Analyzing The Efficacy of Chronic Disease Programs In Haiti

Implications for Improved Care of Hypertension and Diabetes In A Resource Limited Setting

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1 Background & Literature Review

1.1 Country Profile

Haiti is one of the poorest countries in the world and with an HDI[1] of 0.483 and GDP per capita of $846, both the United Nations and World Bank recognize it as the poorest nation in the Western Hemisphere (Haiti Human Development Reports, 2015). Originally one of the most fruitful colonies in all of the America, Haiti gained independence from the French in 1804 through the only successful slave revolt in modern history (Corbett, 1999). The country's current demographic composition and culture is largely a consequence of that revolt: 95% of the population is of African descent and another 5% are mulatto or white (Haiti Demographics Profile, 2016). French and Haitian Creole, a mix of French of African dialects, are the country's two national languages, although only about half of the population speaks French (Lewis, Simons, & Fennig, 2015). Modern religious practices also hold roots in Haiti's colonial origins: 83.2% of the population is Christian, while a majority of Haitians integrate elements Voodoo into their religious practices (Haiti Demographics Profile, 2016). Race and religion are a source of significant division in Haitian society. The vast majority of white Haitians are wealthy and live in higher elevated mountain regions and nearly all of Black Haitians live in extreme poverty. Moreover, the actual practice of Voodoo is largely considered counter-Christian and nefarious. (Corbett, 1999)

Since independence, Haiti's development has been plagued by political instability, foreign intervention, natural disasters, environmental destruction and widespread poverty. Following the 2004 Coup de E'tat that saw democratically elected president Jean Bertrand Aristide exiled, The United Nations Security Council established The United Nations Stabilization Mission In Haiti (MINUSTAH) (United Nations MINUSTAH Mandate, 2012). In 2004, the 7,000 strong peacekeeping force joined an ever-growing foreign presence in Haiti. Before 2010, more than 10,000 non-governmental organizations (NGO's) provided 80% of Haiti basic services including health care and education, earning it the moniker "The Republic of NGO's (Barry-Shaw, Engler, & Jay, 2011).

In January 2010, a 7.0 magnitude earthquake killed an estimated 222,570 people, displaced 2.3 million more, (23% of the population), damaged or destroyed 188,383 houses, and destroyed 60% of the healthcare infrastructure (Healthcare Underprioritized In Haiti Reconstruction, 2015). Aid distribution and organization in the aftermath of the earthquake further entrenched Haiti's dependence on the private sector. Large multilateral and bilateral organizations and nations separated funding into immediate humanitarian relief and long-term recovery. According to the United Nations *Lessons From Haiti* report, of the $13.34 billion dollars allocated to Haiti relief and recovery, only $6.43 billion had been dispersed as of 2012 (Lessons From Haiti, 2012). The Haitian people were largely excluded as aid recipients from 2010-2012; of the 2.28 billion spent on immediate humanitarian aid, The Government of Haiti received less than 1%, while the United Nations, International NGO's, for-profit contractors, and foreign civil and military entities received

[1]The Human Development Index (HDI), currently employed by the United Nations Development Programme to measure fluctuations in development across the globe, consists of a health dimension determined by mean life expectancy at birth, an educational dimension quantified by mean years of schooling and expected years of schooling, and a standard of living dimension tallied by gross national income per capita. Each indicator is assigned a number, after which an indexed score that reflects a given country's level of development is calculated by geometric mean (23).

88% (Lessons From Haiti, 2012). The Government of Haiti and Haitian NGO's received just 9.1% and 0.6%, respectively of the $4.01 billion allocated to long term recovery, while an additional $3.06 billion was donated to UN agencies and NGO's by private donors (Lessons From Haiti 2012). Recently, researchers and journalists alike have leveraged intense scrutiny and criticism over the allocation, use, and impact of Haiti's aid money. These realities have underlined the need for greater cooperation, accountability, and preparation by Haiti's enormous NGO sector (Johnston & Main, 2013).

On October 3rd, 2016 Hurricane Matthew caused catastrophic flooding across Haiti and destroyed enormous swathes of infrastructure along the country's Southern Peninsula. A January 2017 report from UNICEF detailed the damage; Hurricane Matthew displaced 175,000 Haitians to temporary shelters and left 806,000 in immediate need of life-saving aid (Humanitarian Action For Children: Haiti, 2017). Due to the widespread destruction and resulting Cholera outbreaks, many parts of Haiti will remain a humanitarian disaster zone for an extended period of time (Humanitarian Action For Children: Haiti, 2017). The international and local response will test whether lessons from the Earthquake response have been converted into meaningful policy.

1.2 National Health Burden

Haiti's enormous health burden stems from numerous comingled factors, including government instability, failed foreign aid, inadequate health infrastructure, an insufficiently regulated and monitored NGO healthcare network, the 2016 public hospital strike, widespread poverty, inadequate professional training, and geological location, which increases incidence natural disaster and tropical disease.

Recent natural and human disasters like the deadly Cholera epidemic, started in 2010 by Nepalese United Nations Peacekeepers, and the 2010 Earthquake, have been severely exacerbated by a ubiquitous lack of access to clean drinking water, comprehensive healthcare, and adequate sanitation. In 2010, just 69% of the population had access to an improved water source, while only 17% had access to improved sanitation facilities (Gelting, Bliss, Patrick, Lockhart, & Handzel, 2013). Before the Earthquake, more than 70% of Haiti's population did not have access to healthcare, of which 70% was provided by NGO's (Zanotti, 2010). The country's tropical location combined with extreme poverty leaves millions susceptible to both vector borne disease like Malaria, Zika, and Chikungunya and water borne disease like Cholera (Haiti Infectious Diseases, 2016).

In March 2016, doctors around the country began a months long strike demanding wage increases and improved working conditions, cutting of healthcare to millions of citizens. A majority of the country's public hospitals closed, including Port au Prince's Hospital of the State University of Haiti, the largest facility in the country (Charles, 2016). Despite the billions of dollars of aid that poured in following the Earthquake, few sustainable improvements to health infrastructure emerged. Failed efforts by the American Red Cross, which was excoriated for wasting hundreds of millions of dollars by independent ProPublica (2015) and US congressional (2016) reports, the United Nations which caused the Cholera epidemic, and national governments like the United States, France, and Canada which continue to invest in unsustainable hospital construction projects, epitomize a foreign aid culture that largely excludes Haitian participation and does little to improve national health, if not worsen it (Dyer, 2016). A report from the medical relief agency,

Merlin, remarked of the international health response to the Earthquake, "Instead of finding themselves working alongside incoming international teams, local NGOs [nongovernmental organizations] and health workers were bypassed and sidelined by the wave of international NGOs and clinical teams sweeping into their city"... "While welcome and vital, the international response failed to support the existing health capacity, staging a 'take-over' and undermining Haiti's capacity to respond and coordinate. The longer-term implications for Haiti's health system are only now coming to light." (Kelly, n.d.). Following the shutdown of public hospitals, the few functioning and accountable foreign health organizations like Médecins Sans Frontiéres (MSF) and Partners In Health (PIH), which operate hospitals throughout Haiti, struggled to handle the influx of patients (Dyer, 2016). Although the strike concluded September 1st,, 2016 after Haiti's government promised to increase healthcare spending from 4.7% of the national budget to 10%, many Haitians remain incapable of affording treatment or accessing distant medical facilities (McFadden 2016).

1.3 Risk of Hypertension in Haiti

Hypertension, or high blood pressure, is a common health condition that significantly increases the risk of heart disease and stroke, two of the greatest causes of death worldwide (Centers For Disease Control [CDC], 2016). The World Health Organization (n.d.) estimates that hypertension is responsible for 12.8% of total deaths in the world and some economic estimates put the cost of suboptimal blood pressure at $370 billion, or 10% of the worlds overall health expenditures (Gaziano, Bitton, Anand, & Weinstein, 2009).

In 2012, the Haitian Ministry of Health identified hypertension, as the greatest cause of morbidity and mortality in Haiti, ahead of HIV, Cholera, Tuberculosis, and Malaria combined (Jean-Charles, 2014). The prevalence rate of hypertension is between 30 and 45%, and up to 20% of all Haitian deaths may be attributed to both hypertension and hypertension-related disease (Kelche, Wehbe-Alamah, & McFarland, 2015). Within the context of Haiti, the universal risk factors for hypertension, which include age, race, family history, obesity, tobacco and alcohol use, physical inactivity, stress, insufficient potassium intake, overconsumption of sodium, and preexisting chronic conditions like kidney disease and diabetes, vary in significance (Mayo Clinic, n.d. a). Tobacco and alcohol use play less of a role in the country, where and many do not use tobacco or consume alcohol due to religious practice. Moreover, although Haitians typically walk an average of 10 kilometers per day and are generally more inclined to be physically active due to the demands of daily life, 32% and 10.7% of the adult Haitian population classify as overweight (BMI greater than 25) and obese (BMI Greater than 30), respectively (Jean-Charles, 2014), (Global Nutrition Report, 2014).

There is, however, strong evidence in the literature to suggest that increased salt intake, diet, African ancestry, extremely high environmental stress, and variations in social capital contribute to a higher incidence of hypertension (Jean-Charles, 2016). The Haitian diet heavily incorporates high-sodium foods like Bouillon spice cubes, tomato paste, butter, and rock salt. In one study, the Haiti Hypertension Center and Ministry of Health estimated that Haitians consume nearly 9 times more salt per day than recommended by the World Health Organization (Kenerson, 2014). Given that people of African ancestry have a higher incidence of sodium-sensitive hypertension,

the impacts of excess sodium intake are heightened in Haiti, where an overwhelming majority of the population is of African descent (Kenerson, 2014). While dietary modifications have proven to be effective non-pharmacological treatments of hypertension, their implementation in Haiti is hindered by widespread malnutrition and poverty, as well as sodium's cultural importance in Haitian cuisine and utility as a food preservative. Many elements of the Dietary Approaches to Stop Hypertension (DASH) diet, which emphasizes consumption of fruits, vegetables and low-fat dairy foods, are available in Haiti; however, the typical Haitian diet remains heavily dependent on starches and oil based food with little inclusion of protein, fruits or vegetables (Mayo Clinic, n.d. b), (Jean-Charles, 2014). The lack of potassium in the Haitian diet may also be as important as the omnipresence of sodium; a high potassium-sodium ratio is a critical strategy in the prevention and treatment of hypertension (Kenerson, 2014). The disconnect between the availability of healthier options and their actual consumption may be explained by a preference for both high caloric and affordable meals in a country in which 58% of the population was reported to be chronically undernourished before the Earthquake and 58.5% live below the national poverty line (World Bank, n.d.), (Jean-Charles 2014).

Although a direct causation relationship between stress and chronic hypertension is not widely documented in the literature, stress can cause short-term blood pressure spikes and influence the release of large amounts vasoconstricting hormones that increase blood pressure (Mayo Clinic, n.d. c). When associated with other environmental, psychological, and genetic risk factors, stress can also cause more permanent elevations in blood pressure (Faye, Heng, Collomp, & Peroux, 2003). The 2010 Earthquake only exacerbated the Haitian populations exposure to chronic stress risk factors like poverty, insecurity, and political instability, while simultaneously creating "acute-on-chronic" stress situations (Haen & Aronson, 2016). One study of 1355 adults in the Port au Prince region 30 months after the Earthquake found astounding exposure to acute stressors and prevalence of post-traumatic stress disorder and mental illness, both before and after the Earthquake: 29.67% lost a family member during the Earthquake, 72.69% lost a family member during the Earthquake, and 37.42% were displaced to another town (Cénat & Derivois, 2014). Moreover, of the 94.32% of respondents who indicated experiencing a traumatic event prior to the Earthquake including natural disaster, physical violence, fires, road traffic incidents, and sexual assault, 31.95% reported between 6 and 10 events and 11.5% reported between 11 and 16 events. This exposure coincided with extremely high levels of mental illness: 36.75% reported severe symptoms of PTSD, 42.58% reported moderate symptoms of PTSD, and 25.98% reported symptoms of moderate and severe depression[2] (Cénat & Derivois, 2014).

In recent years, there has been a quickly growing body of literature surrounding the utility of social capital as an indicator of individual and community health (Health Canada 2003). In 1999, the World Bank introduced the Social Capital Assessment Tool (SCAT), which examines five factors of social capital in developing nations: 1) groups and networks, 2) trust and solidarity, 3) collective action and cooperation, 4) social cohesion and inclusion, and 5) information and communication (Malino, Kershaw, Angley, Frederic, & Small, 2013). Since then, promising results have demonstrated a relationship between measured social capital and risk of chronic disease.

[2]This study found a significant disparity between incidence of depression and PTSD among gender. Females were significantly more likely to have PSTD (26.33% vs. 47.33%) and depression (21.87% vs. 30.30%) compared to their male counterparts.

One study of 306 adult women in rural Haiti, which used a questionnaire based on a modified framework of the SCAT to measure social capital, adding metrics for structural connectivity and empowerment, found a 41% reduction in odds of hypertension for each social capital factor measured above the theoretical midpoint (the average of the highest and lowest possible score for a given metric)[3] (Malino, Kershaw, Angley, Frederic, & Small, 2013). Although the protective effects of social capital are indirectly mediated through their impact on patient behavior, social capital manifests as a powerful lens to examine the epidemiology of hypertension. In its 2013 *Global Brief on Hypertension* the World Health Organization delineated the marked impacts of social determinants like globalization, urbanization, ageing, income, education, and housing on hypertension, making the case to address these factors as part of a comprehensive healthcare strategy (WHO, 2013).

1.4 Treatment of Hypertension In Haiti

In 2003 The World Health Organization and International Society of Hypertension delineated a dual-pronged strategy to treat hypertension in their Statement on the Management of Hypertension, recommending both lifestyle modifications and drug therapy (WHO 2003). Advised lifestyle modifications include weight loss in the overweight, physical activity, moderation of alcohol intake, a diet with increased fruits and vegetables and reduced saturated fat content, reduction of dietary sodium intake, increased potassium intake, reduction of caffeine intake, and stress reduction activities (WHO 2003). Within Haiti, researchers and organizations alike have moved to implement education programs to properly train healthcare workers and patients on the role of lifestyle modifications in hypertension treatment. The Haiti Hypertension Center in Pétion-Ville has partnered with the State University Medical School to introduce certification programs for healthcare educators that address the social, environmental, and cultural conditions that contribute to hypertension (Jean-Charles, 2014). Similarly, The Fondation Haitienne de Diabete et de Maladies Cardio-Vasculaires (FHADIMAC) in Port au Prince, a hypertension and diabetes treatment clinic, offers public health education programs to its chronic disease patients on a daily basis (FHADIMAC, n.d.) Despite these efforts, high illiteracy, extreme poverty, and inadequate health infrastructure present complicated challenges to the effective distribution of health information to the general public.

Drug therapy for hypertension is informed by an initial risk stratification that examines patient comorbidity, age, sex, race, and blood pressure (Flack, Nasser, & Levy, 2011). There are three stages of hypertension, categorized by blood pressure (systolic/diastolic): stage 1) 140/90–159/99 mmHg, stage, 2) 160/100–179/109 mmHg, stage 3) $\geq$180/110+ mmHg (Partners In Health [PIH], 2013. Evaluated risk combined with a hypertension stage diagnosis determines the type and dosage of

[3]Structural connectivity was assessed by water source and garbage disposal source. Groups and networks was assessed by belonging to societal and community networks. Intra-community trust and solidarity was assessed with four-point Likert scales. Collective action and cooperation were assessed by hypothetical questions probing resources for emotional and economic crises. Information and communication was assessed by access to the perceived best sources of information. Social inclusion was assessed by questions probing the type of services one might be excluded from and reason why she might be excluded. Empowerment was assessed by personal-decision making ability, anticipated ability to make community decisions, provide influence in the community and interact with community officials.

drug therapy. The majority of research on hypertensive treatment over the past fifty years has focused on four classes of anti-hypertensive medications: 1) diuretics, which act on the kidneys to eliminate sodium and water, reducing blood volume, 2) beta blockers, which act on beta receptors to reduce heart rate and cardiac output, 3) ACE-inhibitors, which block the angiotensin-converting enzyme, relaxing blood vessels, and 4) calcium-channel blockers, which also relax blood vessels (PIH, 2013). Each of these classes carries unique contraindications, varies in affordability, and differs in efficacy. Furthermore, anti-hypertensive drugs are generally stratified into first, second, third, and if necessary, fourth line therapies depending on their and efficacy and availability (PIH, 2013). The Joint National Committee Hypertension Guidelines (JNC-8) represents the most recent research-based hypertension guidelines (Joint National Committee for Hypertension [JNC], n.d.). A first line therapy represents the initial choice of drug treatment in a medical protocol. If a patient does not respond to the maximum dosage of a first line therapy then the healthcare provider would begin treatment using the second line therapy and so on. A patient's stage of hypertension and the presence of risk factors influence the ultimate choice of which choice of therapy is appropriate (PIH, 2013). Importantly, all major trials demonstrating drug-induced blood pressure reduction have used stepwise upward-titration drug treatment regimens, not drug substitution. Medications, even those within the same class, can have different pharmacological properties and effects on patients. Drug substitution should only occur after careful analysis of a patients comorbidities, concurrent medications, and previous therapies (Johnston, Stafylas, & Stergiou, 2010).

While diuretics are extremely effective anti-hypertensive drugs, so much so that Partners In Health recommends Hydrochlorothiazide (HCTZ), a thiazide diuretic, as its first line therapy, their use can be dangerous without lab work, especially in tropical, water-insecure environments like Haiti (PIH, 2013). There is significant disagreement over the role diuretics should play among the few available hypertension protocols in Haiti, including that of Partners In Health, Haiti Outreach Ministries, and cardiologist, Eric Roehm (PIH 2013), (Roehm n.d.), (Haiti Outreach Ministries [HOM], n.d.). Although HCTZ, and more significantly, Furosemide (Lasix), a loop diuretic, can cause potassium depletion and dehydration, doctors often use them in the absence of lab testing for severe cases of hypertension, as there is no other option available (Miller, 2016), (Roehm, n.d.), (HOM, n.d.). Furthermore, HCTZ an attractive option in resource-limited settings like Haiti because it is the cheapest and most available anti-hypertensive drug (Roehm, n.d.).

Beta-blockers have historically been an inexpensive first line therapy for hypertension; however, recent research has questioned the efficacy of traditional, non-vasodilating beta-blockers like Atenolol in that role and especially on Black patients (Flack, Nasser, & Levy, 2011), (Wiysonge et al., 2007). A review of Beta-blocker studies over the past decade, not only revealed the limited effect of traditional beta-blockers on lowering central aortic blood-pressure and reducing incidence of stroke, but also showed worse cardiovascular outcomes compared to calcium-channel blockers and thiazide diraeutics (Caterina & Leone, 2011). Moreover, given the many adverse effects of beta-blockers, including drowsiness, sleep disturbance, visual hallucination, depression, and orgasmic and erectile dysfunction, their use as a first line therapy, especially in low-education populations, may suffer from compliance issues and erode patient trust and confidence in further treatment (Caterina & Leone, 2011). This is especially serious as suddenly stopping beta-blockers, including substituting beta blockers, can increase risk of heart attack or other heart problems

and is consequently highly dangerous (Mayo Clinic, n.d. a). In African Americans monotherapy with a thiazide diuretic or a calcium channel blocker has consistently lowered blood pressure more effectively than beta-blockers or ace-inhibitors (Flack, Nasser, & Levy, 2011). The majority of African American hypertensive patients, however, will not be controlled with monotherapy and race does not impact blood pressure response to two-drug antihypertensive therapy if at least one of the drugs is either a diuretic or a calcium channel blocker (Flack, Nasser, & Levy, 2011). It is not yet well known, whether these findings are applicable to Haitians (Roehm, n.d.).

Amlodipine, a calcium-channel blocker, is one of the most widely available anti-hypertensive medications in Haiti and is recommended as a first and second line therapy by Haiti Outreach Ministries and Partners In Health, respectively (PIH, 2013), (HOM, n.d.). It does not require laboratory testing and has less of an impact on potassium levels compared to HCTZ (HOM, n.d.). Additionally, at $25 per 1000 pills, Amlodipine is not relatively expensive compared to Beta-blockers, which cost $20 per 1000 pills (Roehm, n.d.).

Ace-Inhibitors, like Lisinopril and Enalapril, are a third line drug therapy option in both the Partners In Health and Haiti Outreach Ministries medical protocol. Lisinopril can excessively elevate Potassium and thus requires laboratory monitoring in the United States. For that some reason, Haiti Outreach Ministries recommended using it in combination with HCTZ. Ace-Inhibitors are contraindicated for pregnant patients and patients with renal failure, and given that birth control is uncommon in Haiti it should not be used by women of child-bearing age (Roehm, n.d.). Notably, ACE-Inhibitors are an especially viable treatment for patients with both hypertension and diabetes, as they have been demonstrated to improve kidney, heart, and less significantly, eye and nerve function in diabetes patients (Cordonnier, Zaoui, & Halimi, 2001).

An additional class of cholesterol-lowering medications, statins, has been shown to reduce blood pressure and risk of cardiac events. A follow-up of the landmark HOPE-3 Trial, found that treatment with rosuvastatin resulted in a significantly lower risk of cardiovascular events (myocardial infarction and stroke) in an intermediate risk population without cardiovascular disease (Yusuf et al., 2016). A meta-analysis of 20 randomized controlled studies also found that statin therapy caused a small but significant lowering of blood pressure (Strazzullo et al, 2007). Notably, the lowering effect was greater in patients with higher baseline blood pressures (Strazzullo et al.,2007).

In recent years, trials have been undertaken to test the utility and efficacy of a fixed-dose combination “polypill”, containing aspirin, a statin, and two anti-hypertensive drugs. In a 2005 bulletin, The World Health Organization described the “polypill” as a promising treatment option in developing countries with high levels of uncontrolled hypertension, low compliance with multiple-medication hypertension treatment, and increased cost of accessing medication (Wise, 2005). Since then, an individual participant data meta-analysis from multiple trials found the “polypill” to be more effective in decreasing blood pressure, decreasing cholesterol, and improving compliance, as compared to usual treatment (Lafeber, Spiering, Visseren, & Grobbee, 2016).

Ultimately, comprehensive treatment of hypertension demands continuous care and monitoring by a healthcare professional. Beyond initially adjusting medications to ensure their effectiveness, patient-specific risk factors and comorbidities can change constantly and affect treatment. Moreover, many patients have complications and questions regarding lifestyle changes. Hypertension

is a chronic disease that requires continuous access to quality healthcare (PIH, 2013).

1.5 Risk of Diabetes In Haiti

Diabetes is a chronic disease in which the body is unable to regulate the amount of glucose in the blood due to insufficient production or resistance to insulin, a hormone that allows muscle and tissue to absorb glucose from the blood stream (Cheng 2005). There are two main types of diabetes, which vary in incidence and age of development. Type 1 Diabetes is marked by absolute insulin deficiency and is most often diagnosed in children or young adults (Cheng 2005). Although it is unclear what causes Type 1 Diabetes, insulin deficiency results primarily from an autoimmune response that destroys insulin-producing β-cells in the pancreas (Cheng, 2005). Type 2 Diabetes, which accounts for 90 to 95% of the incidence of diabetes results from resistance to insulin and often occurs in adulthood (Cheng, 2005). It is not yet well-known what exactly causes Type 2 diabetes, but researchers believe that obesity, family history, inactivity, race, age, tobacco and alcohol use, prediabetic conditions like impaired fasting glucose[4] (IFG) and impaired glucose tolerance (IGT), and exposure to stress are major risk factors (Harvard School of Public Health [HSPH], 2016), (Wisse, 2015), (Mayo Clinic, 2016b). Uncontrolled diabetes decidedly increases mortality and morbidity: the prevalence of cardiovascular disease and ischemic heart disease among diabetics is much higher than in the general population. Uncontrolled diabetes can also lead to stroke, cardiovascular complications, as well as eye, kidney, and extremity blood vessel damage (Cheng 2005). Changing lifestyles and subsequent increased rates of obesity and physical inactivity are thought to be driving a higher global rate of morbidity. In the United States, alone, there was a 61% increase in incidence of diabetes between 1990 and 2001 (Leahy, 2008). Notably, more than 80% of diabetics live in low/medium income countries (Karabanow, 2014).

