-2), 115.
- Finkelstein EA, Trogdon JG, Cohen JW, Dietz W. (2009). Annual medical spending attributable to obesity: payer-and service-specific estimates. *Health Affairs, 28*(5), w822-31.
- Frey, U., & Suki, B. (2008). Complexity of chronic asthma and chronic obstructive pulmonary disease: implications for risk assessment, and disease progression and control. *The Lancet, 372*(9643), 1088-1099.
- Gandolfi, R., Abplanalp, S., Wander C., Harris, D., Blagev, D., Dean, N. (February 2013). *Management of Chronic Obstructive Pulmonary Disease 2013 Update*. Retrieved from <https://intermountainhealthcare.org/ext/Dcmnt?ncid=520442593>
- Gaynes, B. N., DeVeaugh-Geiss, J., Weir, S., Gu, H., MacPherson, C., Schulberg, H. C., ... & Rubinow, D. R. (2010). Feasibility and diagnostic validity of the M-3 checklist: a brief, self-rated screen for depressive, bipolar, anxiety, and post-traumatic stress disorders in primary care. *The Annals of Family Medicine, 8*(2), 160-169.
- Gilbody, S., Sheldon, T., & House, A. (2008). Screening and case-finding instruments for depression: a meta-analysis. *Canadian Medical Association Journal, 178*(8), 997-1003.
- Gillespie, N. D., & Lenz, T. L. (2011). Implementation of a Tool to Modify Behavior in a Chronic Disease Management Program. *Advances in preventive medicine, 2011*.
- GlaxoSmithKline. (2009). *COPD assessment test*. Retrieved from <http://www.catestonline.org/>
- Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2013. *Global Strategy for the Diagnosis, Management and Prevention of COPD*. Retrieved from [http://www.goldcopd.org/uploads/users/files/GOLD\\_Report\\_2013\\_Feb20.pdf](http://www.goldcopd.org/uploads/users/files/GOLD_Report_2013_Feb20.pdf)

- Hamilton, M. (1960). A rating scale for depression. *Journal of neurology, neurosurgery, and psychiatry*, 23(1), 56.
- Healthy Americans. A Healthier America: 10 Top Priorities for Prevention. (2008). Retrieved from <http://healthyamericans.org/assets/files/10ThingsBook.pdf>
- Healthy Americans. F as in fat: How obesity threatens America's future 2012. September 2012. Retrieved from <http://www.healthyamericans.org/report/100/>
- Healthy Americans. Issue brief: Analysis of obesity rates by state. August 2012. Retrieved from <http://www.healthyamericans.org/report/98/obesityratesbystate>
- Hebebrand, J., & Hinney, A. (2009). Environmental and genetic risk factors in obesity. *Child and adolescent psychiatric clinics of North America*, 18(1), 83-94.
- Heun, R., Bonsignore, M., Barkow, K., & Jessen, F. (2001). Validity of the five-item WHO Well-Being Index (WHO-5) in an elderly population. *European archives of psychiatry and clinical neuroscience*, 251(2), 27-31.
- Jefford, M., Mileshkin, L., Richards, K., Thomson, J., Matthews, J. P., Zalcborg, J., ... & Clarke, D. M. (2004). Rapid screening for depression—validation of the Brief Case-Find for Depression (BCD) in medical oncology and palliative care patients. *British journal of cancer*, 91(5), 900-906.
- Jia, C. E., Zhang, H. P., Lv, Y., Liang, R., Jiang, Y. Q., Powell, H., ... & Wang, G. (2012). The Asthma Control Test and Asthma Control Questionnaire for assessing asthma control: systematic review and meta-analysis. *Journal of Allergy and Clinical Immunology*.
- Jones, P. W., Harding, G., Berry, P., Wiklund, I., Chen, W. H., & Leidy, N. K. (2009). Development and first validation of the COPD Assessment Test. *European Respiratory Journal*, 34(3), 648-654.
- Klein, D. N., Glenn, C. R., Kosty, D. B., Seeley, J. R., Rohde, P., & Lewinsohn, P. M. (2012). Predictors of first lifetime onset of major depressive disorder in young adulthood.
- Kon, S. S., Patel, M. S., Canavan, J. L., Clark, A. L., Jones, S. E., Nolan, C. M., ... & Man, W. D. (2012). Reliability and validity of the four metre gait speed in COPD. *European Respiratory Journal*.
- Kroenke, K., Spitzer, R.L., & Williams, J.B. (2001). The PHQ-9 validity of a brief depression severity measure. *Journal of General Internal Medicine*, 16(9), 606-613.
- Kroenke, K., Spitzer, R.L., Williams, J.B. (2003). The Patient Health Questionnaire-2: validity of a two-item depression screener. *Medical Care*, 41:1284–92.
- Leavell, H. R., & Clark, E. G. (1958). Preventive Medicine for the Doctor in his Community. An Epidemiologic Approach. *Preventive Medicine for the Doctor in his Community. An Epidemiologic Approach*.