In Haiti, diabetes plays a key role in national morbidity and mortality; The World Health Organization estimates 10% of the population has Type 2 Diabetes, while a 2006 study by FHADIMAC of 1620 adults in Port au Prince found diabetes prevalence rates among men and women of 4.8% and 8.9%, respectively (Jean-Baptiste et al., 2006). A 2010 post-Earthquake US Centers for Disease Control found Diabetes to be the seventh leading cause of death in Haiti, at 2% of all deaths (CDC, n.d.). Diabetes carries enormous economic costs: The World Health Organization estimates that diabetes care may account for up to 15% of national health budgets (WHO, n.d. b).

Whereas Type 1 Diabetes is not thought to be preventable, many of the documented, controllable risk factors for Type 2 Diabetes, especially obesity, diet and stress, are present in Haiti. Despite widespread food insecurity and high physical activity, Haiti has a surprisingly high prevalence of obesity and overweight—the two single most important causes of Type 2 diabetes. Adults who are overweight or obese have a seven and twenty to forty times higher risk of developing Type 2 diabetes, respectively. Minor weight loss can have contribute to a major risk reduction: losing 7-10% of current body weight can cut the risk of developing type 2 diabetes in half (HSPH, 2016).

[4]IFG and IGT are states of abnormal glucose regulation between diabetes and normal levels. IFG is defined by a fasting plasma glucose $\geq$100 and <126 mg/dl. IGT is defined by an elevated by plasma glucose concentration $\geq$140 and <200 mg/dl after a 75-g glucose load on the oral glucose tolerance test. Up to 70% of people with these prediabetic conditions may develop type two diabetes. (http://care.diabetesjournals.org/content/30/3/753).

Similarly, minor increases in physical activity, like walking thirty minutes per day, have also been shown to reduce risk by 30% (HSPH, 2016).

The Haitian diet incorporates many of the well-documented dietary contributors to type 2 diabetes risk, including processed carbohydrates, sugary beverages, trans fat and processed meat (HSPH, 2016). Cheap simple carbohydrates like white rice and white bread, which are ubiquitous in Haiti because of their affordability, availability, and satiating nature, have high glycemic indexes and cause unhealthy sustained blood glucose spikes (Karabanow, 2014). In contrast, whole grains, which are also common in Haiti, take longer to digest and consequently prevent rapid blood glucose spikes (Karabanow, 2014). In an 18-year study of 160,000 women in the United States and Canada, women who consumed two to three servings of whole grains per day had a 30% lower incidence of type 2 diabetes than those who hardly ate whole grains (HSPH, 2016). Furthermore, the high intake of sugary beverages likely plays a large role in the onset of Type 2 diabetes; an analysis of eight studies found that the risk of developing type 2 diabetes increased 25% for each 12-ounce sugary beverage consumed per day (HSPH, 2016). Soda, juice, and energy drinks are widely consumed in Haiti; in a survey of 33 "Boutiks", or street vendors, in Port au Prince, soda and processed juice were reported to be one of the top two most purchased items by 73% and 67% of respondents, respectively (Schwartz, 2015). Additionally, cheap food rich in harmful trans fats are found throughout the Haitian diet and marketplace. A survey of 632 Haitians in Port au Prince, found that 91% consume nutritionally deprived pre-packaged snacks every week, with 53% reporting doing so every day (Schwartz, 2015). Widely available and consumed fried street food like "Pate" and hydrogenated oil-laden prepared meals also contain large amounts of trans fats. Both street meals and typical home-prepared meals often contain processed risk-increasing red meat as well. A review of data from roughly 440,000 people across multiple studies found that minor daily consumption of processed red meat (i.e. one-hot dog), increased type 2 diabetes risk by 51% (HSPH, 2016).

By both limiting adherence to behavioral recommendations and activating physiological responses linked to the pathogenesis of Type 2 diabetes, depression, chronic stress and traumatic stress events have been demonstrated to not only increase risk of developing type 2 diabetes, but also inhibit blood glucose management in patients who already have type 2 diabetes. A 2008 meta-analytic review of 13 studies, found a 60% higher relative risk of developing Type 2 diabetes in depressed patients compared to a control group[5] (Pouwer, Kupper, & Adriaanse, 2010). Moreover, a 2000 cross-sectional review of data from 2,262 patients found that patients who had experienced significant live events over the past five years had 1.6-fold increase risk in developing Type 2 diabetes (Pouwer, Kupper, & Adriaanse, 2010). Multiple studies have specifically identified an alarmingly strong association between PTSD and type 2 diabetes. Over an 18-year follow up of 50,347 women in the Nurses Health Study II, A nearly 2 times greater risk of onset of Type 2 diabetes was found in patients with high levels of PTSD symptoms (Roberts et al., 2013). A 2006-2008 follow-up of 2970 adults included in the KORA S4 study in South Germany, conducted from 1999 to 2001, found full PTSD was significantly associated with Type 2 diabetes (odds ratio

[5]Relative risk compares the ratio of two probabilities, or the risk of an event for two separate groups, in which one was exposed to an event and the other was not. An odds ratio compares the presence and absence of an exposure (i.e. smoking) given knowledge of an event (i.e. myocardial infarction). Odds ratio can magnify risk if a disease is more common, as in the case of hypertension.

of 3.56), even after controlling for sociodemographic characteristics, metabolic risk factors, and psychopathological conditions (Roberts et al., 2013). These results are particularly concerning in Haiti, where rates of PTSD and depression are extremely high. General daily and emotional stress, both ubiquitous in Haiti, has also been linked to the onset of Type 2 diabetes: a data analysis of 7,066 men and women from the Copenhagen City Heart Study found that men who reported daily emotional stress were more than twice as likely to develop type two diabetes, while a Japanese study of 55,826 subjects found that the risk of diabetes increased with reported stress level for both sexes, but especially among men (Pouwer, Kupper, & Adriaanse, 2010). In a roughly twenty five year follow up, a national cohort study of 1.5 million male military conscripts in Sweden from 1969-1997 found that low stress resilience among 18-year old men was associated with an increased risk of developing type 2 diabetes after adjusting for BMI, family history of diabetes, and individual and neighborhood socioeconomic factors (Crump, J. Sundquist, Winkleby, K. Sundquist, 2016). Interestingly, the study found that above average stress resilience was linked to slightly decreased risk (Crump, J. Sundquist, Winkleby, K. Sundquist, 2016). Beyond increasing risk for developing type 2 diabetes, stress and has also been implicated in stymieing effective blood glucose control in patients who already have diabetes. Although not without limitations, laboratory studies have linked exposure to acute psychological stress with short increases in blood glucose concentrations, while interview-based studies have linked long term exposure to negative stress with deterioration of blood glucose control over time in type 1 diabetes patients (Lloyd, Smith, &Weinger, 2005). Research has also demonstrated the importance of both social support and psychological therapies in buffering the effects of stress (Lloyd, Smith, &Weinger, 2005), (Ismail, Winkley, & Rabe-Hesketh, 2004). In a meta-analysis of 12 randomized controlled studies, psychological interventions, mostly consisting of variants of behavioral cognitive therapy, were found to significantly improve glycemic control compared to control group of usual care and education (Ismail, Winkley, & Rabe-Hesketh, 2004). Cost-effective stress management training has also been shown to produce clinically significant benefits for patients with Type 2 diabetes (Surwit et al., 2002).

1.6 Treatment of Diabetes in Haiti

Similar to hypertension, diabetes treatment and prevention involves both lifestyle modifications and drug therapy. Diabetes is initially diagnosed with a fasting plasma glucose[6] or HbA1c test. A fasting plasma glucose test is taken following a period in which a patient has not eaten for at least eight hours and provides a one-time plasma glucose measurement. A measurement greater than 126 mg/dL in symptomatic patients indicates diabetes and a measurement between 100 and 125 mg/dL indicates IGT[7]. For asymptomatic patients, a positive diagnosis requires two unique abnormal measurements. The HbA1c, in contrast, provides a measurement of a patients average blood glucose over 3 months, where a measurement of 6.5% or above indicates diabetes and a measurement between 5.7% and 6.5% indicates prediabetes (National Institute of Diabetes and Digestive and Kidney Disease [NIDDK], n.d.). Although the HbA1C test is not widely used

[6]Glucose can be measured in whole blood, plasma, or serum, but the World Health Organization recommends utilizing plasma. (https://www.idf.org/webdata/docs/WHO_IDF_definition_diagnosis_of_diabetes.pdf)

[7]IFG is diagnosed similarly, but with an oral glucose tolerance test (OGTT).

in Haiti because of its comparatively high cost, it is significantly more reliable and useful in diagnosing diabetes and monitoring blood sugar (Karabanow, 2014). Blood glucose concentration is susceptible to short term perturbations caused by stress, diet, and exercise, large biological variability, and diurnal variation (NIDDK, n.d.). One report of 685 subjects without diagnosed diabetes found that only 70.4% of patients with a fasting plasma glucose greater than or equal to 126mg/dL on one test did so on a second test taken roughly two weeks later. A study of 12,882 adults revealed that fasting plasma glucose measurements taken in the morning were significantly higher than those taken in the afternoon, leading to a prevalence of diabetes in the afternoon-examined patients half of that in morning-examined patients (Sacks, 2011). Plasma glucose concentrations are also believed to vary 5.7-8.3% in a single healthy person from day to day (Sacks, 2011). Most importantly, blood glucose concentrations naturally vary quite significantly in diabetics during the course of a day; however, a fasting blood glucose measurement only provides a single value, which does not reveal long-term trends or important post-prandial results (Sacks, 2011), (International Diabetes Federation [IDF], 2012). For that reason, the International Diabetes Foundation reported in its 2012 Type 2 Diabetes Management Guidelines, "Random clinic plasma glucose testing is not seen as having a role in quality diabetes care, however in some situations it may be the only option. When HbA1c is unavailable or inappropriate, timed glucose levels are often recommended as a substitute." Continuous self-monitoring blood glucose is an integral tool in managing Type 1 diabetes; however its benefit and cost-effectiveness in non-insulin treated type 2 diabetes remains unclear. Given the high rates of uncontrolled diabetes, self-monitoring of type 2 diabetes may help reinforce positive behaviors (IDF, 2012). Regardless implementing self-monitoring treatment in Haiti is challenging, as many patients do not have access to blood glucose tests.

Lifestyle modifications, including dieting, exercising moderately for at least 30 minutes a day, weight loss, and actively managing stress serve a primary role in diabetes management in Haiti (Group Health Cooperative [GHC], 2015). Increasing intake of complex carbohydrates like fruits, vegetables, whole grains, legumes, and low-fat dairy products, fiber-rich foods, lean proteins, monosaturated an polyunsaturated fats, and whole grains, while decreasing intake of simple carbohydrates, sugary beverages, trans fat, sodium are key strategies to controlling diabetes. Eating well-balanced meals and separating mealtimes are also important in reducing unhealthy blood glucose spikes (Mayo Clinic, n.d. e). Because diabetes greatly increases the risk for cardiac events, the single most important part of diabetes care is cardiac risk reduction. Hypertension is an extremely common comorbid condition in diabetes, as up to 75% of diabetics have hypertension, thus treating hypertension often represents an important part of diabetes care (Long & Dagogo-Jack, 2011). For that reason, many of the diet recommendations for diabetic patients coincide with the DASH diet (Campbell, 2011). In Port au Prince, FHADIMAC offers weekly education sessions to its patients, emphasizing the value lifestyle changes in treating diabetes. They have also created visual education materials, which are available through their website (FHADIMAC, n.d. b). The J/P Haitian Relief Organization and World Diabetes Foundation are currently partnering to educate 40,000 people in Delmas, Port au Prince on diabetes management. The project also entails the launch of a diabetes clinic, which will consult 9,200 people over two years, and training of 12 matrons, 20 community health workers, and 30 doctors and nurses in diabetes management (World Diabetes Foundation [WDF], n.d.). There are also numerous Creole education materials available on the Internet (Association For Clinicians Underserved, n.d.). As it remains, however,

widespread poverty and insufficient diabetes-focused health resources limit both Haitians access to education and ability to implement recommended changes.

Drug therapy for diabetes in Haiti utilizes three main drugs, whose applicability depends on the type of diabetes: medical insulin, metformin, a biguanide which decreases the amount of glucose absorbed from food and produced by the liver, and glyburide, a sulfonylureas which causes the pancreas to produce insulin (Medicine Plus, n.d. a), (Medicine Plus, n.d. b). Type 1 diabetes is characterized by dependence on medical insulin. Several types of insulin exist, each varying in time to onset, duration, and strength. Insulin is expensive and not widely available in Haiti, consequently many type 1 diabetics die prematurely or during disasters like the 2010 Earthquake (Karabanow, 2014). Metformin and glyburide are used exclusively to treat type 2 diabetes.

Aside from drug therapy, The International Diabetes Foundation Type 2 Diabetes Management Guidelines strongly recommend incorporating foot examinations and BMI measurements in clinical care at least annually. Reducing abdominal adiposity is a valuable strategy in diabetes care and tracking patient progress can help motivate positive patient behaviors. Proper foot care should also be a staple of a diabetes education program and clinical practice. Diabetic patients are extremely likely to develop neuropathy, skin damage, calluses and ulcers in their feet (American Diabetes Association [ADA], n.d.). Consequently patients should be instructed to perform daily foot self-examinations, wash their feet daily, always wear shoes and socks, and elevate and stretch their feet to maximize blood flow (ADA, n.d.). Clinical examinations should involve foot inspections, footwear evaluations, vascular assessments, and if necessary wound management and infection treatment (IDF, 2012). Inadequate foot care can not only directly increase patient suffering and morbidity, but also worsen diabetes by limiting physical activity.

1.7 Partners In Development

Partners In Development (PID), a 501(c) non-profit based in Massachusetts, has worked in Port au Prince, Haiti for over twenty years. The organization has constructed over fifty concrete homes, sponsors over five hundred Haitian children, and with the support of a massive influx of donations in the immediate aftermath of the 2010 Earthquake, opened a primary care walk-in clinic in the Blanchard community of Port au Prince, which now consults 26,000 patients annually (Partners In Development, 2015). The clinic staffs over fifteen fulltime Haitian healthcare workers, and one fulltime Haitian physician. In 2012, PID established a specific diabetes and hypertension clinic , which currently consumes approximately one third of the clinics $107,500 annual budget (GuideStar, n.d.).

As a non-profit organization operating in a developing country, Partners In Development is constrained both financially by its limited access to funding and programmatically by Haiti's general lack of resources. Although the organization has maintained a stable operating budget in the years since the Earthquake's donation boom, it has stopped accepting new hypertension and diabetes patients because of the chronic disease program's ballooning costs. PID funds its hypertension and diabetes budget largely through grants, donations and service trips, which allow foreign, mostly American, healthcare professionals to travel to Haiti for one to two week stints and volunteer in PID's medical clinic. In order for an individual to participate in a medical service trip, PID charges a $660 fee that functions as donation to the clinic itself. PID's hypertension and

diabetes program is financially dependent on service trip funding.

1.8 Clinic Protocol

The chronic disease clinic is designed to operate following medical protocols (see figures 4 and 5) established by American physicians. Once a patient is identified as hypertensive (blood pressure >160/100 mmHg. on three occasions or >180/100 mmHg on one occasion or diabetic (random blood glucose >250 mg/dL or fasting blood glucose >200 mg/dL) by the primary care physician, he/she is prescribed medication and asked to return in one month[8]. Medications, which are bought in the United States and transported in the luggage of service teams, are supposed to be prescribed in accordance with the clinic protocol (see figures 4 and 5). Following a recent clinic policy change, patients must pay a very small fee for their medications. This is to increase patient accountability and offset some of the clinics cost[9]. The hypertension treatment of choice is 12.5mg HCTZ (thiazide diuretic) once daily and Nisoldipine (calcium-channel blocker) 10mg once daily; however in a copy of one protocol found in the clinic amlodipine had been replaced with Atenolol 50mg once daily. For type 2 diabetes the treatment of choice is Metformin 500mg once daily if the fasting blood glucose is greater than 250 mg/dL and Glyburide 5mg if Metformin does not lower blood glucose below 250 mg/dL. PID does not carry insulin and thus cannot treat type 1 diabetes. If the patient does not have complications and the medications are determined to be working by the primary care physician, the patient is permanently referred to the diabetes and hypertension clinic where he/she receives a 30 day supply of medication according to the initial physician-prescribed treatment plan, attends monthly health education, and logs monthly blood pressure/blood glucose measurements. PID does not utilize the HbA1c due to its comparatively high cost. Clinic guidelines state patients who miss appointments will be removed from the program

The primary care clinic internist and primary care clinic supervisor medically oversee the hypertension and diabetes program. A separate chronic disease clinic coordinator (CDC coordinator) is the primary contact for patients permanently in the chronic disease clinic and performs monthly patient consultations, during which patient blood sugar and blood pressures are recorded and a monthly education session is conducted. Approximately 10-20 patients are consulted everyday. The chronic disease coordinator is not a healthcare professional, but has received training from foreign healthcare providers. The chronic disease clinic coordinator does not prescribe medication or medically consult patients; he is only authorized to fill existing prescriptions by primary care clinic internist. If a prescription is changed the primary care clinic internist must consult the patient. Hypertension clinic guidelines state patients should receive a consultation by a medical professional every four months.

The monthly education sessions promote appropriate lifestyle modifications to reduce the risks associated with hypertension and diabetes, including weight loss, exercise, diet, stress management, diabetic foot care and how to properly take prescribed medicine. The chronic disease clinic coordinator gives education orally at every patient visit.

[8]Due to limited resources, PID only treats severe cases of hypertension.

[9]In cases when PID knows a patient cannot afford the small price of monthly medication they provide the medication at no cost.

Although the primary care clinic records all patient data from visitations in an electronic database, the chronic disease clinic does not utilize an electronic database. For four years the CDC coordinator has recorded clinic data, including monthly patient vital sign measurements and medical prescriptions, in writing on computer paper. During each consultations patients also receive a white slip, which contains their prescriptions and vital sign measurements. They are expected to bring all white slips from previous consultations to future visits.

2 Study Purpose

The purpose of this study is evaluate the efficacy of Partners In Developments chronic disease program by examining both how effectively the following clinic goals and are achieved and what further policies, programming, and protocols can be implemented to improve hypertension and diabetes clinical practice in a resource limited setting.

1. What is PID's role in chronic disease care in Port au Prince, Haiti?
2. What local risk factors contribute to risk and prevalence of chronic disease in Port au Prince?
3. Do PID's medical protocols reflect the most recent recommendations in the literature?
4. Does PID's medical practice adhere to its protocols and guidelines?
5. Does PID's medical practice adhere to the most recent recommendations in the literature?
6. Does PID's education program adhere to the most recent recommendations in the literature?
7. Does PID's chronic disease patient population value education as part of its treatment?
8. Does PID's chronic disease patient population retain information from education sessions?
9. Is PID's chronic disease patient population capable of implementing the advice received from education sessions?
10. Does PID's education and medical practice reflect the local factors contributing to chronic disease?
11. Are PID's employed Haitian and American healthcare professionals involved in the chronic disease program properly trained?
12. Are foreign, visiting healthcare professionals properly trained?
13. Are foreign, visiting healthcare professionals effectively integrated into PID's chronic disease program, so that continuity of care is maintained?
14. What specific symptoms and chronic disease complications are most relevant among PID's patient population?
15. Does PID effectively address the complications in its care of chronic disease patients?

16. What role do PID patients' communities play in chronic disease treatment?
17. How do PID employees believe PID can improve its care of chronic disease patients?
18. Does PID effectively retain chronic disease patients in its program?
19. Is PID capable of effectively evaluating the efficacy of its own chronic disease program?
20. Do PID's interventions effectively the lower blood pressure of its chronic disease program patients?

3 Methods

3.1 Study Participants & Data collection

The qualitative portion of this research was conducted in the form of in-depth interviews, which took place at Partners In Development's clinic in Port au Prince, Haiti. Tulane University's Institutional Review Board provided ethical approval for the study, and informed written consent was obtained before each interview. The sample comprised four distinct populations: 1; Haitian chronic disease patients, 2; Haitian healthcare workers, 3; Haitian and American health administrators, and 4; American healthcare workers. Haitian chronic disease patients formed three subgroups: 1; hypertension patients, 2; diabetes patients, 3; hypertension and diabetes patients.

The chronic disease clinic coordinator randomly recruited patients from PID's hypertension and diabetes program. Over a two-week period, sixty-seven patients (21 hypertension patients, 20 diabetes patients, and 26 hypertension and diabetes patients) were interviewed immediately following their monthly clinic visitation. Patients were both male and female, ranged from approximately forty to eighty years old, and had participated in the program between one and thirty-six months. On several occasions patients who wanted to be interviewed were not interviewed due to time constraints. The Haitian clinic director recruited seven Haitian healthcare workers and administrators from triage, wound care, and primary care, who were interviewed as available throughout the workday. Several Haitian healthcare workers were initially skeptical about the confidentiality of their responses; however, upon further explanation about the study, each consented to an interview. American health administrators and healthcare workers were interviewed when available in Haiti. All of the interviews took place in Haiti and were conducted in a closed clinic office.

The interviews followed a semi-structured format, in which questions were asked sequentially from a questionnaire. Personally identifiable information, including age and gender, was not recorded in order to maximize the protection of interviewee's anonymity. In the 72 interviews conducted with non-English speakers, the questions were posed in English and immediately translated into Haitian Creole by a hired translator. Interview responses were translated back into English and transcribed into a Microsoft Word document. In order to minimize the language barrier's impact on the quality of data, clarification was often sought on responses. Questions were also repeated and rephrased when necessary. On several occasions, interviews were shortened

because a patient needed to leave early or was to weak to continue. In the interviews with native English speakers, questions were asked directly. Interviews lasted between approximately fifteen and sixty minutes.

The quantitative portion of the research involved no direct patient contact. Four years of hypertension clinic data was transferred from hard copy of computer paper to a Microsoft Excel document. Many data sets were incomplete, missing dates, medications, or blood pressures. Approximately 40 individual patient visitation records were not added to the database because they were not dated. A patient was included in the database if they met any the following criteria: i) patient had one documented systolic blood pressure measurement of >140 mm/hg, ii) patient appeared on any identifiable hypertension clinic data sheet, iii) patient received a prescription for hypertension medication. When data was illegible or ambiguous, clarification was sought from the clinic coordinator. The data was entered, so each row corresponded to one patient. Personal patient information (age, sex, and name) was entered in the first four columns, while data from monthly clinic visits was recorded in a horizontally repeating four-column header (date, systolic blood pressure, diastolic blood pressure, medications prescribed). A diabetes database was not created due to time constraints and the limitations on deriving accurate statistical models from monthly fasting blood sugar measurements.

3.2 Method of Analysis

Each interview transcription was read line by line. Interview responses were coded manually and indexed in Microsoft Excel according to each question. Statistics were extracted based on the frequency of coded responses. Applicable quotes were also extracted and categorized based on relevant subthemes.

In order to maintain anonymity, patient names were removed from the database used for statistical analysis. The data was manually reformatted and patients without a systolic blood pressure >140 were removed. Using R, an open-source statistical computer program, patient data was used to create linear plots and Kaplan-Meier Survival curves.

3.3 Theoretical Framework

The results of this study are framed by both the Integrated Theory of Health Behavior Change (ITHBC) and the Theory of Planned Behavior (TPB). The ITHBC "purports health behavior change can be enhanced by fostering knowledge and beliefs, increasing self-regulation skills and abilities, and enhancing social facilitation." (Ryan, 2009). In the ITHBC, these factors influence the proximal outcome, self-management of chronic disease, which determines the ultimate health status of participant patients (Ryan, 2009). The examination of patient beliefs is conducted within the TPB, which asserts that intention to engage in a particular health behavior is determined by a patient's attitude towards the behavior, perceived behavioral control, and subjective norms (Ajzen, n.d.). These factors respectively originate from patient beliefs, which are categorized into 1) behavioral beliefs; the perceived subjective probability a behavior produces an outcome, 2) normative beliefs; the perceived behavioral expectations of important referent individuals like family and close peers, and 3) control beliefs; the perceived presence of factors that facilitate or impeded practice of behaviors (Ajzen, n.d.). As seen in figure ?, this study follows an augmented model of The

Integrated Theory of Health Behavior, which includes an additional layer of analysis of the healthcare system. The health system both informs patient knowledge and beliefs and affects health outcomes through clinical healthcare provision. By using a combination of the ITHBC and TPB it is possible to simultaneously examine chronic disease healthcare outcomes through the perspectives of healthcare providers, patients, and community members—three unique and equally impactful viewpoints.

4 Results

The results are divided into interview findings and the statistical analysis of clinic wide data. The interview findings are organized following the concept model in figure 11. The statistics used in the interview findings are separated by patient type and ordered according to a patient's diagnosis with three subgroups: 1; hypertension patients, 2; diabetes patients, 3; hypertension and diabetes patients. Not all patients answered every question; hence, "N" indicates the number of respondents to each question. Quotations used are not always exact, as a translator was used for non-English speaking subjects. To protect anonymity, names cited in quotes are replaced by job title.

4.1 Healthcare System

4.1.1 Partners In Development's Role In Chronic Disease Healthcare In Port au Prince

PID's hypertension and diabetes clinic is one of few operating in Haiti. All seven healthcare workers identified PID and The Fondation Haitienne de Diabete et de Maladies Cardio-Vasculaires (FHADIMAC) as the only two locations to their knowledge offering continuous hypertension and diabetes monitoring, treatment, and public health education. FHADIMAC, however, was reported to be too expensive for PID's patient population and difficult to gain membership too, leaving PID's clinic as the only comprehensive option for low-income patients in the region. Although patients identified short-term clinics in some communities, their scope of services and longevity did not compare to PID or FHADIMAC. Moreover, in spite of the lack of chronic disease healthcare resources, patients largely described a high prevalence of hypertension and diabetes within in Haiti and their respective communities.

> "Where I live there's a lot of people with high blood pressure and blood sugar. A year ago the Red Cross had a station where I lived. They checked our blood pressure and blood sugar, but the Red Cross left."... Hypertension Patient

> "Hypertension and diabetes are the two sicknesses that bother people here in Haiti."... Hypertension and Diabetes Patient

Due to the paucity of available and accessible healthcare facilities, interview respondents described the emergence of auxiliary community blood sugar and/or blood pressure monitoring services, in which patients could pay local Haitian health professionals to obtain a vital sign measurement. While this service was reported to be affordable, it does little to treat chronic disease outside the framework of a comprehensive program and thus is not an effective healthcare service in itself to non-PID patients. Hypertension patients (65% N=20) were more than four times likelier to be able

to reliably check their vitals at home than diabetes patients (15% N=20). Many diabetics, who owned glucometers, struggled to find replacement strips or encountered functional problems: just 23% (N=13) of diabetics who reported owning a glucometer stated it was working correctly.

4.1.2 Chronic Disease Risk Factors Affecting Partners In Development's Patient Population

4.1.2.1 Widespread Poverty

Partners In Development's chronic disease patient population lives in a variety of communities, which range in economic development, environmental stability, and access to health resources. These communities include Blanchard, a relatively secure and developing area where the PID clinic is located, Cite Soleil, an urban slum with considerable violence and gang activity, Canaan, a mountainside Earthquake relocation camp, and the Haitian countryside, which encompasses the more distant rural and agricultural regions outside of Port au Prince. Although the majority of patients live within the Port au Prince region, at least one patient reported traveling five hours to access PID's free hypertension and diabetes clinic[10].

> "I live in the countryside, but I come here every month. I stay at my relatives house when I come here, but my house is 4-5 hours away."...Hypertension and Diabetes Patient

In each of the communities PID serves, environmental instability compounds sluggish economic development. In Port au Prince, for example, housing is a reliable indicator of poverty and varies quite dramatically by community. Shelters in the impoverished shantytown of Cite Soleil are largely constructed from tin and have dirt floors. These dwellings are hardly resilient to flooding and one family that moved from Cite Soleil to Blanchard reported having to stand during nighttime rainfall. In contrast, a majority of Blanchard residents, who are slightly more economically secure, live in robust concrete homes, which can withstand storms and rainfall. Before the 2010 Earthquake PID had built over fifty concrete homes in Blanchard and nearly all of them survived. Residents in Canaan live in a variety of housing structures, including tents, concrete houses, and wooden houses.

While varying in the exact degree of poverty, these communities, which house many PID chronic disease patients, generally all classify as extremely poor. A majority of residents in the Port au Prince region obtain water from wells and cook with charcoal, which consumes free time and increases exposure to illness. Additionally, families of PID patients are typically large and with high levels of unemployment, many patients struggle to provide for their families or in the cases of older patients, be provided for. Patients cited affording their children's tuition, food, and healthcare as everyday challenges. Poverty impacted patient's ability to follow lifestyle recommendation, access healthcare, and contributed ubiquitously to stress.

4.1.2.2 Family History

Both hypertension patients and diabetes were likely to report a family history, although hypertension patients (68% N=21) were more than twice as likely to do so than diabetes patients 30% (N=20). It was not clear whether patients with both hypertension and diabetes were referring to a family history of diabetes or hypertension. Even if patients did not report a family history, many mentioned knowing someone in their community with either hypertension or diabetes.

[10]This study did not collect information on patient neighborhood.

4.1.2.3 Tobacco and Alcohol Use

Tobacco and alcohol use was virtually non-existent among all interviewed patients, who often voluntary cited their religion, as a reason for abstaining (Hypertension: 5% N=20, Diabetes: 0% N=17, Hypertension & Diabetes: 8% N=26). Financial poverty also contributed to diminished alcohol and tobacco use, as Haitians generally struggle to meet everyday needs and do not have excess money to spend.

4.1.2.4 Exercise

A majority of patients reported exercising regularly when asked directly (Hypertension: 85% N=20, Diabetes: 85% N=20, Hypertension & Diabetes: 81% N=26). The definition of exercise varied by patient age, sex, and physical stamina. A vast majority of patients in all three groups reported walking regularly. In Haiti walking is an integral part of the typical lifestyle, and patients reported walking to the market, church, PID's clinic, and to retrieve water from the community well. Elderly patients in all three groups, who sometimes were unable to walk, reported performing arm stretches and domestic tasks as exercise.

4.1.2.5 Availability of and Access to Healthy Foods

Almost directly outside PID's clinic in Blanchard, and in most neighborhoods in Port au Prince, are fresh food markets. Because of its tropical location, Haiti produces many fruits, vegetables, whole grains, and meats. The typical market place contains an abundance of healthy foods for hypertension and diabetes patients. Unfortunately, these markets also contain many nutritionally deprived prepackaged foods, sodas, sugar-rich juices, energy drinks, simple carbohydrates, and processed dairy products. Moreover, many street vendors, as observed outside PID, sell "pate", an unhealthy fried dough and high sodium and carbohydrate street meals that include spaghetti, hot dogs, fried meat, and salty rice dishes. Healthcare workers reported that the typical Haitian diet put the general public and chronic disease patients at an unnecessary risk.

> "Haitians put sugar and salt on everything."... US Healthcare Provider

4.1.2.6 Chronic and Traumatic Stress

PID's chronic disease patients reported widespread chronic and acute stress. Chronic stress was endemic among all three of PID's patient populations: 57% (N=21) of hypertension patients, 60% (N=20) of diabetes patients, and 38% (N=26) self-reported chronic stress. Patients recounted an environment, in which political instability, widespread poverty, and inadequate healthcare contribute to constant social and financial pressures. Moreover, many patients live with extreme day-to-day uncertainty, including where there next meal will come from, whether political or natural disaster will strike, and what resources will be available to them.

> "Now, because our country is poorly managed and politically everything is upside down everybody has stress."... Hypertension Patient

> "That's the problem of Haiti: you never know what's going to happen because of the way the country is. That causes a lot of stress."... Diabetes Patient

Aside from an already high rate of chronic stress among all three patient populations, nearly half of

all diabetic patients (45% N=20) and hypertension and diabetes patients (50% N=50) self-reported a traumatic stress event. Port au Prince was near the epicenter of the 2010 Earthquake and severely affected by both Hurricane Matthew and the Cholera outbreak. As will be further discussed in Section 2, patients reported considerable exposure to death and violence. It is important to note that patients were not formally asked whether they suffer from stress, so the prevalence of both chronic and acute traumatic stress may very well be higher.

> "Everyone has stress. There are riots, shootings, stealing."...Haitian Healthcare Worker

4.1.3 Quality of Medical Treatment at Partners In Development's Chronic Disease Clinic

4.1.3.1 Disparity Between Medical Protocol and Medical Practice

PID's treatment of hypertension and diabetes patients involves both clinical care, which includes drug therapy, consultations, and disease complication management, as well as public health education to inform patients about necessary and positive lifestyle modifications. In this section, PID's hypertension and diabetes medical protocol and will be compared against current literature, after which PID's medical practices will be compared against its medical protocol and the chronic disease clinic guidelines. In the next section, PID's chronic disease public health education guidelines will be compared against the literature, after which PID's educational programming and practice will be compared its guidelines.

Hypertension patients are supposed to be prescribed medications in accordance with the protocols in figure 5 and diabetes patients are supposed to be prescribed medications in accordance with the protocol in figure 6. In the most recent hypertension protocol, PID's choice of first line therapy, HCTZ 12.5mg and Nisoldipine 10mg, for hypertension patients is in line with the JNC-8 Hypertension guidelines and both Partners In Health's and Haiti Outreach Ministries' protocols[11]. The protocol advises time-specific dosage adjustments for these medications in patients with persistent hypertension (blood pressure >160/90). Furthermore, the hypertension protocol mentions the dangers of substituting beta-blockers, risk of using Lasix (Furosemide) in chronically dehydrated patients, ineffectiveness of monotherapy with ace-inhibitors and beta-blockers in patients of African descent, which are all key points informing hypertension care in the literature. Partners In Development's hypertension protocol, however, does not mention specific dosage or pharmacological guidelines for treatment with ace-inhibitors, beta-blockers or statins. It also does not include several common contraindications for anti-hypertensive drug classes and medications: beta-blockers are contraindicated if a patient's heart rate is below 55 beats per minute, ace-inhibitors are contraindicated in pregnant patients, and HCTZ is contraindicated in severe renal failure.

PID's paper chronic disease medical records, which were converted into an electronic database as part of this study, were used to compare the hypertension clinic's actual drug treatment practices against the hypertension medical protocol. A review of data between 2012 and 2016 revealed that PID violated its own medical protocol and recommendations in the literature by routinely substituting beta-blockers, stopping beta blockers without a two-week taper, prescribing beta-blockers as a first line treatment for hypertension, prescribing monotherapy with ace-inhibitors,

[11]On one hypertension medical protocol found in the hypertension clinic Nisoldipine 10mg had been crossed out and replaced with Atenolol.

prescribing monotherapy with beta-blockers, prescribing ace-inhibitors to women of childbearing age, constantly performing inter-drug class drug substitutions, constantly performing intra-drug class substitutions, and constantly switching medication dosages. Not only do most of these practices inhibit the effectiveness of drug therapy, some of them, including substituting beta-blockers and prescribing ace-inhibitors to women of childbearing age, can kill patients and cause birth defects. PID also utilizes beta-blockers, loop diuretics, and ace-inhibitors despite having no specific prescription guidelines in its medical protocol. The protocol is only intended as an adjunct to an existing healthcare professionals knowledge, so its exclusion of information does not excuse violations of the Hippocratic Oath, "**first do no harm",** which incidentally is written in bold on the front page of PID's medical protocol packet. Most of these unadvisable practices, though, were clearly contraindicated within PID's hypertension medical protocol.

The diabetes (FBG >250) protocol recommends Metformin 500 mg and, if necessary, Glyburide 5mg as the first line drug therapy for Type 2 diabetes. This is in line with recommendations in the literature. The diabetes protocol and diabetes clinic guidelines also specifically advise tracking patient weight, an important part of controlling blood sugar, conducting periodic foot examinations for ulcers, loss of sensation, and infections, and tracking blood pressure, an important part of reducing cardiovascular risk. Unfortunately, it did not appear these recommendations had been followed for the entirety of the diabetes clinics four-year existence, if at all. Few, if any, of the diabetes patient records contained patient weight measurements and patients were never observed to be being weighed during their monthly consultation with the chronic disease clinic coordinator. Patients in the primary walk-in clinic are weighed as part of their triage, but once diabetes patients enter the chronic disease clinic they are no longer triaged at every visit. PID often does refer patients to their wound care nurse to clean and debride the ulcers and wounds on diabetic patient's feet; however, monthly examinations are not performed as part of the chronic disease clinic coordinators regular clinic consultation. Moreover, the chronic disease clinic coordinator is not qualified to perform these examinations, as he is not a medical professional. Finally, although recent diabetic patient medical records did contain blood pressure and fasting blood glucose measurements, many records between 2012-2016 did not contain blood pressure measurements. It was unclear whether they had simply not been documented or had not always being taken.

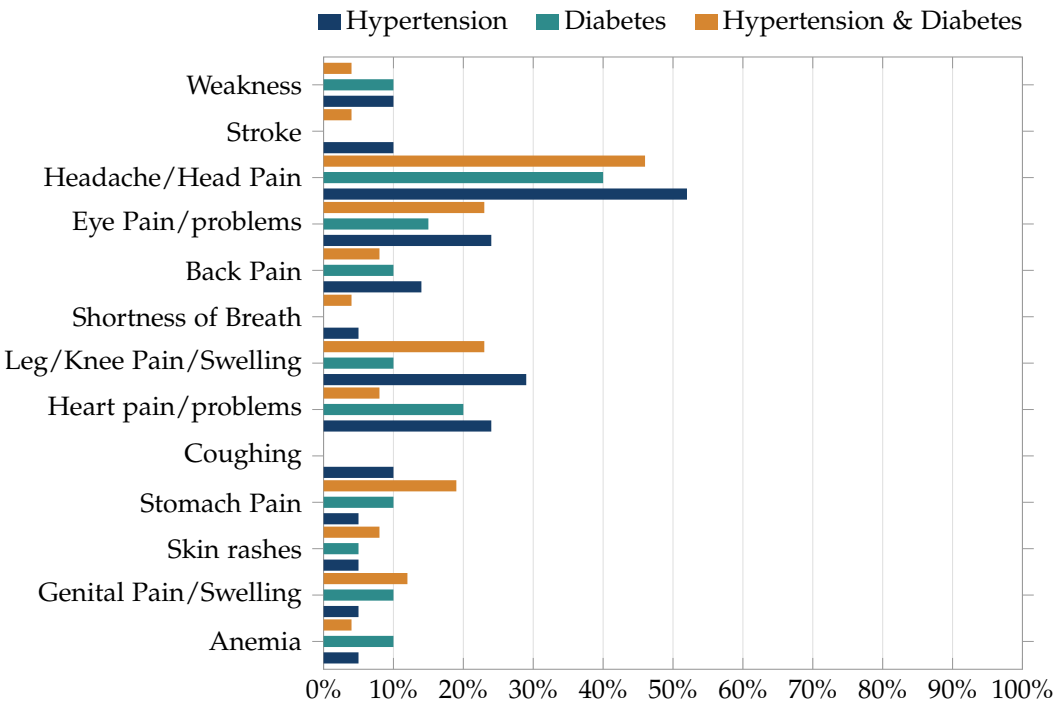
Both PID's hypertension and diabetes clinic guidelines, as seen in figures 5 and 6, state that patients should be initially evaluated by the primary care clinic internist, who referred them to the program, on a weekly basis, in order to adjust medication dosage and type, until the patient reaches a blood pressure goal of 140/90 or blood sugar goal below 250 mg/dL. This is consistent with the literature, as it can take multiple medication adjustments (increasing dosage and adding additional drug classes) before blood pressure or blood sugar stabilizes. Guidelines also state that patients should be evaluated every 4 months by the primary clinic internist regardless of the need to adjust medications. This is also recommended in the literature as patient complications, comorbidity, and conditions can change. Finally, PID's hypertension clinic guidelines stated that patients should be removed from their respective program if they missed their monthly consultation. Especially given the limited availability of medications in Haiti, this policy eliminates gaps in drug therapy and maximizes the effectiveness of PID's resources.

In practice, however, these guidelines were not followed by either PID's hypertension or diabetes clinics. Despite commonly reporting complications and ailments, PID's chronic disease patients

described struggling to gain access to PID's primary care internist once they were referred to the chronic disease clinic. As can be seen in figure 1, patients reported a litany of health complications, including headaches/head pain (Hypertension: 52% N=21, Diabetes: 40% N=20, Hypertension & Diabetes: 46% N=26), leg pain/swelling (Hypertension: 29% N=21, Diabetes: 10% N=20, Hypertension & Diabetes: 23% N=26), and eye pain/vision problems (Hypertension: 24% N=21, Diabetes: 15% N=20, Hypertension & Diabetes: 23% N=26). These ailments often went untreated or examined because the primary care internist did not consult chronic disease patients for extended periods of time. The primary care physician is typically tasked with consulting the primary care clinic walk-in patients and is generally not assigned to consult chronic disease patients specifically. Patients reported feeling medically isolated within the chronic disease clinic, as the chronic disease clinic coordinator is not a medical professional. Patients requested a healthcare professional to be specifically designated to their care.

> "Even though we don't have an emergency, we ask to see the [primary care doctor] as a favor and [the primary care doctor] will refuse. [The chronic disease clinic coordinator] will have to ask as a favor. I would like another doctor for [hypertension and diabetes patients]. I would want the doctor to consult us and know if anything else is wrong. [The clinic coordinator] only asks us to take our medications. We have pain and rashes, but can't be treated for that."... Hypertension Patient

Figure 1: Frequency of Reported Chronic Disease Complications By Patient Group



Aside from a general lack of access to PID's primary care internist, patients criticized the PID physician for being rude and dismissive. Chronic disease patients reported this behavior both as patients in the general walk in clinic and patients in the chronic disease clinic. Some patients reported being so bothered by their interactions that they would no longer utilize PID for illnesses not related to their chronic disease. It goes without saying, that eroded trust between chronic disease patients and healthcare providers diminishes patient compliance with medication,

lifestyle modifications, monthly attendance, as well as harming PID's reputation to the general public.

> "Sometimes there are people who don't feel comfortable with the Haitian doctor because he doesn't greet you kindly. The doctor can be rude and doesn't have love in his heart."... Hypertension Patient

> "I first came to PID because my son is asthmatic. I was upset with the way the doctor greeted me. He was rude and it made my blood pressure go up. If I had another illness I wouldn't come here because I don't want to see him."... Hypertension and Diabetes Patient.

These criticisms did not extend to the chronic disease clinic coordinator, who patients commended for his respectfulness and demeanor towards patients. During observations of patient monthly consultations, the chronic disease clinic coordinator appeared invested in patient well-being and open to learning as much as possible.

> "[The clinic coordinator] is great so I come for hypertension and diabetes."... Hypertension and Diabetes Patient

> "[The clinic coordinator] speaks nicely with patients. He respects the patients."... Diabetes Patient

As far as adjusting patient medications until ideal blood pressure or blood sugar goals were accomplished, it was unclear how long the primary care physician monitored patients. The chronic disease clinic coordinator reported taking patient slips to the primary care physician on a case by case basis to determine whether changes to said patients drug regimen were advised; however, it was not apparent how often this occurred. Additionally, alterations to a patient's drug therapy generally require more in-depth patient-physician consultations to probe patient response to the initial treatment and determine whether any contraindications for changing medication or dosage are present. This clearly was not occurring every month. With respect to the hypertension program, patient blood pressures often remained uncontrolled (greater than 160/90), in some cases for multiple years after the patient was in the program.

Moreover, it was evident through both examining patient records and interviewing patients, that PID's policy of removing a patient from their respective chronic disease program if consultations were missed was not enforced. Hypertension patient records regularly contained gaps between visits exceeding the thirty-day limit; in some cases gaps were as large as 850 days. While it is plausible some of these gaps originated from a lack of data as opposed to patients missing their consultations, patients openly reported missing consultations because they forgot, could not afford transportation, did not have the money to purchase their medications, or were disabled.

> "I was supposed to come four days ago but I didn't come then because I didn't have the money."...Hypertension and Diabetes Patient

> Sometimes I forget to come. Today I just remembered, but I haven't been in two months."...Hypertension Patient

> "Sometimes it can be hard to pay a [motorcycle taxi] to come here, so I don't always come... Son of crippled, mute Hypertension and Diabetes Patient.

Although PID employees offered suggestions to treat patients in special circumstances, like those

who are mentally and physically disabled (see next subsection) PID's chronic disease medical protocol emphasizes assessing patient access to continued care before admitting them to the chronic disease program. If a patient is unable or unwilling to return on a monthly basis to obtain medications, their medical treatment will suffer. Sporadic and intermittent drug therapy will not be effective in producing meaningful health outcomes and patients who are not committed to attending monthly consultations will be less likely to understand and effectively implement necessary lifestyle modifications. As will be discussed in the next subsection, effective utilization of health resources is especially imperative in Haiti.

4.1.3.2 Lack of Access to and Availability of Medical Treatment

Among PID's chronic disease population, physical and mental disabilities, as well as financial poverty inhibit patient access to medical treatment, while a complex and challenging drug supply chain bottlenecks the availability of medications. PID only supplies 30-day prescriptions to ensure patients return every month and charges a very small fee of 10 and 20 Haitian dollars (approximately $1.50 and $3.00) per month for medication. Several patients and administrators reported this was not only very reasonable for PID's chronic disease patient population, but also that it could help make patients more accountable and invested in their own treatment. PID does not charge this fee to extremely poor patients, but some patient's who were still being charged complained they could not afford the medicine.

> "I want the medication to be free because I don't have money sometimes. Patients might not come because they're in debt."...Hypertension and Diabetes Patient

In Haiti, there can be a very grey line between the extreme poor, who can afford medications, and the general poor, who can reasonably contribute to their medications and it can be costly to physically visit a patients home and make an actual determination of their ability to pay, especially considering the chronic disease program serves hundreds of patients. PID left this decision to Haitian healthcare workers, who reported confidence in knowing which patients could actually afford medications.

> "I know if a patient can afford a medication the way they dress and if they say it."...Haitian Healthcare Worker

Chronic disease patients and Haitian healthcare workers supported the idea of visiting patients at their homes if they are physically or mentally disabled and thus unable to come every month. While this would help bridge an access gap for some patients, one must question whether it is a particularly effective use of health resources.

> "I think we also need to visit patients. Some patients call me and say 'I had surgery and I can't come, but I need my medications'. I have three to five patients that I would like to visit and I only need money for transportation."...Haitian healthcare worker

> "If PID could come visit the patients and talk with them it would be great, especially for people that are [mentally disabled]."...Hypertension and Diabetes Patient

The chronic disease clinic coordinator can consult between 10 and 25 patients a day, including conducting one collective education session. His daily productivity would drop significantly

due to the time cost of visiting each home individually and need to perform multiple education sessions. Furthermore, the quality of healthcare in home visits would be extremely limited. The chronic disease clinic coordinator cannot change patient prescriptions or provide medical advice, thus his utility outside of a definitive care facility, beyond simply recording blood pressure and distributing standing orders for medications, would not be significant. Additionally, disabled patients are not likely to be able to implement necessary behavioral changes, like exercising 30 minutes a day or cooking their own healthy meals, so the impact of PID's medical interventions is already limited.

In terms of physical drug availability, PID relies on traveling American administrators and visiting service trips to transport chronic disease medications from the United States to Haiti. Although these trips typically happen regularly, they can fluctuate in frequency and number of individuals travelling (affecting the number of available luggage to transport medication). Consequently the availability of hypertension and diabetes medications is subject to the patterns of these trips. Further complicating the supply chain, Haiti's customs will often confiscate drugs or demand bribes if they find them in luggage. PID goes to extreme measures to secure medications from Haitian customs like hiding pills in tissue boxes and in toilet paper rolls. If a medication is not available, PID gives patients a prescription that can be filled in an external pharmacy.. PID prescribes its medications at an extremely discounted price compared to prices at local Haitian-operated pharmacies and several patients reported not having the money to fill these prescriptions

> "I usually get one medicine here and they prescribe the other, so I have to buy that one. Sometimes I don't have money and only take one medicine."... Hypertension and Diabetes Patient

While healthcare workers recommended prescribing patients another available medication if the first choice was available in order to avoid circumstances in which patients go without a medication for a month because they cannot afford to purchase it externally, this is hardly a perfect solution. Prescribing available medications in place of unavailable ones is a reasonable and effective practice within the context of the primary care clinic where drug continuity is not an issue. However, in the chronic disease clinic switching patients between medication classes limits the effectiveness of long-term drug therapy, and in some cases, as in the instance of substituting beta blockers, can be dangerous.