- Mannarino, M., Tonelli, M., Allan, G. M. (2013). Tools for Practice: Screening and diagnosis of type 2 diabetes with HbA1c. *Canadian Family Physician*, 59 (1), 42.
- Martinez, F. J., Raczek, A. E., Seifer, F. D., Conoscenti, C. S., Curtice, T. G. & D'Eletto, T., et al. (2008). Development and Initial Validation of a Self-Scored COPD Population Screener Questionnaire (COPD-PS). *COPD: Journal of Chronic Obstructive Pulmonary Disease*, 5(2), 85-95.
- Meltzer, E. O., Busse, W. W., Wenzel, S. E., Belozeroff, V., Weng, H. H., Feng, J., ... & Lin, S. L. (2011). Use of the Asthma Control Questionnaire to predict future risk of asthma exacerbation. *Journal of Allergy and Clinical Immunology*, 127(1), 167-172.

- Miller, W. R., & Tonigan, J. S. (1996). Assessing drinkers' motivation for change: the Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES). *Psychology of Addictive Behaviors*, 10(2), 81.
- Nathan, R. A., Sorkness, C. A., Kosinski, M., Schatz, M., Li, J. T., Marcus, P., ... & Pendergraft, T. B. (2004). Development of the asthma control test: a survey for assessing asthma control. *Journal of Allergy and Clinical Immunology*, 113(1), 59-65.
- National Heart Lung and Blood Institute. *Expert panel report 3 (EPR3): guidelines for the diagnosis and management of asthma*. (August 2007). Retrieved from <http://www.nhlbi.nih.gov/guidelines/asthma/asthgdln.htm>
- National Heart, Lung, and Blood Institute. Classification of overweight and obesity by BMI, waist circumference, and associated disease risks. Retrieved from [http://www.nhlbi.nih.gov/health/public/heart/obesity/lose\\_wt/bmi\\_dis.htm](http://www.nhlbi.nih.gov/health/public/heart/obesity/lose_wt/bmi_dis.htm)
- National Institute of Health. National Heart, Lung, and Blood Institute. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults. September 1998. NIH Publication, 98, (4083), 1- 262. Retrieved from [http://www.nhlbi.nih.gov/guidelines/obesity/ob\\_gdlns.pdf](http://www.nhlbi.nih.gov/guidelines/obesity/ob_gdlns.pdf)
- Norberg M., Eriksson, JW., Lindahl, B., Andersson, C., Rolandsson, O., Stenlund, H., Weinehall, L. (2006). A combination of HbA1c, fasting glucose and BMI is effective in screening for individuals at risk of future type 2 diabetes: OGTT is not needed. *Journal of Internal Medicine*, 260 (3), 263-71.
- Norcross, J. C., Krebs, P. M., & Prochaska, J. O. (2011). Stages of change. *Journal of clinical psychology*, 67(2), 143-154.
- O'Grady, M.J. & Capretta, J.C. *Health-care cost projections for diabetes and other chronic diseases: the current context and potential enhancements*. (2009). Retrieved from <http://charmeck.org/mecklenburg/county/HealthDepartment/wtw/Resource%20Library/HCCostProjectionsChronic.pdf>
- O'Connor, E. A., Whitlock, E. P., Beil, T. L., & Gaynes, B. N. (2009). Screening for depression in adult patients in primary care settings: a systematic evidence review. *Annals of Internal Medicine*, 151(11), 793-803.
- OECD. *OECD Health Data 2012*. (2012). Retrieved from <http://www.oecd.org/unitedstates/BriefingNoteUSA2012.pdf>
- Ogden, C., Carroll, M., D., Kit, B., Flegal, K. (2012). Prevalence of Obesity in the United States, 2009–2010. US Department of Health and Human Services, Center for Disease Control and Prevention (CDC). Retrieved from <http://www.cdc.gov/nchs/data/databriefs/db82.pdf>.
- Ohar, J. A., Sadeghnejad, A., Meyers, D. A., Donohue, J. F., & Bleecker, E. R. (2010). Do symptoms predict COPD in smokers?. *CHEST Journal*, 137(6), 1345-1353.
- Ozier, A., Girodet, P. O., Bara, I., Tunon de Lara, J. M., Marthan, R., & Berger, P. (2011). Control maintenance can be predicted by exhaled NO monitoring in asthmatic patients. *Respiratory medicine*, 105(7), 989-996.
- Partnership to Fight Chronic Disease. *2009 Almanac of Chronic Disease*. (2009). Retrieved from [http://www.fightchronicdisease.org/sites/fightchronicdisease.org/files/docs/2009AlmanacofChronicDisease\\_updated81009.pdf](http://www.fightchronicdisease.org/sites/fightchronicdisease.org/files/docs/2009AlmanacofChronicDisease_updated81009.pdf)
- Phillips, R. L., & Bazemore, A. W. (2010). Primary care and why it matters for US health system reform. *Health Affairs*, 29(5), 806-810.