> "If a patient comes, but we don't HCTZ for example, and we give them a prescription, they might not buy it. However, if we could replace it with a medication we do have then that would be better."... Haitian Healthcare Worker

4.1.4 Quality of Health Education at Partners In Development's Chronic Disease Clinic

As part of its public health adjunct to medical treatment, the chronic disease clinic coordinator conducts monthly education sessions for PID's hypertension and diabetes patients. American physicians trained the chronic disease clinic coordinator to provide these education sessions according to the most recent recommendations in the literature and provided educational documents to guide the sessions. The educational talk is given to hypertension and diabetes patients simultaneously after daily consultations are completed. The same educational talk is given every month. In this subsection the quality of PID's hypertension and diabetes educational guidelines

will be compared against the literature, after which PID's actual educational practices will be compared against current literature and its own recommendations. In the next section, an analysis of patient knowledge will provide another test of the efficacy of PID's education.

4.1.4.1 Hypertension Education

Guidelines for the hypertension education program are given in the hypertension medical protocol in figure 7 and hypertension educational documents in figures 8. Key elements mentioned include following the low-salt DASH diet, abstaining from alcohol and tobacco, exercising at least 30 minutes day 5 days a week, practicing stress management, the pathology of hypertension, and information regarding proper consumption of medications. Each of these topics is recommended to be included in hypertension education in the literature and the educational documents provide necessary in-depth description of specific foods to eat and avoid, stress management techniques like deep-breathing exercises, and explanations of how hypertension medications work and must be taken.

In practice, however, it appeared many of these topics were omitted in hypertension health education or covered on a cursory level. In terms of diet, some recommendations were too general and not quantity-specific. For example, patients were told to avoid certain high sodium foods like Bouillon cubes or table salt, but not visually shown how much sodium is permitted daily or told exactly how much sodium certain foods contain. Furthermore, the description of the DASH diet was not nearly technical enough. Hypertension patients were broadly told to avoid fried and fatty foods, for example, but not given a comprehensive break down of which specific foods to target as appropriate meal replacements. Healthcare administrators acknowledged that chronic disease diet education was limited by its heavy focus on foods to avoid, as opposed to replacement food options. Unfortunately, there had not been much organizational progress in identifying locally available, satiating, and affordable meal alternatives at the times of this study.

> "We tell a lot of patients don't eat this or don't do this, but then you get two options were the patient doesn't eat and dies of starvation or continues their old habits because it's all they can afford. We need someone to break down alternative food options at the same economic level."... American Healthcare Administrator

Additionally, the education failed to sufficiently delineate the connection between hypertension drug therapy and important diet changes. Although many patients are treated with diuretics, which deplete potassium levels, they were not specifically told to consume potassium rich foods, or which available foods are high in potassium. Using diuretics in a chronically dehydrated patient population, especially without lab work, can be dangerous. It is important to take every necessary to reduce risk.

With respect to exercise, non-disabled hypertension patients were instructed to perform stretches, increase the amount they walk, and remain active around their house. These recommendations, however, were also not specific enough. The Centers for Disease Control, Department of Health and Human Services, and American College of Sports Medicine call for at least 150 minutes per week of moderate-intensity aerobic activity and 75 minutes of vigorous aerobic activity. (Exercising With High Blood Pressure, n.d.). While walking is already in an integral part of the typical Haitian lifestyle, education must categorically define goals for exercise intensity and

duration in terms of heart rate and breathing rate. Resistance training, like weightlifting and yoga, has also been shown to produce notable decreases in blood pressure and can have therapeutic value as well. PID does offer yoga classes regularly for local children; however, these classes were not offered to adults. Exercise education should incorporate demonstrations of appropriate exercises, precautions about dehydration and hypotension, and quantity specific goals. Moreover, PID's chronic disease population includes several disabled patients and patients with lateral deficits from a prior stroke. During interviews, several of these patients requested information regarding rehabilitation exercises and general exercise methods geared to physically limited patients.

> "I would like PID to offer physical therapy and teach me more exercises or techniques I can use. "... Hypertension Patient (prior stroke)

Stress management education suffered from the same previously described lack of specificity and technicality. Although, PID's hypertension protocol specifically recommends teaching simple deep-breathing exercises that patients can practice daily, patients were simply told to avoid stress or provided with limited advice. Stress reduction education did emphasize avoiding social isolation and arguing, but failed to define concrete stress management strategies. Deep-breathing, like any exercise requires practice and repetition, which PID was not regularly including in its hypertension education session. After the Earthquake, several American teams of psychologists provided therapy to clinic patients during one-week trips; however, the effect of the therapy was reported to be limited due the to short durations of the trips and the lack of cultural knowledge. It is now rare for a team of psychologist to visit and PID does not staff any licensed therapists or psychologists. Healthcare workers stated a desire for PID to not only hold specific stress-oriented classes, but also hire a therapist or psychologist to treat PID's chronic disease patients. PID administrators reported that financial limitations were barring them from hiring a therapist or psychologist. With proper training, though, the chronic disease clinic coordinator is capable of offering more in-depth stress management education.

> It is very common to be stressed here in Haiti. We need to have classes for that."... Haitian Healthcare Worker

> "We should also have a psychologist. Sometimes its not just money, patients also need to talk through their problems. The medicine wont work with out the help of a therapist."... Haiti Healthcare Worker

> "We should have stress-reduction and psychological classes."... Haitian Healthcare Worker

Proper education on the pathology of hypertension is an important component in increasing patient compliance with medical treatment; if patients understand how and why their medication works, they will be more inclined to consume it as prescribed. PID's hypertension education did not sufficiently explain how prescribed blood pressure medications treated the mechanism of hypertension, or more generally how lifestyle modifications specifically reduced the risk of hypertension. Pharmacological education should incorporate drug-specific guidelines, including avoiding suddenly stopping beta-blockers, increasing potassium consumption while on diuretics, increasing fluid intake while on diuretics, as well as relevant medical complications patients should be aware of and report to the doctor. It was unclear how in-depth PID's primary care internist explained these topics when initially prescribing anti-hypertensive medications to new

hypertension patients. The monthly PID education sessions, however, did not address these issues nearly in-depth enough.

4.1.4.2 Diabetes Education

Guidelines for the diabetes education program are given in the diabetes medical protocol in figure 7 and clinic diabetes education documents. Key elements mentioned include modification of diet, abstaining from alcohol and tobacco, regular exercise and BMI reduction, practicing stress management, the pathology of diabetes, complication management and proper self-care, dispelling common myths, and information regarding proper consumption of medications.

Similar to the hypertension education, the diabetes education both did not sufficiently discuss the specificity of proper dieting and too heavily emphasized foods to avoid as opposed to discussing healthier alternatives. Diabetes education must incorporate healthy eating habits, like eating regular meals and a wide variety of foods, as well as a precise breakdown of foods to target and foods to avoid. PID's education session did include some of these strategies like avoiding carbohydrates and soda, but did not adequately breakdown wholesome meal options or important differences among food groups like simple and complex carbohydrates. Although PID's diabetes education guidelines mentioned one critical approach to diet balancing, the "plate method", where ¼ of the plate is filled with meat, ¼ with carbohydrates, and ½ with vegetables, effective delivery of diet recommendations must consider local variables and conditions. PID's diabetes diet education did not adequately consider and adjust for market availability and cost of certain foods, the need for satiating meal alternatives, and cultural preference.

Beyond lacking specificity in exercise recommendations, similar to the hypertension education program, the diabetes education program lacks goal oriented and sufficient quantity specific recommendations on weight loss. The diabetes medical protocol advises that losing 5-10 pounds may cure new cases of type 2 diabetes, and BMI reduction has been demonstrated as a substantive factor in diabetic management. PID's diabetes program does not track patient weight loss, and the diabetes education program does not provide sufficient in-depth advice for weight loss strategies like dieting and exercise. Patients were told to exercise thirty minutes to an hour each day, but this advice was not qualified with necessary specifications on heart rate or breathing rate goals, or precautions of hypotension, dehydration and foot damage. PID also did not offer exercise strategies outside of stretches and walking, like yoga or weight training. PID's disabled diabetes patients echoed hypertension patient's request for specific physical therapy classes.

> "I hope the clinic can provide a space for exercising. Many of us are crippled by our illness and would benefit from physical exercise, especially some older patient who might need physical therapy."...Diabetes Patient

PID's diabetes education also failed to accommodate patients struggling with complications of diabetic foot nephropathy. PID did not suggest alternative exercises for diabetic patients who struggled to walk due to foot damage or incorporate valuable tips like elevating feet to reduce swelling. Moreover, outside of recommending patients always wear shoes, PID did not sufficiently educate its patients on proper foot care, including daily foot self-evaluations, how to clean ulcers and infections, trimming toe nails, and toe and feet stretches. These topics require in-depth discussion, patient feedback, and demonstrations, none of which was occurring.

Although stress management was mentioned in the hypertension medical protocol and diabetes education documents, it was not included in the diabetes medical protocol. Diabetes stress management education was limited in the same ways as hypertension stress management education; stress management techniques were not adequately described and demonstrated and patients were inhibited by a lack of access to professional psychological care.

Despite diabetes education documents comprehensively covering diabetes pathology, myths, and drug-treatment, PID's diabetes education only paid cursory attention to these topics. Firstly, understanding the complications of long-term uncontrolled blood sugar, which include cardiovascular, organ, eye, skin, and foot damage, is a critical tool to motivate patient adherence to treatment. Patients might assume that they don't have to worry about their diabetes because they don't feel symptoms or believe that it is beyond their control once symptoms arise. Instilling the importance of lifestyle modifications at an early point of intervention by explaining how they limit the onset and development of complications is an imperative strategy in managing diabetes. It can also preserve health resources that are spent on complication management, like foot debridement and cleaning. Similarly, as clinic education documents, education must emphasize the biological connection between dangerous carbohydrates and blood sugar, as patients might otherwise intuitively, and incorrectly, assume that only sugary foods cause diabetes and poor blood sugar control. Teaching patients about the functional mechanisms behind prescribed medications can reinforce this information and add additional motivation to remain compliant with drug therapy even when they do not physically feel ill.

> There's this I would say mentality that if you take your medication and feel better you don't have to take it again."... US Healthcare Administrator

As a final consideration, PID must consider how it schedules its diabetes education. In order to obtain a fasting blood glucose measurement during monthly consultations, PID's diabetes patients cannot eat for eight hours before their consultation. Because consultations usually occur from 9-12pm, by the time education occurs in the afternoon almost all diabetes patients are extremely hungry and have not eaten since the previous night. One Haitian healthcare worker explained that patient's hunger likely interfered with effective information retention.

> "I wish when we're teaching diabetics we could give them crackers and water because they have to fast and try and leave because they're hungry."... Haiti health

Another healthcare provider reported that patients do not always comply with instructions not to eat. This can have a significant impact on the interpretation and utility of the fasting blood glucose measurement. PID must emphasize the importance of patient compliance with clinic protocol as part of its education

> "Some of the, eat [before the fasting blood glucose test] and some of them don't."... Haitian Healthcare Provider

4.1.4.3 Chronic Disease Educational Methods and Class Diversity

Beyond simply content, both PID's hypertension and diabetes educational programs are held back by their methods, timing, and lack of diverse programming. First and foremost, hypertension and diabetes education, while overlapping in some parts, contain important unique elements. By

providing hypertension and education information at the same, PID is introducing the unnecessary risk that patients confuse hypertension and diabetes information. Most, if not all, type two diabetes patients need education regarding hypertension risk reduction and management and similarly some hypertension patients are at risk for diabetes; however hypertension and diabetes patients require different education on the pathology of their disease, proper medication consumption, self-care, and diet.

The overall efficacy of PID's current public health education practice is also thoroughly hampered by its reliance on oral information dissemination, lack of diverse programming, and lack of continuity. PID's healthcare workers reported a need to disseminate information beyond a simple monthly talk. It is very difficult to incorporate all of the comprehensive information required of a hypertension and diabetes program into just one session, and even more difficult for patients to pay attention to the entirety of that information in one session. One healthcare administrator explained that the current information talks were diluted because patients were tired after their consultation and did want to sit through the exact same talk they received last month.

> "[The educational talks] will get cut short because the patients don't want to hear it again and [the talks] eventually gets watered down."…US Healthcare Administrator

Haitian healthcare workers further reported that using different educational methods could result in more effective information dissemination. Specifically, they recommended distributing informational hand outs to chronic disease patients, which would include picture for illiterate patients. Given that PID only consults patients on a monthly basis, and some do not come every month, these handouts could prove to be valuable in improving the reliability and continuity of patient access to chronic disease-specific information.

> "I think we should give people documents with pictures because they can't read. For example, [the handout] would say when you eat this, you're going to feel like this. Then the patient can read it and see, for example, if you eat a lot of meat your blood pressure's going to skyrocket. They can keep it and read it."…Haitian Healthcare Worker

Haitian Healthcare also described a need for more frequent, in-depth and diverse programming, including classes solely dedicated diabetic foot care, stress management, physical therapy, diet, and even exercise classes. By focusing on a single topic, these classes could improve patient information retention and provide the type of comprehensive discussion that does not occur during the monthly oral education. Moreover, by actually providing private space and time for patients to perform and learn physical therapy or stress management, for example, PID would provide a vital forum to reinforce positive behaviors that might otherwise be subject to community stigma.

> "We don't do the classes enough. If we had classes more often it would reinforce the advice we are giving."…Haitian Healthcare Worker

> "I think some patients come to the classes, but forget."…Haitian Healthcare Worker

> "I think we need new and different classes. We can do nutrition classes for people who don't know what to eat and those who cant afford certain foods. For example, we can show them what healthier foods they can buy with the same amount of money. We should also have stress-reduction and psychological

classes."... Haitian Healthcare Worker

As a method to incentive participation in the program and foster collective bonding, another healthcare worker suggested holding parties or celebrations for PID's chronic disease program. The parties could also be used to demonstrate and sample healthy meal alternatives or recognize patient health improvements.

> "We should organize little parties for the hypertension for diabetes patients. There could be healthy foods there."... Haitian Healthcare Worker

4.1.4.4 Preventative Education

Perhaps the largest failure of PID's chronic disease education is its limited focus on current patients. Any effective public health education should place enormous emphasis on prevention, including teaching positive lifestyle practices to the general public. The easiest way to ease the chronic disease health burden is to prevent new cases of hypertension and diabetes from developing in the first place. These are two unique illnesses, in that they are extremely preventable and manageable. Hundreds of local Haitians regularly pass through PID's primary care walk-in clinic on a daily basis, some waiting for hours on end to receive care. PID is handicapping its own practices by not offering chronic disease public health education, or general public health education for that matter, while these patients wait. Healthcare administrators did report that in the past nurses conducted education with patients in the primary waiting room; however, they had inexplicably stopped. Other healthcare workers suggested installing televisions to display health information in PID's waiting room, as other local hospitals do. While the information would certainly benefit from observation by hundreds of patients per day, it is unclear what the cost effectiveness of such an effort might be. Regardless, the impact of conducting single topic-focused oral education sessions with PID's general patient population represents a critical step towards advancing PID's public health education program.

> "There is another hospital with TV's in the waiting room, so while people are waiting all day they can receive public health information. The information benefits from repetition."... Haiti health

4.1.5 Integration of Foreign Healthcare Providers at Partners In Development's Chronic Disease Clinic

Within PID's hypertension and diabetes clinic, foreign, visiting healthcare providers play a pivotal role in both healthcare provision and practice. American physicians wrote both the hypertension and diabetes clinic protocols and a significant amount of patients in all three groups reported being consulted by a foreign healthcare provider (Hypertension: 45% N=20, Diabetes: 42% N=19, Hypertension & Diabetes: 28% N=25). Given foreign healthcare provider's key duties, assessing the quality of their integration into PID's chronic disease clinic represents an important component of understanding the overall efficacy of the clinic itself. Interviews with both patients and healthcare workers revealed that foreign healthcare provider's effective integration into PID's chronic disease clinic, and health system in general, was hindered by an organizational failure to foster cooperation between Haitian and foreign healthcare providers, as well as foreign healthcare providers lack of preparation for the extreme level of poverty in Haiti, inexperience working in resource-limited health systems, and failure to read PID's medical protocol.

4.1.5.1 Inadequate Preparation

Poverty has a significant and often underappreciated impact on the provision of healthcare in Haiti. Whereas in a developed nation like the United States, healthcare providers do not typically have to consider a patient's access to water, sanitation, medication, food, or continuing care when determining an appropriate treatment plan, in Haiti these factors have a critical affect of medical care. Both foreign and local healthcare workers reported that foreign healthcare providers were often ill-informed about the complexities of poverty in Haiti

> "I do not think [foreign healthcare workers] know enough about Haiti unless they have experience here in Haiti or other developing countries. These people are in an entirely different climate with different access to foods and different water sources."... US Healthcare Provider

> "If doctors have come before or come often they understand our problems. However, when a doctor comes for the first time he doesn't understand how poor Haitians really are. There are a lot of things we need to tell them."... Haitian Healthcare Worker

Foreign healthcare providers need to adjust their consultations and consider factors they might not otherwise have to. For example, in Haiti, healthcare providers must consider chronic dehydration and water insecurity when prescribing a loop diuretic like Furosemide or potentially over treating hyperglycemia. Similarly, many chronic disease patients do not have access to the same foods and medications as patients in the United States. Consequently, lifestyle recommendations must be locally relevant and consider necessary cultural, economic, and social variables. Both foreign and local healthcare workers expressed a belief that foreign doctors, to no fault of their own, were often not prepared to adjust their medical practices based on the extreme level of poverty in Haiti.

> "Before you start preaching your education you need to ask questions like 'where do you live', 'what kind of house do you live in', 'do you have access to clean water', 'do you have transportation', 'do you have a job', 'can you buy food'. For example, I have asked 'how many times a day you eat' and they might only eat at nighttime. [Foreign healthcare providers] need to rethink treatment based on responses to these questions. I can't tell someone to clean a wound with clean water, or to eat one hour before taking their medicine if they don't have food or clean water. I'll have to change the treatment plan."... US healthcare provider

Foreign healthcare providers who do not sufficiently understand local market prices of medicines and the poverty of PID's patients also may not adequately adjust their medical practices for the limited availability of resources in Haiti. A foreign healthcare providers go-to first line drug therapy for a certain disease or patient condition is often unavailable in PID's pharmacy. In the primary care clinic, the best choice of practice is often replacing a desired treatment with a drug available in PID's pharmacy as opposed to giving a patient a prescription to fill externally, which they may not be able to afford. Within the context of the chronic disease program, switching drug therapies can actually be dangerous, as discussed in the previous section, and must be done at the discretion of a professional while taking local considerations into account. Haitian healthcare workers reported that foreign healthcare providers often lacked knowledge of PID's drug supply and recommended giving them advance notice.

> "Before and when they come they should know which medicines we have."... Haitian Healthcare Provider

Many foreign healthcare workers have no prior experience working in resource-limited healthcare environments where certain medications and lab work are often unavailable. PID sends its medical protocols to foreign healthcare providers in advance of a trip so they can adjust their practice based on the resources available at PID's clinic; however, it was reported that some do not read it. It was also reported that foreign healthcare workers had insufficient access to the clinic protocol once in Haiti. This is extremely problematic, as PID's medical protocol contains important regional specific information that foreign physicians may not be aware of, like Haitians low tolerance to pain medications and resilience to disease.

> "The protocols that PID send are excellent if people read them, but I don't think everybody reads it."... US Healthcare Provider

> "We should have organized protocols in exam rooms. People always want to see my binder with protocols."...US Healthcare Provider

A lack of preparation for both the extreme poverty in Haiti and PID's resource-limited healthcare setting can negatively treatment decisions. Firstly, unprepared and inexperienced foreign health-care providers may be inclined to make the mistake of prescribing medication when unnecessary. Patients, due to a lack of medical knowledge, may request more medications than appropriate, and foreign physicians should not prescribe medication merely because they want to appease the patient or feel pity. The front page of PID's medical protocol, emphasizes this point.. Ultimately a lack of mental preparation for poverty in Haiti places foreign healthcare providers at risk of these poor decisions, and patients often reported observing foreign doctor's surprise and shock at Haiti's poverty.

> "When foreign doctors come I see they feel like crying because they're not adjusted to poverty."... Hypertension and Diabetes Patients

PID's chronic disease program also has extremely limited access to lab work that would otherwise be a critical part of treatment determinations in the United States. PID's medical protocols are a valuable resource in guiding foreign healthcare providers through difficult treatment decisions, like whether to prescribe HCTZ or Lasix without having access to a patients potassium or creatinine levels. Haitian healthcare providers reported that many foreign healthcare providers do not prepare to make these decisions ahead of time and often become frustrated.

> "They get frustrated because they cant do everything they want"... US Healthcare Provider

> "They should have a guide to read before they start. If they find a patient with a problem that they're not aware of in Haiti and they get frustrated."... Haitian Healthcare Provider

One experienced foreign healthcare provider also reported that physicians from the US were at times unfamiliar with the disparity in tolerance to medication between patients in the US and Haiti. Due to decreased healthcare access, Haitians typically have not been exposed to low-strength pain medications like Tylenol. Many chronic disease patients complain of pain and often require pain medications; however inexperienced foreign healthcare providers may unknowingly believe they need stronger pain medications. Furthermore, many patients both in the chronic disease program and primary care clinic will respond to lower dosages than patients in the United States.

> "[Foreign healthcare providers] forget that patients have never had medications, so they want to prescribe doses normal in the US when Haitians will respond to low doses. [Haitians] are medication virgins. We need to build them up to normal US doses. For example Tylenol will help their pain as opposed to heavy duty pain medications."... US Healthcare Provider

Haitian chronic disease patients might also not present the same as their US counterparts. Patients in Haiti can have a much higher tolerance to pain and disease complications. Healthcare workers advised that foreign healthcare providers needed to be more in-depth and attentive to Haitian patients symptoms, as severe problems can often go undetected.

> "Haitians are very strong and resilient and thus don't notice symptoms."... US Healthcare Provider

4.1.5.2 Insufficient Haitian-American Cooperation

Haitian healthcare providers reported a lack of coordination between Haitian and foreign healthcare providers. Many foreign doctors are unfamiliar with Haiti and its unique medical problems and Haitians expressed a desire to acclimate them. Foreign doctors will often tour the clinic on their first day of work to meet their Haitian colleagues; however, there is no planning or exchange of relevant medical information between the two parties before hand. The language barrier plays a significant role in preventing professional communication, as several Haitian healthcare workers do not speak English.

It was reported that attempts to have a Haitian administrator orient foreign healthcare providers upon arrival in Haiti were ineffective likely due to foreign healthcare providers role in funding PID's medical clinic. A significant portion of PID's budget originates from trip fees (donations to PID's programs) that foreigners must pay to attend a service trip, essentially making PID's healthcare services dependent on visiting foreigners. Maintaining the perceived self-importance of members of PID's foreign service trips is critical to cultivating future service trips and protecting the PID medical clinic's revenue source. When Haitian employees typically address PID service teams it often devolves into continuously thanking the foreigners and drumming up their value to PID. These addresses can actually be quite a degrading experience for Haitian employees. This dynamic was reported to preclude any meaningful exchange of health information during attempts to have a Haitian healthcare administrator orient foreign healthcare providers.

During interviews Haitian healthcare providers clearly stated a desire to collaborate with US healthcare providers and share important medical information. Unfortunately, Haitian healthcare workers reported that PID generally does not inform them ahead of time when foreign healthcare teams are coming or work with them to create training protocols for foreign doctors. Haitian healthcare providers possess important information that is critical to effectively integrating foreign healthcare providers into the chronic disease clinic and the primary care walk-in clinic, including how the clinic operates, the types of patients PID sees, how PID treats patients, and what local factors complicate treatment.

> "I never know when they are coming in advance. There's no planning, so we don't know foreign doctors are coming. We never receive a heads up that they're coming. It would be nice if the supervisor could advise us. Then we can tell [the foreign healthcare providers] 'here, we have more people who have fevers and less people who have wounds or diarrhea'. We can prepare them for the types of illnesses

> they are going to encounter."... Haitian Healthcare Provider

4.1.5.3 Foreign Healthcare Provider Integration Effect On of Continuity of Care

During interviews PID did not have an active database to track chronic disease patients health data. Without accessible patient records, a foreign healthcare provider's treatment and recommendations during a one week trip will make little difference in long term patient outcomes. Complication management and drug therapy require continuous monitoring and tinkering. For example, if a hypertension patient complains of cramping and a foreign healthcare provider recommends increasing water intake, there will be no follow up the next month, as chronic disease clinic coordinator cannot conduct medical consultations and patients struggle for access to the primary clinic physician. Furthermore, this can become a more significant issue if a foreign healthcare provider changes a patient's drug therapy and there is no follow up for potential complications or changes in patient condition. During interviews hypertension and diabetes patients reported that continuity of care was a serious issue for them. Whereas a physician in the US would consult a chronic disease patient for many years at time and establish rapport, Haitians are not afforded the same opportunity. The consequence of this is a decreased quality of care, in which healthcare providers cannot address symptoms of chronic disease or adjust medication type and dosage depending on patient responses over time. Long term, it also inhibits the clinic's ability to identify and address larger socioeconomic and public health issues that contribute to hypertension and diabetes.

> "[Foreign doctors] didn't take the time to hear my problems the way you (the PI) are. The Haitian doctors might have you come back, but the American doctors only see us once. The Haitians follow up with us."... Hypertension Patient

4.1.5.4 Undermining The Capacity of Local Healthcare Workers

Partners In Development's utilization of foreign healthcare providers may also have the unintended consequence of undermining the capacity of local health providers. If foreign healthcare providers change a patients drug therapy or treatment recommendations without proper documentation, it inhibits the primary care internist's ability to assess the quality of his own interventions. Furthermore, whereas the primary care internist may be less in-depth with patients because of his cultural knowledge and need to consult a high volume of patients, foreign healthcare providers are not held to the same standard. Visiting foreign healthcare providers can, and often do, take more time to consult patients due to their inexperience providing treatment in Haiti and the need to foster effective cross-cultural communication. This difference in time spent with patients can very well be misperceived as an indication that foreign healthcare providers care more about Haitian patients compared to local health providers. Moreover, foreign healthcare providers may unnecessarily prescribe medications or provide in-depth consultations when not needed just to appease Haitian patients, allowing what is really inefficient medical practice to be misinterpreted as higher quality care by Haitian patients. Also, foreign healthcare providers may, and often do, intervene to pay for a patient prescription or transportation in a way local Haitian healthcare providers are not financially able to. Collectively, these practices, while seemingly benign or helpful, actually serve to create a perception that foreign healthcare providers are superior to or more compassionate than Haitian healthcare providers. This phenomena can fracture

trust between Haitian patients and Haitian healthcare providers, contribute to psychological dependence on foreign intervention, and ultimately inhibit Haitian healthcare workers ability to provide high quality care. It is very well likely that these factors contributed to patient reports of a disparity between the quality of care provided by Haitian healthcare workers and foreign healthcare providers.

> "Some patients realize [the foreign doctors] must care a lot to be here. The Haitian workers don't care for us the way foreign doctors do. If not for the white people, PID would not be here. "... Hypertension Patient

> "I feel more confidence and trust in the foreign doctors. They care more about the blood sugar and blood pressure patients."... Diabetes Patient

> "The foreign doctors really understand Haiti because they leave their houses and families and pay to come here. Haitians wouldn't do that."... Hypertension Patient

> "I prefer to see foreign doctors. The foreign doctors make us feel happy. The Haitian doctors don't care as much because it's a job for them. The foreign doctors are more in depth with us. Haitians don't care about each other. When foreign doctors come everyone knows and comes to PID."... Hypertension and Diabetes Patient

4.1.6 Ineffective Chronic Disease Data Monitoring and Clinical Oversight

4.1.6.1 Inadequate Recording and Utilization of Data

Dangerous and ineffective medical practices within PID's chronic disease clinic have continued unabated for over four years due to insufficient and inadequate clinic wide monitoring and evaluation, including ineffective data tracking methods, a lack of data utility, and insufficient clinical oversight. For the past four years PID has recorded patient blood pressure and blood sugars on hard copy. Some of these sheets were organized with headers and columns, while others were just standard computer paper. Over half of the hypertension patient records did not contain information regarding patient prescriptions, a majority of hypertension records did not contain data regarding patient pulse, an important indicator for some hypertension drug therapies, and as already mentioned, many diabetic patient records did not contain blood pressure or weight measurements.

The lack of data tracking can not only inhibit healthcare providers, especially foreign ones, ability to effectively prescribe medications, but also curb the clinics ability to review and evaluate its own medical practices. Data is a critical tool in comprehensive chronic disease treatment, as it can reveal both the efficacy of certain drug regimens and patient compliance with lifestyle modifications. Foreign healthcare providers, who almost always do not have prior experience with PID's hypertension and diabetes patients, are severely handicapped without access to prior patient prescriptions and health data trends. PID's chronic disease patients do receive a slip of paper with their prescribed medications and blood pressure/blood sugar at each consultation; however, patients do not always bring all their prior slips (which can date back four years) to every monthly consultation. Even a data gap from just one missing sheet can severely impair a healthcare providers ability to make effective treatment decisions. Without data tracking ensuring continuity of care and proper follow up on drug treatment and lifestyle modifications, patients

are more likely to be medicated inconsistently and not held accountable for self-care.

> "To improve treatment of patients we need data. If you can check it daily you can see trends and better correlate it with medicine."... US Healthcare Provider

Equally important, data tracking is the foundation of effective healthcare monitoring and evaluation. Many of the above identified ineffective and dangerous practices of PID's hypertension and diabetes clinics occurred for four years without notice. These malpractices could've been, and were in this study, found in a few minutes by simply searching through organized patient records. However, in order to extract a single individuals patient history from PID's paper database, one would've needed to review hundreds of incomplete, disorganized, and often times illegible, data sets.

Although the new electronic database will facilitate easier review of the hypertension clinic drug treatment practices and patients responses, the diabetes clinic's lack of HbA1c severely curbs the implementation of an effective diabetes monitoring and evaluation strategy. A fasting blood glucose has extremely limited clinical utility and cannot be used as a metric to reliably track long-term patient trends and improvements as blood pressure can. The HbA1c is certainly expensive and not always available in a resource limited setting like Haiti, but without it, PID's diabetes clinic is severely limited in its ability to monitor patient progress.

4.1.6.2 Insufficient Clinical Oversight

PID's failure to detect malpractices also stems from a flagrant clinic wide lack of oversight. From top to bottom, the chronic disease program's organizational structure lacks both proper training, medical background and adequate appropriation of accountability. First, despite some knowledge of the problems occurring within the chronic disease clinic, like the diluted education program and insufficient programming, it was not clear who, if anyone, had been tasked with evaluating the efficacy of the education program. Moreover, no one apparently was responsible for reviewing chronic disease clinical practices, like drug therapy treatment trends or the bedside manner of both the chronic disease clinic coordinator and primary care physician. PID does not have a defined ongoing monitoring and evaluation strategy to continuously probe and fix problems where they occur. Without this, healthcare workers are not held accountable for their responsibilities and serious problems fall through the cracks, as they have at PID for four years.

The medical protocol is also supposed to be periodically updated by foreign physicians. New studies are continuously being published and affecting chronic disease treatment guidelines, as in the Hope Trials, which recently found statins to be effective in reducing cardiovascular risks. No employee of PID had been tasked with conducting literature reviews to understand the most recent clinical recommendations for hypertension and diabetes treatment. Moreover, given that the primary clinic intern is overwhelmingly responsible for determining drug therapy practice in the chronic disease clinic, any alteration of clinic protocol cannot preclude his participation. The primary clinic intern reported using monotherapy with beta blockers as first line therapy for hypertension, despite widespread evidence of their demonstrably low impact on severe cases of hypertension, especially on black patients, in the literature and medical protocol.

These issues are in large part due to the lack of proper training and medical background within PID's chronic disease organizational structure. The primary care clinic physician is the only doctor

on staff at PID and medical professional in the chronic disease program trained to consult patients and adjust medications. With the exception of foreign doctors who do not conduct in-depth analysis of clinic practices, no one in the chronic disease program organizational structure has sufficient medical knowledge to identify drug therapy malpractices or improper and inadequate education practices. Hypertension and diabetes patients, especially, require continuous treatment and consultation. Without the clinic physician, the only definitive resource for medical knowledge, always available to hypertension and diabetes patients, patient care suffers from inconsistent treatment.

The chronic disease clinic coordinator was provided initial training to conduct public health education and record patient blood pressures and blood sugars; however, few continuing education resources were made available or explicitly defined. Additionally, PID does not have any protocols in place for formal knowledge evaluations of the chronic disease clinic coordinator, or anyone involved in the chronic disease clinic for that matter. Hypertension and diabetes are complex diseases with intricate pathogenic mechanisms and treatment. It is important that everyone involved in the chronic disease program be adequately trained and subject to continuous knowledge evaluations. Providing incorrect or insufficient information to chronic disease patients is a waste of health resources, and in some cases even dangerous.

In this study, Haitian staff and foreign healthcare providers played a fundamental role in identifying both shortcomings in clinical practice and potential solutions. Any future monitoring and evaluation strategy must include regular and comprehensive input from both Haitian employees and foreign visiting healthcare providers. Haitian healthcare workers live in the communities they serve and understand the factors that limit the chronic disease program's efficacy better than any American can. Foreign healthcare providers also offer a depth of professional experience and knowledge that is universally lacking within PID's chronic organizational structure. Most importantly, these two sources of input must not operate independently; chronic disease care at PID requires collaboration from Haitians and Americans.

4.2 Patient Knowledge and Beliefs

This section will directly examine the efficacy of PID's chronic disease health education by evaluating patient knowledge of the components of PID's public health education curriculum, specifically as it relates to diet, stress, exercise, and disease pathology. In the following section an examination of patient beliefs will be conducted within the framework of the Theory of Planned Behavior.

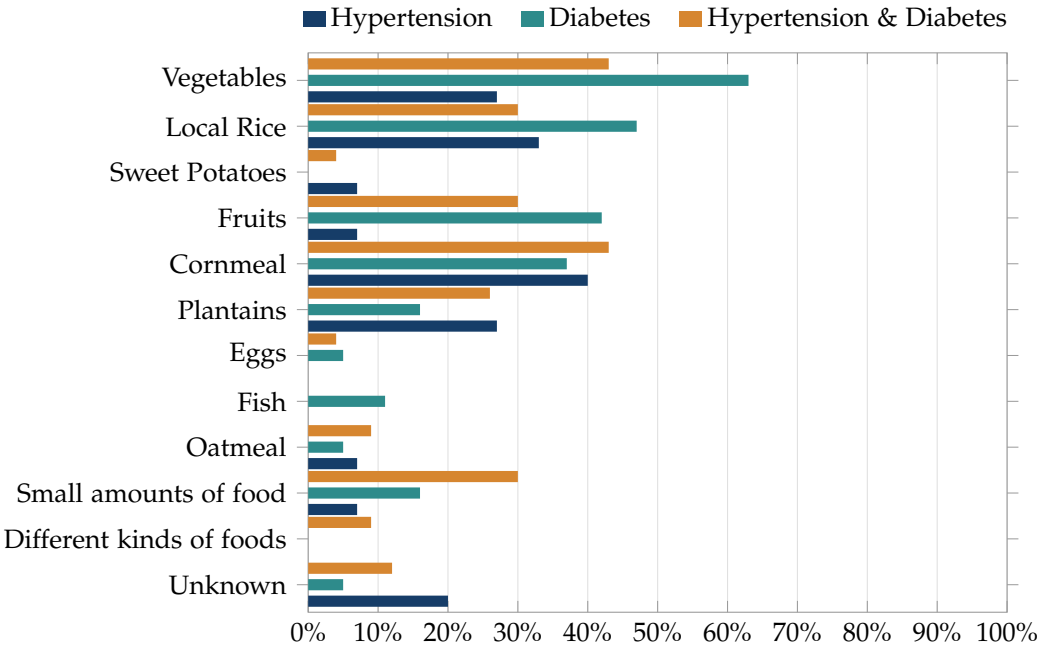
4.2.1 Patient Knowledge

Patient knowledge of hypertension and diabetes originates in large part from PID's public health education program, and as such, serves as a crucial litmus test for both the quality of information PID teaches and the effectiveness of its dissemination methods. Furthermore, PID cannot move to tackle the factors that contribute towards behavioral intention among its chronic disease patients if patients are not knowledgeable of the necessary behavior changes in the first place.

4.2.1.1 Diet

A vast majority of patients in each group mentioned that PID had recommended diet advice (Hypertension: 90% N=21, Diabetes: 95% N=20, Hypertension & Diabetes 77% N=26); however as seen in figures 2 and 3, when prompted to elaborate on the specific recommendations, patients in all three groups struggled identifying foods that they were supposed to consume or avoid. The knowledge void was significantly more evident among hypertension patients, who responded with smaller average volume of diet recommendations. Furthermore, patients were extremely unlikely to mention eating habits that are integral to the DASH diet like eating meals regularly, eating a variety of foods, and eating small amounts of certain foods. As seen in figure 3, patients in all three groups, were more responsive when asked which foods they are supposed to avoid as opposed to foods they are supposed to consume. This was indicative of a clinic-wide problem, in which patients struggle to find economical, plentiful, replacement diet options.

Figure 2: Reported Healthy Foods and Eating Habits for Chronic Disease Patients



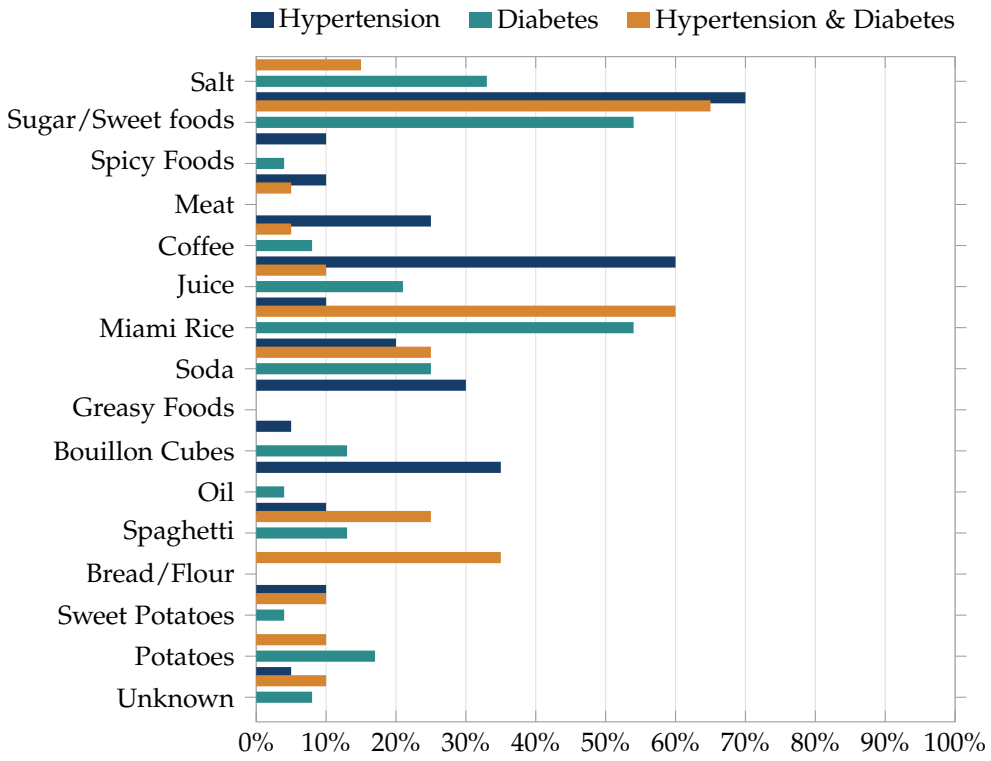
4.2.1.2 Stress

Although both American and Haitian healthcare workers stated clearly that stress was a severe problem among PID's chronic disease patients, very few of the interviewed patients reported PID had recommended stress management to control their illness (Hypertension: 5% N=21, Diabetes: 15% N=20, Hypertension & Diabetes: 4% N=26). Several patients reported attempting to avoid arguments, or excitation, but rarely, if ever, did patients demonstrate a concrete stress management technique like yoga or deep-breathing exercises.

4.2.1.3 Exercise

Very few patients in all three groups reported that PID had recommended exercise to treat their respective disease (Hypertension: 14% N=21, Diabetes 15% N=20, Hypertension & Diabetes: 15%

Figure 3: Reported Unhealthy Foods for Chronic Disease Patients



N=26). Although many patients reported walking and stretching (Hypertension: 85% N=20, Diabetes: 85% N=20, Hypertension & Diabetes: 81% N=26), it was unclear if this was due to PID's recommendations or already necessitated by daily life. Few if, any, patients reported performing high intensity aerobic exercise, resistance training, or yoga.

4.2.1.4 Disease Pathology

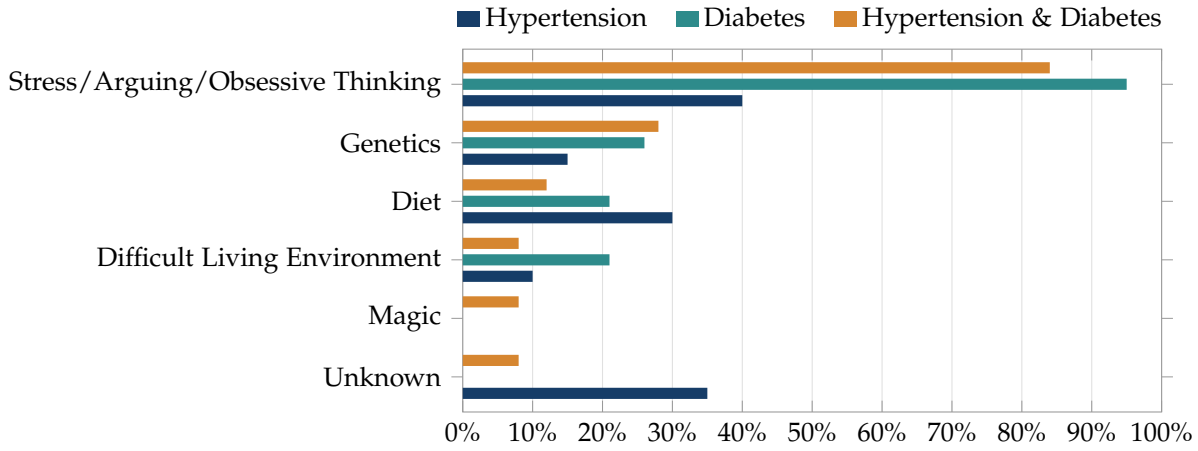
Over the past few decades, community understanding of hypertension and diabetes has evolved away from socioeconomic and cultural origins, gaining a stronger grounding in modern medical knowledge. Interview responses revealed several historical beliefs about the causes of hypertension and diabetes as well as type of individuals who develop chronic disease rooted economic status and religion. Patients and healthcare workers explained that although diseases like hypertension and diabetes may have been historically attributed to economic status or religion, specifically Voodoo, the growing countrywide health infrastructure and an increase in public health education initiatives in the past few decades have shifted community perceptions of chronic disease.

> "Some people used to think [hypertension and diabetes] were Voodoo, but now people know it's a sickness. If people thought it was Voodoo they wouldn't come [to the clinic] every month."... Haitian healthcare worker

> "A long time ago my mom told me diabetes is something for rich people. As poor people she thought we wouldn't get it. Now that I have it, I realize its something that can happen to anyone. Sometimes when our grandparents had a headache or back pain, people would say a zombie was sent to haunt them. Now people know it's an illness."... Hypertension and Diabetes Patient

Although patient knowledge of hypertension and diabetes has certainly become more grounded in Western medicine, patient responses still indicated a widespread lack of understanding regarding the cause of chronic disease. As can be seen in figure 4, patients in all three groups cited a number of different perceived causes for their diseases, including stress, genetics, diet, a difficult living environment, and magic/voodoo. A significant portion of patients in all three groups believed their disease was caused by either stress, arguing, obsessive thinking, or a combination of the three (Hypertension: 40% N=20, Diabetes: 95% N=19, Hypertension & Diabetes 84% N=25)[12]. This was especially true for diabetes and hypertension and diabetes patients, who overwhelmingly attributed their disease to stress. Aside from stress, no other cause was named by more than 30% of respondents in any group.

Figure 4: Reported Cause of Respective Disease



Patients with diabetes often linked the onset of their diabetes to traumatic stress events, which included social isolation, violence, and the death of a family member. In Haiti social relationships are very important and the death of family member was the most frequently reported traumatic event experienced by PID's hypertension and diabetes patients. During the Earthquake a majority of Haitians were exposed to death in their communities and many times within their own family. Patients, healthcare workers, and healthcare administrators reported unimaginable trauma and upheaval in the aftermath of the Earthquake. Many families refused to reenter their homes, sleeping on the streets through seemingly endless aftershocks, bodies piled in the streets while stray dogs fed on them, homes and livelihoods turned to rubble, and vital resources like food, water, and shelter suddenly became unavailable.

> "I was in shock after The Earthquake. I saw too many people die. My mother was very sick and about to die and I had a lot of problems caring for her after the Earthquake. I think more people after the Earthquake have type two diabetes. People were in shock over the loss of loved ones in just seconds."... Diabetes Patient

> "After the earthquake many people in Haiti became diabetic and hypertensive. Many people were shocked, whether it be the loss of a family member or stress."... Haitian Healthcare Worker

[12]Patients were able, and often did, report multiple causes for their disease.

> “A lot of people got diabetes after the Earthquake.”. . . Diabetes and Hypertension Patient

Many patients also reported the sudden death of a close family member, which in large part was caused by inadequate access to healthcare in Haiti. Patients reported that treatable injuries and health complications like C-sections and infected wounds often resulted in traumatic and unexpected deaths. In many cases, patients reported multiple deaths of family members. These events were directly linked to the onset of type two diabetes.

> "My wife died in 2003 and it shocked me. She had complications from a C-section and got an infection. She had two operations and the doctor said if she had a third one it could be problematic...At that time we couldn’t find a specialist and that’s when I become diabetic. I didn’t get another wife, I just thought about her.”. . . Hypertension and Diabetes Patient

> "I am very stressed in my life. I had a brother who had a little cut and he eventually died from it. Also, my mother just woke up one Saturday after that and died suddenly. My father had died five years before they died. These were very important people to me and now they’re gone. I sometimes sit and put my hand on my head and think about them. I don’t know if the stress from that is why I got diabetes, but it happened at the same time.". . . Hypertension and Diabetes Patient

> "My mother had an operation on her left breast. I took care of her for two years until she died and constantly stressed about her. My brother told me to get checked out during this time.". . . Diabetes Patient

> "I lost my husband and first born child and they told me my diabetes was caused by stress from that. I used to keep thinking about them. They were so special.". . . Hypertension and Diabetes Patient

> "I have a lot of stress because my 23 year old daughter passed away a while ago. It happened fast; she was only sick for a few months. After that, I went to the hospital and was told my sugar was very high. I think my diabetes was caused by that."...Diabetes Patient

> "In 2008 my brother was visiting from the countryside when they told him his child died...Before my brothers child died I had always gone to the hospital to be tested for HIV and never been told I had diabetes. At my nephews funeral I got fat and when I came back to Port au Prince and saw a doctor, they told me I had diabetes."...Diabetes Patient.

One patient linked the onset of her diabetes to the traumatic stress and physical insecurity of living in Cite Soleil. Cite Soleil is well-known urban slum in Port au Prince with considerable gang activity, violence, and poverty.

> "In 2004 gangsters would kill and rape people where I was living. One time, there was a man standing by my house watching over with a gun waiting for another man. I was on the roof, where I would sleep with my children, and my mother crawled up and told me not to come down. My mother warned me I was going to be sick from all this stress. I just took all my important things and ran and tried to sleep in all other places I could.”...Diabetes Patient

> “I wasn’t born with diabetes and when I got it in 2006 there was a lot of shooting where I lived. It made me shiver when I heard gunshots.”. . . Diabetes Patient

Another patient reported that her type two diabetes resulted from a miscommunication that

resulted in social isolation. Many elderly Haitians rely on their children for social and physical support. Social isolation can create significant emotional stress and cut off access to necessary resources.

> "While I was talking to someone in church, my son's wife thought I was trash talking her...I tried to explain that to my son, but he blamed me for a while. All that stressed me out and I got sick...I have never told anyone, but I think that's the cause of my diabetes."

In Haiti, traumatic events are compounded by constant chronic stress. Patients who reported a traumatic event were also likely to report struggling with daily stress and uncertainty. This acute on chronic stress phenomenon inhibits a patients ability to cope and process traumatic events.