- Pignone, M.P., Gaynes, B.N., Rushton, J.L., Burchell, C.M., Orleans, C.T., Mulrow, C.D., & Lohr, K.N. (2002). Screening for depression in adults: a summary of the evidence for the US Preventive Services Task Force. *Annals of internal medicine*, 136(10), 765.
- Preventative Medical Center of Marin (PMCM). *Services*. Retrieved from <http://www.pmcmarin.com>
- Public Health Agency of Canada. (2009). The Canadian Diabetes Risk Assessment Questionnaire (CANRISK). Retrieved April, 4, 2013, from
- Qoltech. *Asthma control questionnaire*. Retrieved from <http://www.qoltech.co.uk/acq.html>
- QualityMetric Incorporated. (2008). *COPD population screener*. Retrieved from <http://www.drive4copd.org/areyouatrisk/takethescreener.aspx>
- QualityMetric Incorporated. *Asthma control test*. Retrieved from <http://www.qualitymetric.com/WhatWeDo/DiseasespecificHealthSurveys/AsthmaControlTestACT/tabid/190/Default.aspx>
- Radloff, L.S. (1977). The CES-D scale: a self-report depression scale for research in the general population. *Applied psychological measurement*, 1(3), 385-401.
- Reinberg, S., March, 2013. Millions on average of diabetes don't know it: CDC. Retrieved March 31, 2013, from <http://health.usnews.com/health-news/news/articles/2013/03/21/millions-on-verge-of-diabetes-dont-know-it-cdc>
- Rogers, R. W., & Prentice-Dunn, S. (1997). Protection motivation theory.
- Romera, I., Delgado-Cohen, H., Perez, T., Caballero, L., & Gilaberte, I. (2008). Factor analysis of the Zung self-rating depression scale in a large sample of patients with major depressive disorder in primary care. *BMC psychiatry*, 8(1), 4.
- Rubin, E. *Depression: relationship to strokes, heart disease, and other illnesses*. (October, 2011). Retrieved from <http://www.psychologytoday.com/blog/demystifying-psychiatry/201110/depression-relationship-strokes-heart-disease-and-other-illnes-0>
- Salameh, P., Khayat, G., & Waked, M. (2012). Could symptoms and risk factors diagnose COPD? Development of a Diagnosis Score for COPD. *Clinical epidemiology*, 4, 247.
- Saudek, C., Herman, W., Sacks, D., Bergenstal, R., Edelman, D., Davidson, M. (2008). A new look at screening and diagnosing diabetes mellitus. *The Journal of Clinical Endocrinology & Metabolism*, 93 (7), 2447-2453.
- Saudek, CD., Herman, WH., Sacks, DB., Bergenstal, RM., Edelman, D., Davidson, MB. (2008). A new look at screening and diagnosing diabetes mellitus. *The Journal of Clinical Endocrinology and Metabolism*, 93 (7), 2447-53.
- Schwarzer, R. (2008). Modeling health behavior change: How to predict and modify the adoption and maintenance of health behaviors. *Applied Psychology*, 57(1), 1-29.
- Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. *Journal of consumer Research*, 325-343.
- Soni, A. & Roemer, M. *Top five most costly conditions among the elder, age 65 and older, 2008: estimates for the US civilian noninstitutionalized adult population*. (July 8, 2011). Retrieved from [data\\_files/publications/st327/stat327.pdf](http://data_files/publications/st327/stat327.pdf)
- Subbarao, P., Mandhane, P. J., & Sears, M. R. (2009). Asthma: epidemiology, etiology and risk factors. *Canadian Medical Association Journal*, 181(9), E181-E190.

- Substance Abuse and Mental Health Services Administration. (2008). *Projections of national expenditures for mental health services and substance abuse treatment* (DHHS Publication No. SMA 08-4326). Rockville, MD: U.S. Government Printing Office.
- U.S. Preventive Services Task Force. (2008). *Screening for chronic obstructive pulmonary disease using spirometry*. Retrieved from <http://www.uspreventiveservicestaskforce.org/uspstf08/copd/copdrs.htm>
- Van Dam, N.T., & Earleywine, M. (2011). Validation of the Center for Epidemiologic Studies Depression Scale—Revised (CESD-R): pragmatic depression assessment in the general population. *Psychiatry research, 186*(1), 128-132.
- Wang, J., Stancáková, A., Kuusisto, J., Laakso, M. (2010). Identification of undiagnosed type 2 diabetic individuals by the finnish diabetes risk score and biochemical and genetic markers. *The Journal of Clinical Endocrinology and Metabolism, 95* (8), 3858-62.
- Welch, C. A., Czerwinski, D., Ghimire, B., & Bertsimas, D. (2009). Depression and costs of health care. *Psychosomatics, 50*(4), 392-401.