> "When people have troubles and they can't pay for their children's' school and have obsessive thoughts [diabetes] can come. When you hear someone is in the hospital or that your relative was hit by a car that can cause [diabetes] too. It can be from a traumatic event, but stress is also always here in Haiti. People don't see hope here and it bothers them."...Haitian healthcare worker

4.2.2 Patient Beliefs

In this section the Theory of Planned Behavior is used to frame an evaluation of PID's chronic disease patient's beliefs towards the behaviors recommended as part of PID's hypertension and diabetes treatment, including following a diet, exercising, managing stress, and properly taking medication. Beliefs are organized into 1) behavioral beliefs; the perceived subjective probability a behavior produces an outcome, 2) normative beliefs; the perceived behavioral expectations of important referent individuals like family and close peers, and 3) control beliefs; the perceived presence of factors that facilitate or impeded practice of behaviors.

4.2.2.1 Behavioral Beliefs

When asked whether PID's interventions were helping them, patients in all three groups expressed an overwhelming belief that PID had helped in managing their respective chronic disease (Hypertension: 94% N=18, Diabetes: 100% N=16, Hypertension & Diabetes: 95% N=21). Although this question was intended to encompass both PID's clinical treatment and public health education, it is likely many patients were only referring to medical treatment. When asked what PID had done for them, patients overwhelmingly cited the medicine they receive from PID at little or no cost (Hypertension: 100% N=20, Diabetes 94% N=18, Hypertension & Diabetes 95% N=22). Few, if any, patients, however, mentioned education (Hypertension: 0% N=20, Diabetes 22% N=18, Hypertension & Diabetes: 23% N=22) when responding. It is important to note that the belief that medical treatment improves diabetes and hypertension management may be limited to patients already experiencing complications. Although a majority of patients in all three groups reported always taking their medication (Hypertension: 95% N=21, Diabetes: 80% N=20, Hypertension & Diabetes 96% N=25), at least one patient reported stopping taking her medications when she felt better[13]. Reports from healthcare workers indicated that PID's hypertension and diabetes patients

[13]Despite high reported levels of treatment compliancy, numerous discovered issues inhibited compliancy, including missing appointments, forgetting to take medication, taking medication intermittently depending on perceived well-being, and patients thinking they couldn't take their medication if they did not

were mixed over whether lifestyle modifications beyond adherence to medical treatment were critical towards achieving desired health outcomes.

> "I think some of them only want medicine. There are patients that understand more of the disease and if you educate them on diet some will really do it, but there's a large number that just expect medicine to do the trick."... US Healthcare Administrator

> "Some patients understand they are sick and that they should adjust their diet. It's hard for someone to do exactly what he or she is told. That doesn't mean that they only want medicine. People sometimes just don't have the money to provide the right foods for themselves."... Haitian Healthcare Worker

> "[The interventions] help me a lot. Before I didn't have control over my hypertension. Now I can bring my blood pressure down. I think god sent PID here. If he didn't, I might be dead. At other places you have to pay a lot of money."... Hypertension Patient

Among patients who reported valuing PID's lifestyle modifications as part of their treatment, adherence to diet recommendations played a key role in outcome expectancy. Patients reported feeling better when eating healthier foods and in some cases, were able to connect high blood sugar measurements with poor diet habits. Even some patients who reported being unable to follow PID's diet recommendations, acknowledged the importance of diet in achieving improved management and control of diabetes and hypertension.

> "When I apply what they tell me I feel good. I always think about what they tell me."... Hypertension and Diabetes Patient

> "Last month my blood sugar was low. Now it's high, so I think it's caused by not eating the right foods. Yesterday I ate rice even they told me not to eat it. I can see the cause and effect. "... Hypertension and Diabetes Patient

> "I know there are certain foods I should eat."... Diabetes Patient

Although, for the most part, patients did not report knowledge of stress management techniques like deep-breathing exercises that were included in PID's hypertension and diabetes education guidelines, patient reports indicated that religion was a critical tool in managing stress. Among patients who believed that hypertension and diabetes were caused by stress, several reported praying and attending church regularly to reduce stress. These reports suggest some patients believed that stress management is a necessary component in better managing and reducing the prevalence of hypertension and diabetes. Moreover, as described in the previous subsection, almost all of PID's chronic disease patients associated poor stress management with the undesired outcome of causing hypertension and diabetes.

> "I have a lot of stress. To deal with it sometimes I pray because god helps us remove the stress."... "Hypertension and Diabetes Patient

> "Sometimes with the way the country is, it is hard not to stress. I pray and sing to Jesus to manage my stress."... Diabetes Patient

Patients did not generally cite exercise or weight loss as an important strategy in managing

have food to take it with.

their hypertension and diabetes. As discussed in the previous section, older patients requested improved exercise and physical therapy classes, indicating some understanding of the connection between physical activity and mobility. It was not clear, however, if many patients believed that exercise or weight loss contributed significantly towards improved health outcomes with respect to hypertension and diabetes.

4.2.2.2 Control Beliefs

PID's hypertension and diabetes patients highlighted numerous factors that impacted their ability to follow recommended behaviors, including poverty, physical disability, religion, and circumstantial uncertainty. Patients in all three groups rarely blamed themselves for their disease (Hypertension: 6% N=17, Diabetes: 13% N=15, Hypertension & Diabetes: 5% N=20). With the exception of a small amount of patients who blamed themselves for constantly stressing, most attributed the development and mismanagement of their disease to external barriers.

Nearly all of PID's chronic disease patients reported difficulty affording the foods recommended as part of a healthier diet (Hypertension: 90% N=20, Diabetes: 88% N=17, Hypertension & Diabetes: 95% N=20). Throughout interviews, patients echoed a general frustration with balancing diet needs and extreme financial poverty. In some cases, limited access to resources put patients in the position of having to choose between eating healthy and other necessities like affording their children's tuition. It is possible that patients' perceived lack of control over their diet impacted their interest and attentiveness to PID's education. Although PID's diet education for both hypertension and diabetes patients suffers from a lack of focus on economical diet alternatives, there are undoubtedly common instances when patients can avoid unnecessary risks like adding sodium to their foods or find affordable and healthy diet replacements. For example, a piece of fruit may be cheaper than a pre-packaged snack or a whole grain the same price as a simple grain. While poverty may often severely restrict PID's patient's control over their diet choices, it is likely patients will encounter opportunities, all be it with variation in frequency, when they are able to use knowledge acquired from PID's diet education to make a healthy and economical choice. Unfortunately, if patients perceive poverty as too significant of a control factor they may simply ignore or pay minimal attention to PID's diet recommendations and be unable to use them in these circumstances. The disparity in patient self-efficacy with respect to diet was reflected in patient interviews, where some simply reported eating what they could, while others acknowledged PID's recommendations while still citing difficulty. Patient demeanor during interviews also further depicted the dichotomy of self-efficacy. Some patients seemed more engaged in their own self-care and answered questions with both a greater sense of empowerment and depth. In contrast, another distinct group of patients appeared powerless to controlling their disease and were more likely to cite control factors as opposed to knowledge from PID's public health education.

> "I understand my diabetes will never be cured, but it's important to find a way to control it."...Hypertension and Diabetes Patient

> "They tell me what to eat, but I don't have a lot of money to keep up with their recommendations."

> "The doctor tells you what to eat, but its expensive...I want to give my kids the best food and send them to school. I have to sacrifice."...HT/D

> "I am a poor man, so I eat what's in front of me."...HT/D patient

> "Sometimes we have to break the rules to survive."...D patient

> To the translator: "Because you are Haitian you know the problems we have; some times you have things and other times you don't. HT/D

Financial poverty and uncertainty also inhibited PID's patient's ability to manage their stress. Although both hypertension and diabetes patients often reported trying to control their stress, the frequency of traumatic events and daily political and economic uncertainty presented a constant barrage of stressors. When describing their situation, many patients referred to the phrase "Life in Haiti" as an idiom that implied day-to-day stress, uncertainty, and resource limitations.

> "I stress and think a lot. I have trouble sleeping. The stress for me is always there. I try my best not to stress, but just like that it can come back. It's for life. You know how things are here in Haiti."...Hypertension Patient

Some traumatic events, beyond their impact on patient stress, also further entrenched patients in poverty and limited their capabilities. For example, the loss of a child would not only manifest as an enormous source of traumatic stress, but also remove a vital physical resource from a patient's life. On the other hand, some patients reported that the presence of friends of family helped mitigate the difficulties incurred by traumatic events. Many Haitians share their earnings with their family and support family members who are jobless, disabled, or elderly. Having a large pool family and friends creates a social safety net that abetted many patients navigate both physical and mental challenges.

> "When I lost my daughter it become hard for me because she helped in the house and my husband died. I struggled to take care of my kids."...Diabetes Patient

> "I used to have a big business, selling and buying things. And after the Earthquake my business broke up. Now friends and relatives help me because I struggle financially."...Hypertension and Diabetes Patient

Religion was the most widely reported tool patients used to manage stress. Some patients did not claim to suffer from stress at all due to their faith and others reported praying and reading their bible for relief. While religion was effective in limiting stress for some, it had little impact for others. Another reported strategy for stress management was social bonding. Patients with higher levels of stress generally suffered from social isolation, in some cases due to the deaths of family members. In contrast, those who were able to curb their obsessive thinking and stress usually cited key social relationships with friends or family members. Increased social capital allowed patients to avoid arguing and obsessive thinking, while also providing daily enjoyment and laughter.

> "You should have friends around and have fun. That will prevent your stress and your sugar problem."...Diabetes Patient

> "When I'm at home I know I shouldn't be stressing or sitting by myself and thinking...I have a good husband at home who makes me laugh and amuses me. I try not to think a lot at home."...Diabetes

Patient

> "I don't stress because I read my bible and I know guide is there to guide me."... Hypertension Patient

Physical disabilities also functioned as a severe control factor for many, mostly elderly, chronic disease patients. Given transportation may be cost-prohibitive for some patients, disabilities could limit a patient's ability to walk to the clinic, subsequently affecting their access to healthcare. Although it was unclear, the degree to which certain patients were disabled, some reported enduring extreme physical pain and exhaustion to come to PID's clinic, while others missed appointments and came sporadically. One hypertension and diabetes patient, who relied on a crutch to walk, reported having to stop four times to rest on his trip to PID's clinic. Moreover, in another case, a patient was so weak and malnourished that the interview was stopped prematurely. One mentally and physically disabled patient had to be carried around the clinic by her son. A patient's value of PID's interventions played an important role in determining self-efficacy; the more likely an individual was to believe PID's medication and behavioral recommendations produced valuable health outcome, the more likely they were to endure severe physical obstacles in accessing those goods and services.

4.2.2.3 Normative Beliefs/Community Facilitation

PID's chronic disease patients reported a significant disparity in the perceived behavioral expectations of peers or lack there of. While some patients reported that community members would actively intervene to ensure they followed proper lifestyle modifications like dieting, others stated that community members were indifferent towards their well-being. Patients reported intervention from both unspecified community members and close friends. Reported interventions from community members specifically generated pressure to avoid certain unhealthy foods, which in some cases actually caused patients to change their behavior. In other cases, community members encouraged PID's patient to adhere to their medical treatment creating positive pressure to consistently consume medication.

> "People in my community tell me to keep taking my medicines and drink tea"... Diabetes Patient

> "People in my community always tell me to see a doctor. They'll tell me if I'm eating something bad for me. They'll come up to me and grab it and say 'that's bad don't eat that'. I know its bad too, but I have to eat."... Hypertension and Diabetes Patient

> "If I'm eating a mango outside, [people in the community] yell at me to stop eating it. Sometimes I go straight inside and throw it away."... Diabetes Patient

> "Sometimes when people in my community understand the problems of diabetes they'll tell us not to walk with sandals."... Diabetes Patient

Although less directly impactful in creating behavioral pressures, other patients reported the presence of community members who would monitor their well-being and doctors visits. When reported, these interactions instilled a feeling of community support among PID's chronic disease patients and also helped reinforce accountability for self-management of hypertension or diabetes. Other patients cited physical support from fellow community members in accomplishing day-to-

day tasks. This support helped contribute an environment in which patients could be open about their illness and disabilities.

> "People in my community ask how the visit went. . . 'Is it high. Is it low'."...Hypertension Patient

> "The people in my community help me when I ask for help carrying my water buckets. They will still help me even if I don't ask. That makes me think they understand my problems."... Hypertension and Diabetes Patients

Many patients described a contrasting phenomenon, in which community members either paid no attention to the struggles of hypertension and diabetes patients or imposed stigmas that contributed to perceived social isolation. Reported indifference towards patient's well-being stemmed from limited resources, ubiquitous poverty, and a resulting 'every man for themselves' type community attitude.

> "People in the community think it's your sickness, so you deal with it. Everyone lives for themselves."... Hypertension Patient

> "If I can't take my medicine and ask for help people say they have their own problems."... Hypertension and Diabetes Patient

Some patients reported that the community did not care about them in general, but described positive influence and advice from smaller pockets of similarly-aged peers, who in some cases shared the same disease. These pockets were reported to function like self-help groups, in which members shared vital health information and provided social support. These groups serve an especially critical role in Haiti where not all members of a community have access to chronic disease healthcare. Several hypertension and diabetes patients reported sharing information acquired through PID's program with other peers who did not have access to a chronic disease program.

> "There are some old people like me [in my community]. They will come to me and ask me how my blood sugar and blood pressure is. I will give them tips. After that I don't think people care. Us old people stick together."... Hypertension and Diabetes Patient

> "Some [community members] will teach us, but others don't care about our problems. It's only those who know how it is. I always explain to them what to do because I talked to my doctor."... Diabetes Patient

> "When we have classes, some people understand better than others. Those people, like myself, can explain what the [clinic coordinator] is saying to the ones that understand less."... Hypertension and Diabetes Patient

Interview responses also reflected widespread community awareness, and in some cases panic, regarding the severity of hypertension and diabetes in the communities PID serves. This awareness, in large part, stemmed from a reported high frequency of hypertension and diabetes in local communities. Patients were extremely likely to know a peer or family member who shared their disease. The ubiquity of hypertension and diabetes appeared to accelerate the development of stigma. Patients specifically reported a communal belief that individuals with hypertension and diabetes have a shortened life expectancy and higher risk of mortality. Many cited the role of

hypertension and diabetes' extreme consequences; namely, strokes, heart attacks, and diabetic ulcers in creating and reinforcing strong perceived associations between chronic disease and suffering.

> "The community knows that hypertension and diabetes are fragile. Any minute you can pass out and die."... Hypertension and Diabetes Patient

Some patients reported that the presence of stigmas caused community intervention to have an overall negative impact on their well-being. Fears of harassment by peers and family members prevented PID's hypertension and diabetes patients from sharing their diagnosis with community members, cutting off their access to critical social support, including health information dissemination, social-bonding stress relief, and physical assistance. Moreover, subjective feelings of social isolation created by stigma can not only contribute to additional stress and the development illness, but also inhibit patients' desire to follow critical behavioral recommendations for fear of revealing their diagnosis.

> "I don't want people to know I have diabetes. They will tell everyone and make a big deal and tell me I'll die and then I'll have more problems."... Diabetes Patient

> "One time my cousin called me and told me I was going to die because I had diabetes. I told him I'm not going to die because God will help me. People in my community tell me people with hypertension and blood sugar problems die early."... Diabetes Patient

As a final note, PID's hypertension and diabetes patients live in variety of communities and this study did not control for neighborhood, so it remains unclear if there was a definitive relationship between PID communities and degree of community intervention or stigma.

4.3 Quantitative Analysis of the Efficacy of Partner's In Development's Chronic Disease Clinic

Clinic-wide consultation records from 8/14/12 to 8/16/16 (1,463 days) were transcribed from hard copy to an electronic database on-site in Haiti during July–August 2016. A record was included if the patient had at least one documented systolic blood pressure >140 mmHg, appeared on any identifiable hypertension paper record, or was prescribed any anti-hypertensive medication. The final analysis includes 412 hypertension patients (104 male, 298 female, and 10 of unknown sex). Two analyses were performed: a Kaplan-Meier survival analysis of patient retention, and a longitudinal analysis of systolic blood pressure using Generalized Estimating Equations (GEE).

4.3.1 Patient Retention

Kaplan-Meier survival analysis was used to estimate the probability that a patient remains in the hypertension program after a given number of consecutive monthly visits. A patient was considered to have left the program when their visitation record showed no visit within a "permissible gap." Some gaps may reflect missing records rather than true absences, so the analysis was repeated with permissible gaps of 40, 60, and 80 days. Patients are expected to return every 30–35 days to refill their prescriptions, so the 40-day gap corresponds to the case in which

the records are complete.

In every scenario, retention decays exponentially, with the greatest losses occurring in the first few visits (Figure 13, Table 1). The average patient is retained for only 2.44 to 5.9 consecutive visits. Allowing patients to remain active across the largest gap in the records (195 days, between 3/12/14 and 9/23/14) did not meaningfully change the survival functions.

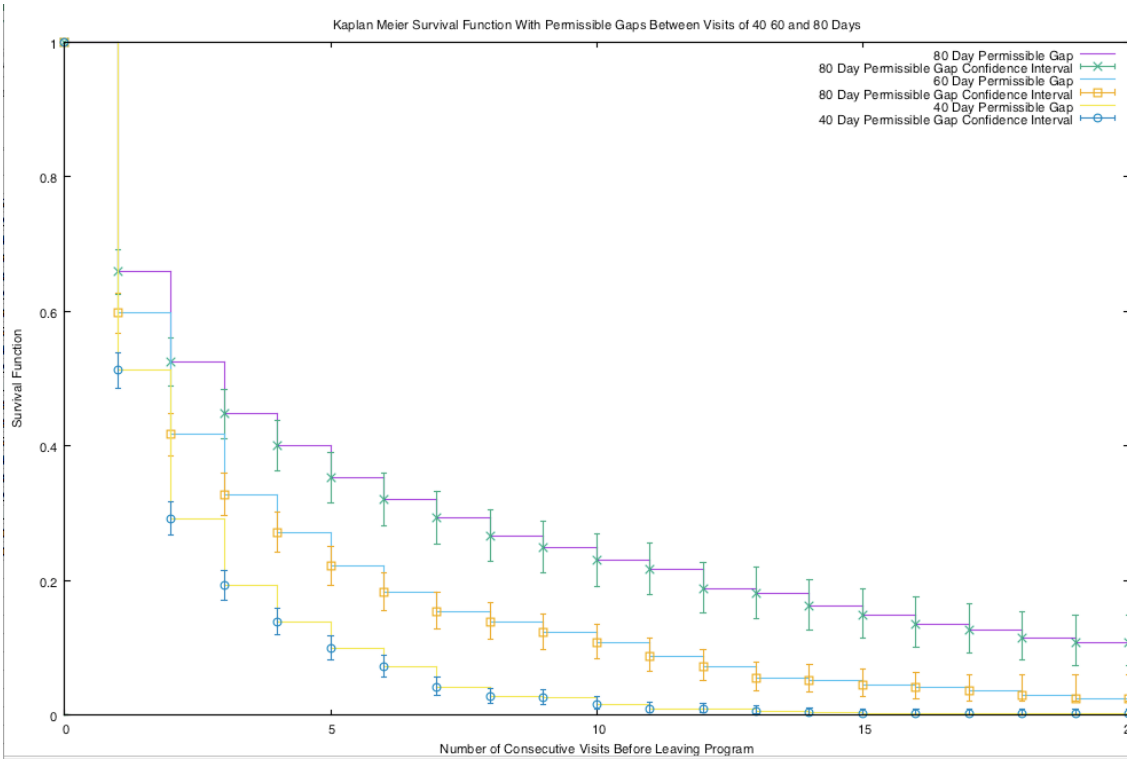


Figure 13: Kaplan-Meier survival functions for 40-, 60-, and 80-day permissible gaps between patient visits, with confidence intervals.

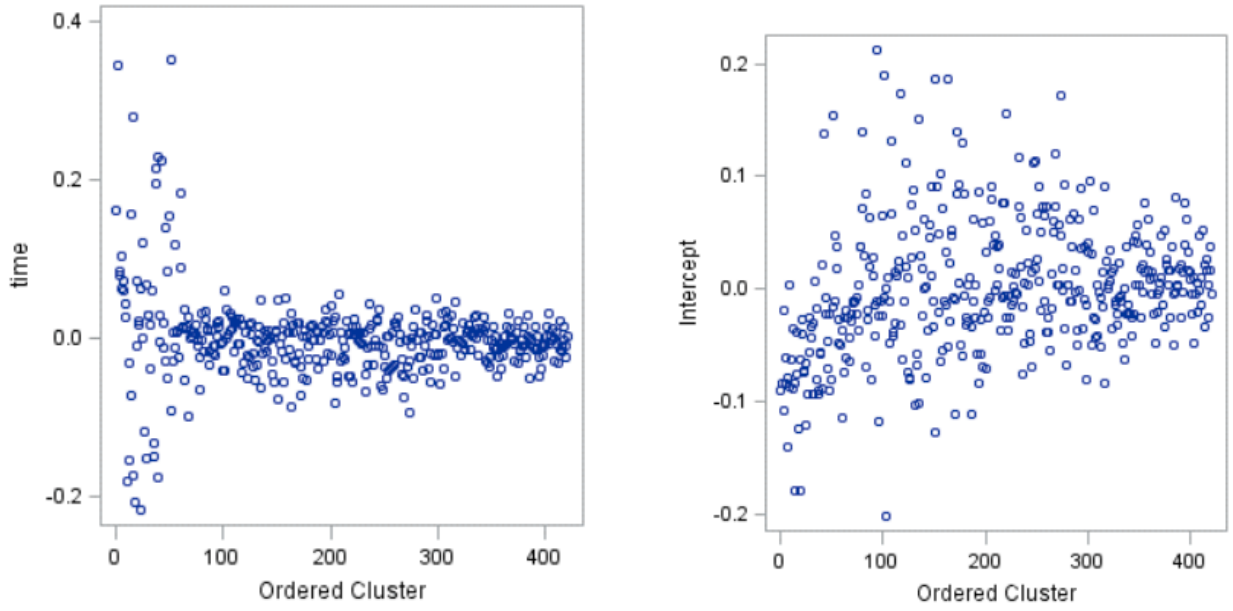
Table 1: Exponential fits and average retention for each permissible gap. Fits were calculated by least squares; the y-intercept was not fixed at 1, to avoid distorting the rate of decay.

Permissible Gap	Exponential Fit	R^2	Average Retention (Visits)
40 days	$S(t) = 0.6931\, e^{-0.382x}$	0.992	2.44
60 days	$S(t) = 0.6262\, e^{-0.179x}$	0.974	3.93
80 days	$S(t) = 0.6717\, e^{-0.104x}$	0.953	5.9

4.3.2 Systolic Blood Pressure Over Time

GEE was used to model clinic-wide systolic blood pressure as a function of days in the program, treating each patient's set of measurements as a single cluster of correlated data. The model estimates a change of 0.0001 mmHg per day of treatment (95% CI, -0.0042 to 0.0044), meaning there is no statistically significant change in systolic blood pressure over the course of PID's interventions.

DFBETA statistics, which recalculate the model's fit parameters while excluding one patient at a time, show that both the slope and the y-intercept are stable (Figure 14). The wider spread among the first ∼75 patients reflects their earlier enrollment and correspondingly greater number of data points. Because there was no untreated control group, this result cannot show whether PID's interventions kept systolic blood pressure from rising further than it otherwise would have.



(a) Slope: daily change in systolic blood pressure

(b) Intercept: systolic blood pressure at enrollment

Figure 14: DFBETA statistics for the GEE model as a function of the patient (cluster) excluded.

5 Discussion

Partners In Development has made extraordinary progress in filling the chronic disease healthcare void in Port au Prince, Haiti; however, as it remains, the organizations' hypertension and diabetes program suffers from critical, and in some cases, unacceptable, shortcomings. With respect to clinical treatment, dangerous and ineffective drug therapy practices have been commonplace for the clinic's four year existence. The regular clinic practice of substituting beta blockers and switching patients between drug classes exemplify a treatment strategy that both violates literature recommendations and PID's own medical protocol. Inadequate integration of foreign healthcare providers and a lack of healthcare professionals within the chronic disease clinic severely limit continuity of care. PID's chronic disease health education suffers from a progressive degradation of quality and comprehensiveness. The organizational failure to implement an ongoing monitoring and evaluation strategy, including clinical oversight, professional training, and data utility, has not only allowed these ineffective practices to go unnoticed for extended periods of time, but also precluded valuable input and potential solutions from local and foreign healthcare providers, as well as Haitian patients.

Within the framework of the Theory of Integrated Health Behavior Change and Theory of Planned

Behavior, insufficient chronic disease education, inadequate health data monitoring, a difficult and uncertain living environment, community stigma and indifference and a general lack of healthcare resources have impeded patient self-regulation skill and ability. Both insufficient intent to engage in behavior and inadequate resources have curbed crucial behavioral implementation strategies, including goal setting, self-monitoring and reflection, planning, and management of emotional response.

First and foremost, PID's diluted and overly simplistic chronic disease health education practices have not only bottlenecked patients' access to information and subsequent knowledge of appropriate behavioral goals, but also insufficiently instilled and delineated the relationship between health behaviors and health outcomes. PID's chronic disease patients lacked both awareness and specific knowledge of multiple pivotal lifestyle recommendations. This contributed to patient devaluation of education in comparison to drug therapy as part of a comprehensive chronic disease treatment strategy.

A lack of health data monitoring and continuous healthcare also functioned as a missed opportunity to hold patients accountable for behavioral changes. Clinical and patient tracking of weight, as well as blood pressure and blood sugar can encourage goal setting and positive decision-making, while complication-specific lifestyle recommendations and follow-up can spur planning and plan implementation. For example, if a patient complains of cramping, a healthcare professional could recommend increased water intake and work directly with the patient to derive an appropriate time and quantity based strategy. PID's lack of documented follow-up and continued patient access to healthcare professionals restricted the impact of this practice.

Widespread poverty and resource uncertainty limited patient's perceived control over their disease and severely hindered PID's patient's motivation to pursue lifestyle recommendations. Uncertainty with respect to income, Haiti's political state, and natural disaster negatively impacted patient's ability to create remotely long-term adherence plans. Traumatic and chronic stress also compounded the impact of patients perceived lack of control by decreasing resilience to obstacles and failure. This study uncovered profoundly high rates of traumatic and chronic stress, which are likely much higher due to this study relying on self-reporting.

While some hypertension and diabetes patients reported support from their communities, which reduced external barriers to behavioral execution, others cited stigma and widespread indifference as hurdles towards disease management and behavioral compliancy. The opportunity costs of lacking community support were significant. Patients lost access to social relationships that aided stress management and decompression, constructive social pressure that improved behavioral adherence, informational resources and self-help groups, physical assistance with daily activities, and a safe and judgment free environment to engage in recommended behaviors.

Overall, as PID moves forward to fix the issues described in this report and implement an ongoing monitoring and evaluation strategy to identify problems more consistently, action must be informed by both a comprehensive theoretical understanding of patient behavior and robust understanding of the literature.

It is important to note this research was limited by the Haitian Creole-English language barrier, limited Haitian trust in a foreign evaluator, and strong protections on anonymity. The Haitian

interview translator was not completely fluent in English and on a few instances misinterpreted words. Furthermore, it is possible useful information was lost in the translators paraphrasing of patient responses. Patient typically spoke rapidly and the translator may have omitted important information in keeping up. Additionally, Haitian healthcare workers were initially reluctant to participate in interviews because of a misunderstanding over the purpose of the study. After explaining that their responses were protected by confidentiality and the interviews were not a performance evaluation, but rather an opportunity to offer constructive criticisms of the chronic disease clinics all Haitian healthcare workers consented to an interview. It is certainly possible that Haitian healthcare workers did not reveal certain information because a fear of repercussions. Finally, useful information pertaining to patient sex, neighborhood of residence, level of poverty, and age, which could have provided additional layers for data analysis was not recorded in order to maximize patient anonymity

Future research is needed to understand the impact of treating hypertension and diabetes without comprehensive lab work and HbA1c on patient mortality and morbidity. In resource limited settings like Haiti, lab work and HbA1c are typically cost-prohibitive and studies must examine their true cost-effectiveness. These studies should examine the optimal chronic disease treatment strategy in Haiti, be it low-quality, high quantity care versus high-quality, low-quantity care, to achieve lower morbidity and mortality. Moreover, it is unclear whether anti-hypertensive drugs like ace-inhibitors and beta blockers, which have been documented to be less effective on African Americans, are equally as ineffective on Haitians.

There is also a dire need for studies to examine the connection between hypertension and diabetes and traumatic and chronic stress in Haiti, especially acute-on-chronic stress, which many Haitians suffer from. An alarmingly high number of diabetes patients reported developing diabetes from a traumatic stress event, and a confirmation of this link would have enormous applications for future interventions designed to treat hypertension and diabetes. Future studies are needed to address this.

As it pertains to this study, further research should control for patient neighborhood of residence, sex, gender, and level of poverty when examining patient beliefs. Larger studies are also needed to examine community knowledge of hypertension and diabetes risk factors as well as the local incidence of chronic disease, chronic stress, traumatic stress, and mental illness.

6 Recommendations

In order to both fix the problems highlighted in this report and prevent future errors, the following recommendations have been put forth. The recommendations are dichotomized into those that are immediately accomplishable with PID's current resources, and those that may become possible with additional resources and funding. It is highly advised that PID take immediate steps to implement these changes. This will undoubtedly involve a greater organizational emphasis on accountability, data, education and oversight.

6.1 Immediately Accomplishable

6.1.1 Immediately Cease All Dangerous Drug Therapy Practices

Partners In Development should immediately convene the chronic disease clinic coordinator, primary care internist, American and Haitian chronic disease clinic administrators, and if necessary American cardiologists and nephrologists, to assure a mutual understanding that intermittent use and substitution of beta-blockers, prescribing ace-inhibitors to women of child-bearing, and prescribing diuretics to chronically dehydrated patients or without recommendations for increased potassium intake are dangerous and unacceptable medical practices. It should also be made clear that only medical professionals are authorized to make any adjustment to a patient drug treatment regimen. This means only the primary care clinic internist and foreign visiting doctors may change patient drug treatment regimens. A non-medical professional, under no circumstance, may switch a patients medications, even if within the same drug class, without the consent of a medical professional.

6.1.2 Update Chronic Disease Medical Protocols

6.1.2.1 Hypertension Protocol

In Development's diabetes and hypertension medical protocol should be updated to reflect the latest literature recommendations and include dosage, drug-type, and time-increment specific guidelines for all medications used by the clinic. With respect to the hypertension clinic, all anti-hypertensive drugs should be stratified into at least four sequential therapies with appropriate contraindications, considerations, and treatment guidelines. For further information see the Haiti Outreach Ministries Protocol, Partners In Health Protocol, or HypertensionRxHaiti Protocol. Outdated protocols including those that recommend beta-blockers as a first line therapy should be removed from the clinic. PID should also consider adding statins, which have been shown to have a substantial impact on reducing mortality in intermediate-risk hypertension, to their treatment regimen. Specific and locally applicable diet guidelines and meal replacements should be added as well and emphasized during consultations with healthcare providers

6.1.2.2 Diabetes Protocol

The diabetes medical protocol should be updated to include specific diet recommendations that are locally available, affordable, and satiating. Specific stress management techniques that apply to both chronic and traumatic stress should be added to the diabetes protocol. Relevant guidelines for reducing cardiovascular risk and treating patient's comorbid with hypertension and diabetes should also be included.

6.1.2.3 Simultaneous Local and Foreign Participation

Because PID's patients are treated by both foreign healthcare providers and the primary care clinic internist, protocol guidelines should be written with Haitian participation and be agreed upon by both parties. It is appropriate to have two separate sets of treatment guidelines for local and foreign healthcare providers, as this will negatively impact continuity of care and the efficacy of drug therapy.

6.1.3 Prioritize Drug Supplies Based Updated Medical Protocol and Data Tracking

PID should take extreme care to avoid fluctuations in the stock of chronic disease drugs. Although the need to import drugs and non-compliant Haitian customs present obstacles to consistent drug supply, by prioritizing supplies for first line anti-hypertensive therapies PID can coordinate the drug supply chain with demand. This effort will involve constant data monitoring, in which drugs with the lowest supplies and highest need gain priority in transport from the US.

6.1.4 Train Chronic Disease Clinic Coordinator, American Chronic Disease Clinic Administrator, and Haitian Chronic Disease Clinic Administrator

Additional and Immediate training should be held for all non-medical professionals within the organizational structure of the chronic disease program, covering PID's updated chronic disease medical protocol, hypertension and diabetes drug therapy, proper health education, and identifying incorrect or dangerous practices. The failure to identify malpractices, in large part stemmed from insufficient medical knowledge, and a subsequent organizational inability to identify clinical problems.

6.1.5 Immediately Utilize Chronic Disease Database to Record Patient Data

PID should immediately begin recording information from the hypertension clinic into the electronic record system created as part of this study. The maintenance of this system is critical to maintaining continuity of care between local and foreign healthcare providers, identifying dangerous and infective drug treatment practices, observing patient response to drug therapy, and assuring proper follow up on disease complications. The guidelines for use of the database are given in figure 7, and should include patient age, sex, diagnosis, blood pressure, drug therapy, and reported complications. A database was not created for diabetes patients due to the limited utility of monthly fasting blood glucose measurement in deriving long term patient trends; however, in the future a database should be created in order to track patient drug therapy, weight, and complications.

6.1.6 Immediately Begin Enforcing Clinic Compliancy Policies

Patients who routinely miss monthly appointments should be immediately warned that PID will begin enforcing its compliancy policies and remove patients from the program if necessary. Accurate attendance records in the clinic database will assist in identifying these patients. Patients who attend intermittently receive inconsistent and ineffective drug therapy and waste valuable and limited clinic resources. Furthermore, they are significantly less likely to be knowledgeable of educational information and subsequently less likely to implement critical lifestyle recommendations.

6.1.7 Update Chronic Disease Educational Practices

6.1.7.1 Implement topic-focused classes

Partners In Development should immediately begin offering in-depth, interactional, and topic-specific educational classes beyond its monthly oral educational talk. These talks will provide a much need opportunity for patients to actually practice important behaviors, ask important

questions, offer feedback, and retain information more effectively. Based on employee and patient feedback the following classes are needed:

- Diabetic Foot care and Wound treatment
- Diet
- Stress Management
- Exercise & Physical therapy

6.1.7.2 Restructure Monthly Oral Educational Talk

As it stands, the monthly oral educational PID gives to its chronic disease patients lacks comprehensiveness and has been extremely diluted. PID should employ different educational methods like videos, participatory education, and demonstrations. FHADIMAC publishes educational videos on its website. Because it is difficult to teach all information necessary of a chronic disease education program in one session and not all the information is applicable to each patient, PID can save more specific information for individual classes.

6.1.7.3 Feed Diabetic Patients Before Education

Because diabetic patients are currently expected to fast for eight hours before their consultation in order to provide a fasting blood glucose, many do not retain information effectively during the monthly education talk because they are extremely hungry. PID should begin providing crackers and water to its chronic disease patients to reduce this problem.

6.1.7.4 Distribute Take-Home Documents with Pictures

PID's should supplement its current monthly education with take-home informational documents that include pictures and diagrams for illiterate patients. The currently monthly educational talk is not nearly in-depth enough and patients struggle to retain all the information from one monthly session. These documents will prove to be a valuable information document in between visits, not just for PID's patients, but also for many other interest community members. Patients should be required to bring this document to each visit.

6.1.7.5 Preventative Education For General Population

Chronic Disease Health education should not be limited to only PID's current patient population. PID should provide preventative education, including diet recommendations, exercise guidelines, and stress management techniques to the general walk-in patient population while they wait in the clinic. Preventative education represents one of the most useful tactics to reduce the chronic disease health burden in Haiti, and stop new cases before the arrive at PID.

6.1.7.6 Identify Affordable/Satiable Diet Meal Alternatives

One of the greatest current bottlenecks on PID's chronic disease education program is the lack of inclusion of specific affordable diet meal alternatives. Poverty was cited as one of the largest control factors inhibiting patients from following PID's diet recommendations. PID should collaborate with a nutritionist and local Haitian to review food availability and pricing as well

cultural preferences in order to create a comprehensive set of meal substitution guidelines.

6.1.7.7 Hold Periodic Knowledge Evaluations

Whether done formally or informally, PID's chronic disease clinic coordinator should evaluate hypertension and diabetes patients' knowledge of recommendations as part of regular clinic education. Patients will be more likely to pay attention if they are held accountable for learning information.

6.1.7.8 Form Self Help Groups

This study identified the autonomous forming of community chronic disease self-help groups. Whether PID's encourages participation and collaboration among patients, or actually moves forward to form additional more groups, self-help groups and community interaction manifest as crucial processes for improved health information dissemination, stress reduction, and patient well-being.

6.1.8 Hold Effective Orientation Sessions for Foreign Healthcare Providers

Although PID has been unable to successfully implement orientations for foreign healthcare providers using Haitian administrators, it must work to identify and train a staff member who can review the chronic disease clinic protocol, explain relevant local factors that effect healthcare provision like poverty and culture, and explain how PID's clinic functions. The orientation should include training on using the database, making appropriate lifestyle recommendations, how and when to seek out support from Haitian staff, adjusting for the poverty patients experiencing, and avoiding unnecessary care or treatment. These sessions should be held the night before foreign healthcare providers begin work in the clinic. Foreign providers should be made aware of where they can find updated copies of the medical protocol. Additionally, local healthcare providers should be advised when foreign teams are coming and given the opportunity to meet with them and provide advice with the assistance of a translator.

6.1.9 Develop Pre-departure Educational Video For Foreign Healthcare Providers

Many foreign healthcare providers do not sufficiently review or understand PID's chronic disease medical protocol, or general medical protocol for matter, prior to arriving. This negatively impacts treatment and wastes valuable time during clinic hours. Foreign healthcare providers, unless they have worked with PID before, also do not understand critical local factors that affect healthcare treatment. An education video can be made that explains these factors and allows foreign healthcare providers appropriate time to adopt their desired treatment strategies.

6.1.10 Prioritize Admitting Patients In the Microfinance and Child Sponsorship Program

The single-most significant control factor affecting PID's chronic disease patients' ability to implement necessary behavior changes is poverty. By giving prioritized access to patients who have family members in PID's microfinance program or child sponsorship program, PID can target poverty elimination on multiple levels, while also increasing the probability that patients are able to implement behavioral changes without being controlled by poverty.

6.1.11 Hold Specific Health Evaluation Days for PID's Chronic Disease Patients

Currently, PID's hypertension and diabetes patients struggle to access the primary care clinic internist, the only doctor on PID's staff. This affects effective drug therapy monitoring and treatment, disease-complication management, and education dissemination. The primary care clinic internist already cannot feasibly consult both primary care clinic patients and chronic disease patients on a regular basis. PID should create special days when the primary clinic internist is only available to chronic disease patients to address complications, adjust medications, evaluate changes in comorbidity, and conduct the periodic evaluations that PID should already be conducting as part of its chronic disease clinic guidelines.

6.1.12 Establish Clinical Monitoring and Evaluation Strategy

Partners In Development should immediately convene the chronic disease clinic coordinator, primary care internist, American and Haitian chronic disease clinic administrators, and if necessary American cardiologists and nephrologists, in order to create a definitive and ongoing clinical monitoring and evaluation strategy. This strategy should have specific accountability measures, and delineate exactly which employee and how often said employee is responsible for reviewing drug therapy practices, reviewing drug supplies and prioritizing and requesting additional supplies, training and orienting foreign visiting healthcare providers, reviewing educational practices, reviewing the bedside manner of the chronic disease clinic coordinator and primary care clinic internist, and enforcing clinical policies like removing non-compliant patients that miss consultations. This strategy should also seek routine input from foreign healthcare providers, local healthcare providers, local healthcare administrators, and local hypertension and diabetes patients. Partners In Development's clinical shortcomings have largely stemmed from a lack of oversight and accountability, and this strategy will seek to limit issues from falling through the cracks for extended periods of time.

6.2 Accomplishable With Further Investment and Resources

6.2.1 Hire A Full-time Professional Therapist

Partners In Development's hypertension and diabetes patients suffer from extraordinary high stress that not only significantly affects their ability to control their disease. Patient reports and studies also point to a significant link between mental illness and traumatic stress and the onset of type two diabetes. Continued access to a mental health professional would serve to reduce the stress of patients and disseminate important stress management strategies within the community.

6.2.2 Incorporate Appropriate Lab Work Chronic Disease Program

While implementing both hypertension and diabetes lab work into regular chronic disease clinic operations would demand a significant investment from PID, it would dramatically improve healthcare providers ability to create accurate and appropriate treatment strategies.

6.2.3 Implement HbA1c Monitoring For Diabetic Patient

While fasting blood glucose measurements are extremely useful in providing a cheap initial diagnosis of diabetes, they have little long-term clinical utility in understanding patient prognosis or identifying appropriate treatment strategies. The HbA1c would provide healthcare providers with a tool to identify long-term patient trends and increase their ability to make effective treatment judgments.

6.2.4 Initiate Door-to-Door Community Outreach Program

Many Port au Prince communities do not have access to critical chronic-disease risk reduction information. By working to increase the prevalence of preventative behaviors and reduce the presence of hypertension diabetes risk factors in local communities, PID can simultaneously reduce the incidence of chronic disease and its own health burden. Moreover, given PID has capped its chronic disease program many current community members with hypertension and diabetes do not have access to health information.

6.2.5 Hire A Full-Time Chronic Disease Physician

As previously stated, PID's hypertension and diabetes patients do not receive adequate treatment from a medical professional, including the periodic evaluations that are required as part of existing clinic guidelines. Patient treatment suffers from a lack of continuity, complication management, and effective drug therapy—all direct consequences of insufficient medical care. As PID moves forward it should seriously consider designating funding for a medical professional to continuously consult chronic disease patients.

6.2.6 Implement A Telemedicine Program

Telemedicine is a largely untapped frontier for medical treatment in Haiti. The NGO community, including PID, largely relies on visiting healthcare professionals to provide critical medical treatment; however, this model suffers severely from a lack of continuity, especially within the context of chronic diseases. At PID, effective drug therapy and patient care is hampered by lack of access to a medical professional. A telemedicine program, in which patients are consulted by American healthcare physicians over Skype, was piloted as a part of this study and found to be fully feasible within PID's current resources. Foreign healthcare providers can utilize PID's database to monitor drug therapy and patient conditions. PID already has a pool of doctors who would be capable of conducting periodic consultations, and because the time commitment is minimal and does not require travel to Haiti, more would be likely to participate. A future study testing the impact of telemedicine on patient morbidity, drug compliance, knowledge, and prognosis is readily needed.

7 Conclusion

These recommendations, primarily the immediately accomplishable ones, will absolutely require both active long-term effort and allocation of resources; however, they are non-negotiable if PID is serious about offering high quality chronic disease care in Haiti. It is no secret that foreign

intervention and an insufficiently regulated and prepared NGO sector have thoroughly failed Haiti in its development and recent disaster recovery. It is time Haiti's NGO's begin holding themselves accountable; good will is not good enough. Although PID operates in a resource limited setting, it is fully capable of fixing the issues uncovered in this report. Dangerous and ineffective medical practices should not be allowed to continue for multiple years. Treating hypertension and diabetes are key methods for reducing a profound national and global health burden, but without careful implementation and meticulous monitoring and evaluation, valuable and limited resources will continue to be wasted on low-quality healthcare.

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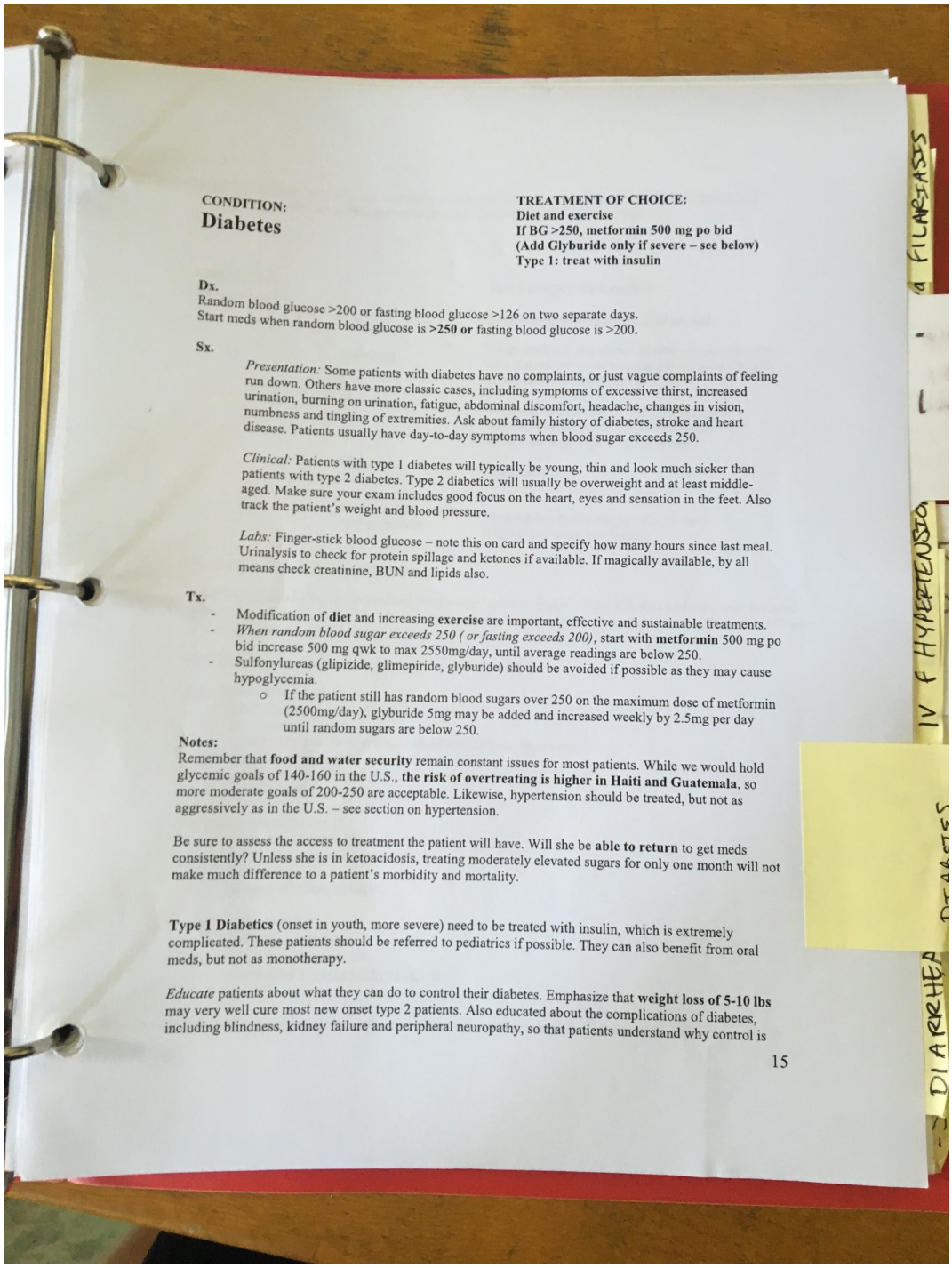
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Appendix

Figures



CONDITION:
Diabetes

TREATMENT OF CHOICE:
Diet and exercise
If BG >250, metformin 500 mg po bid
(Add Glyburide only if severe – see below)
Type 1: treat with insulin

Dx.
Random blood glucose >200 or fasting blood glucose >126 on two separate days.
Start meds when random blood glucose is **>250 or** fasting blood glucose is >200.

Sx.

Presentation: Some patients with diabetes have no complaints, or just vague complaints of feeling run down. Others have more classic cases, including symptoms of excessive thirst, increased urination, burning on urination, fatigue, abdominal discomfort, headache, changes in vision, numbness and tingling of extremities. Ask about family history of diabetes, stroke and heart disease. Patients usually have day-to-day symptoms when blood sugar exceeds 250.

Clinical: Patients with type 1 diabetes will typically be young, thin and look much sicker than patients with type 2 diabetes. Type 2 diabetics will usually be overweight and at least middle-aged. Make sure your exam includes good focus on the heart, eyes and sensation in the feet. Also track the patient's weight and blood pressure.

Labs: Finger-stick blood glucose – note this on card and specify how many hours since last meal. Urinalysis to check for protein spillage and ketones if available. If magically available, by all means check creatinine, BUN and lipids also.

Tx.

- Modification of **diet** and increasing **exercise** are important, effective and sustainable treatments.
- *When random blood sugar exceeds 250 (or fasting exceeds 200)*, start with **metformin** 500 mg po bid increase 500 mg qwk to max 2550mg/day, until average readings are below 250.
- Sulfonylureas (glipizide, glimepiride, glyburide) should be avoided if possible as they may cause hypoglycemia.
    - If the patient still has random blood sugars over 250 on the maximum dose of metformin (2500mg/day), glyburide 5mg may be added and increased weekly by 2.5mg per day until random sugars are below 250.

Notes:
Remember that **food and water security** remain constant issues for most patients. While we would hold glycemic goals of 140-160 in the U.S., **the risk of overtreating is higher in Haiti and Guatemala**, so more moderate goals of 200-250 are acceptable. Likewise, hypertension should be treated, but not as aggressively as in the U.S. – see section on hypertension.

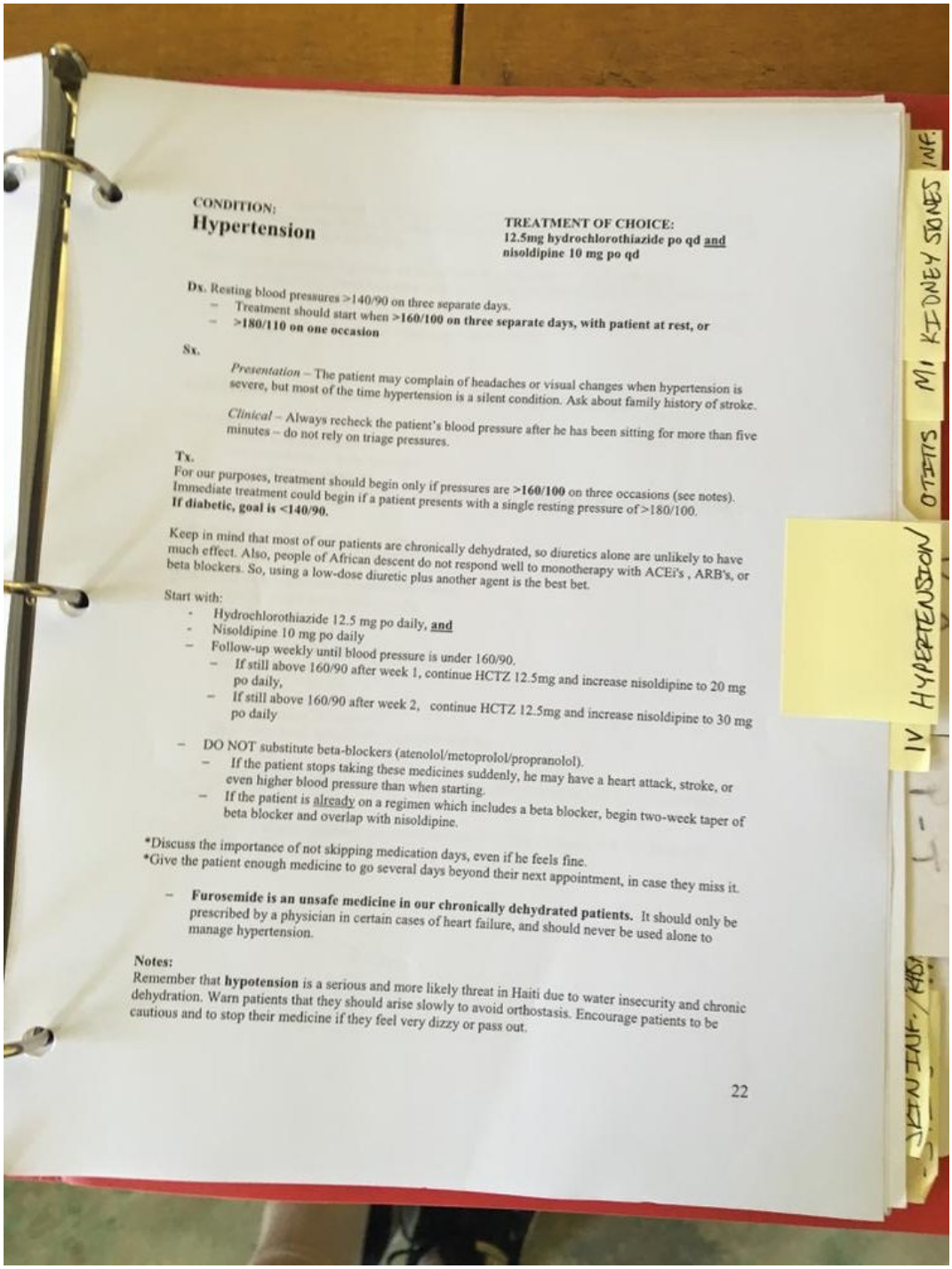
Be sure to assess the access to treatment the patient will have. Will she be **able to return** to get meds consistently? Unless she is in ketoacidosis, treating moderately elevated sugars for only one month will not make much difference to a patient's morbidity and mortality.

Type 1 Diabetics (onset in youth, more severe) need to be treated with insulin, which is extremely complicated. These patients should be referred to pediatrics if possible. They can also benefit from oral meds, but not as monotherapy.

Educate patients about what they can do to control their diabetes. Emphasize that **weight loss of 5-10 lbs** may very well cure most new onset type 2 patients. Also educated about the complications of diabetes, including blindness, kidney failure and peripheral neuropathy, so that patients understand why control is

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Figure 5: PID Diabetes Medical Protocol



CONDITION:
Hypertension

TREATMENT OF CHOICE:
12.5mg hydrochlorothiazide po qd and nisoldipine 10 mg po qd

Dx. Resting blood pressures >140/90 on three separate days.
- Treatment should start when **>160/100 on three separate days, with patient at rest, or**
- **>180/110 on one occasion**

Sx.

Presentation – The patient may complain of headaches or visual changes when hypertension is severe, but most of the time hypertension is a silent condition. Ask about family history of stroke.

Clinical – Always recheck the patient's blood pressure after he has been sitting for more than five minutes – do not rely on triage pressures.

Tx.
For our purposes, treatment should begin only if pressures are **>160/100** on three occasions (see notes). Immediate treatment could begin if a patient presents with a single resting pressure of >180/100. **If diabetic, goal is <140/90.**

Keep in mind that most of our patients are chronically dehydrated, so diuretics alone are unlikely to have much effect. Also, people of African descent do not respond well to monotherapy with ACEi's , ARB's, or beta blockers. So, using a low-dose diuretic plus another agent is the best bet.

Start with:
- Hydrochlorothiazide 12.5 mg po daily, **and**
- Nisoldipine 10 mg po daily
- Follow-up weekly until blood pressure is under 160/90.
  - If still above 160/90 after week 1, continue HCTZ 12.5mg and increase nisoldipine to 20 mg po daily,
  - If still above 160/90 after week 2, continue HCTZ 12.5mg and increase nisoldipine to 30 mg po daily

- DO NOT substitute beta-blockers (atenolol/metoprolol/propranolol).
  - If the patient stops taking these medicines suddenly, he may have a heart attack, stroke, or even higher blood pressure than when starting.
  - If the patient is already on a regimen which includes a beta blocker, begin two-week taper of beta blocker and overlap with nisoldipine.

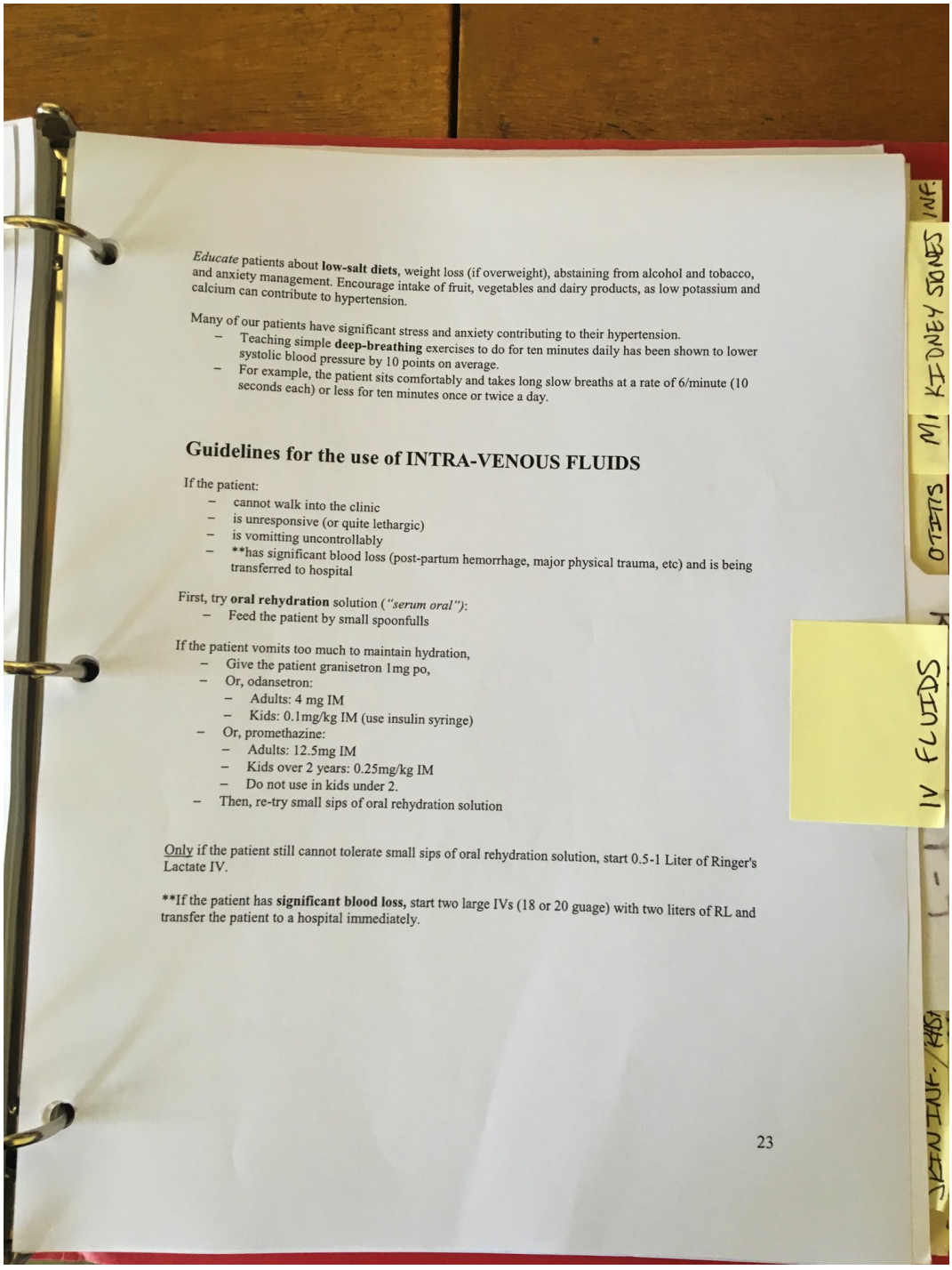
*Discuss the importance of not skipping medication days, even if he feels fine.
*Give the patient enough medicine to go several days beyond their next appointment, in case they miss it.

- **Furosemide is an unsafe medicine in our chronically dehydrated patients.** It should only be prescribed by a physician in certain cases of heart failure, and should never be used alone to manage hypertension.

Notes:
Remember that **hypotension** is a serious and more likely threat in Haiti due to water insecurity and chronic dehydration. Warn patients that they should arise slowly to avoid orthostasis. Encourage patients to be cautious and to stop their medicine if they feel very dizzy or pass out.

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Figure 6: PID Hypertension Medical Protocol



Educate patients about **low-salt diets**, weight loss (if overweight), abstaining from alcohol and tobacco, and anxiety management. Encourage intake of fruit, vegetables and dairy products, as low potassium and calcium can contribute to hypertension.

Many of our patients have significant stress and anxiety contributing to their hypertension.
- Teaching simple **deep-breathing** exercises to do for ten minutes daily has been shown to lower systolic blood pressure by 10 points on average.
- For example, the patient sits comfortably and takes long slow breaths at a rate of 6/minute (10 seconds each) or less for ten minutes once or twice a day.

Guidelines for the use of INTRA-VENOUS FLUIDS

If the patient:
- cannot walk into the clinic
- is unresponsive (or quite lethargic)
- is vomitting uncontrollably
- **has significant blood loss (post-partum hemorrhage, major physical trauma, etc) and is being transferred to hospital

First, try **oral rehydration** solution (*"serum oral"*):
- Feed the patient by small spoonfulls

If the patient vomits too much to maintain hydration,
- Give the patient granisetron 1mg po,
- Or, odansetron:
  - Adults: 4 mg IM
  - Kids: 0.1mg/kg IM (use insulin syringe)
- Or, promethazine:
  - Adults: 12.5mg IM
  - Kids over 2 years: 0.25mg/kg IM
  - Do not use in kids under 2.
- Then, re-try small sips of oral rehydration solution

Only if the patient still cannot tolerate small sips of oral rehydration solution, start 0.5-1 Liter of Ringer's Lactate IV.

If the patient has **significant blood loss, start two large IVs (18 or 20 guage) with two liters of RL and transfer the patient to a hospital immediately.

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Figure 6: PID Hypertension Medical Protocol

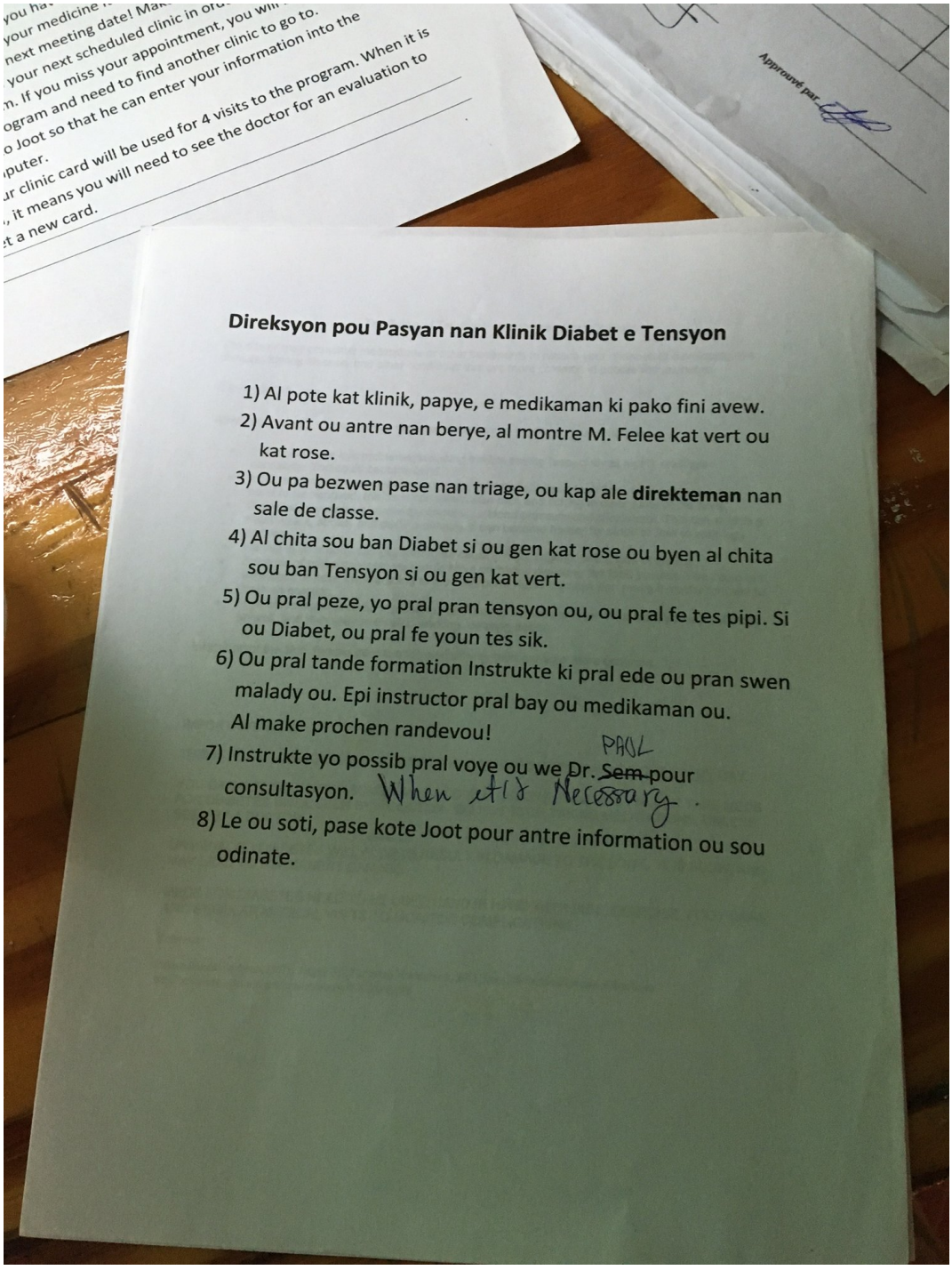
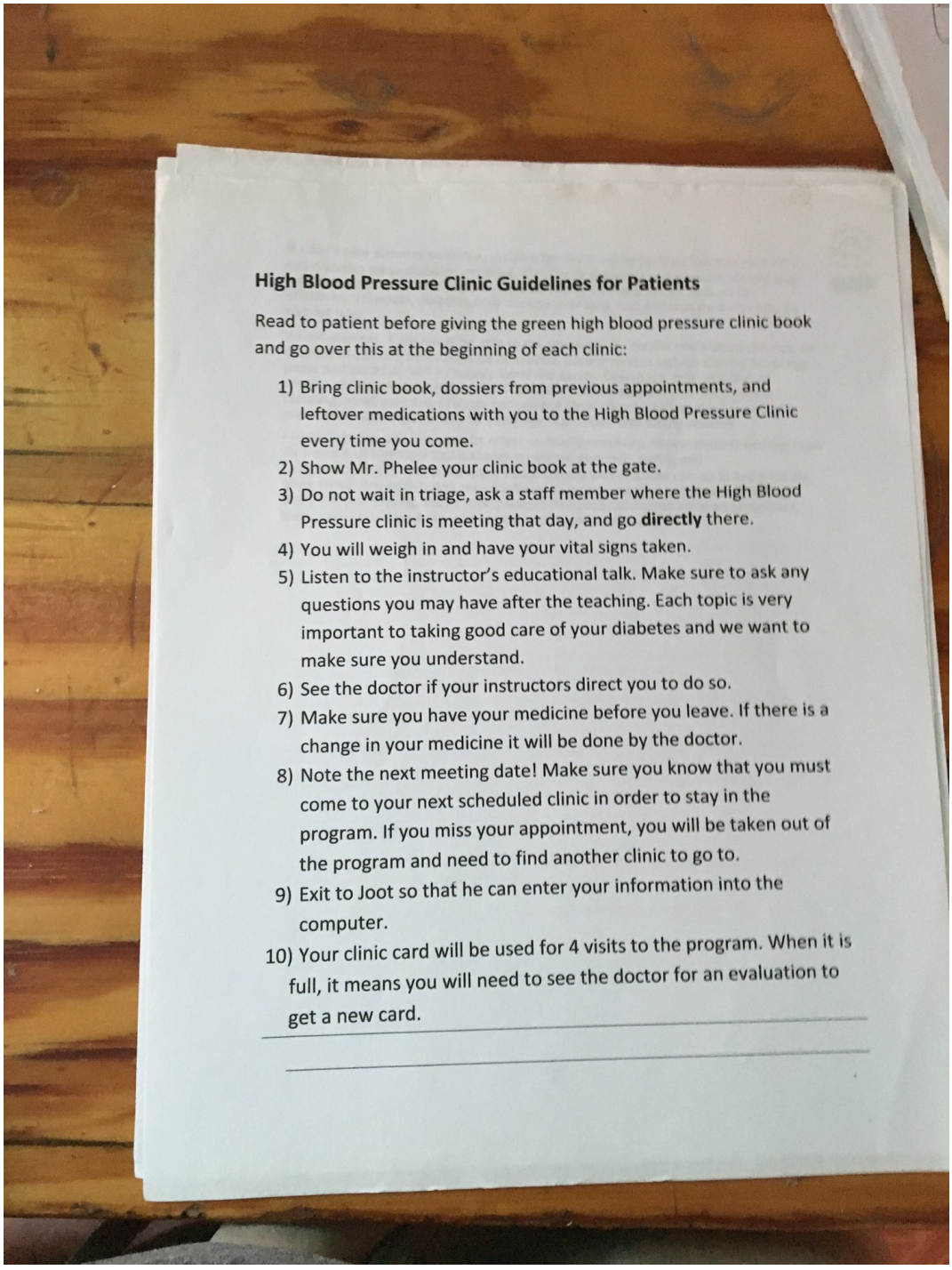


Figure 7: Diabetes Clinic Guidelines



High Blood Pressure Clinic Guidelines for Patients

Read to patient before giving the green high blood pressure clinic book and go over this at the beginning of each clinic:

1) Bring clinic book, dossiers from previous appointments, and leftover medications with you to the High Blood Pressure Clinic every time you come.
2) Show Mr. Phelee your clinic book at the gate.
3) Do not wait in triage, ask a staff member where the High Blood Pressure clinic is meeting that day, and go **directly** there.
4) You will weigh in and have your vital signs taken.
5) Listen to the instructor's educational talk. Make sure to ask any questions you may have after the teaching. Each topic is very important to taking good care of your diabetes and we want to make sure you understand.
6) See the doctor if your instructors direct you to do so.
7) Make sure you have your medicine before you leave. If there is a change in your medicine it will be done by the doctor.
8) Note the next meeting date! Make sure you know that you must come to your next scheduled clinic in order to stay in the program. If you miss your appointment, you will be taken out of the program and need to find another clinic to go to.
9) Exit to Joot so that he can enter your information into the computer.
10) Your clinic card will be used for 4 visits to the program. When it is full, it means you will need to see the doctor for an evaluation to get a new card.

Figure 8: Hypertension Clinic Guidelines

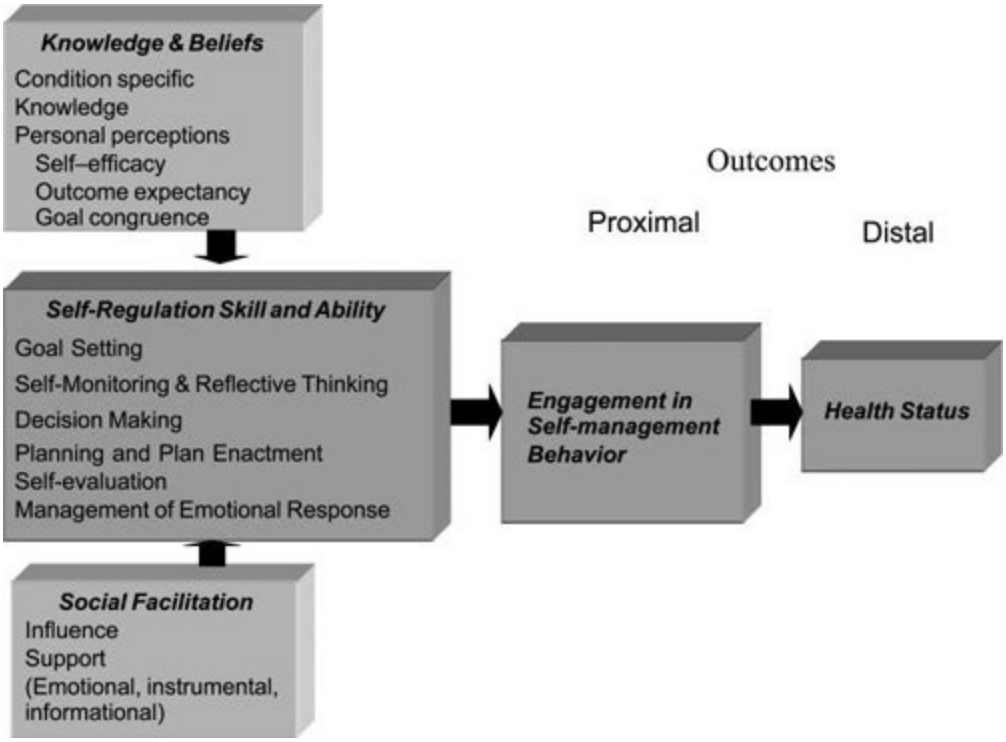


Figure 10: Integrated Theory of Health Behavior Change

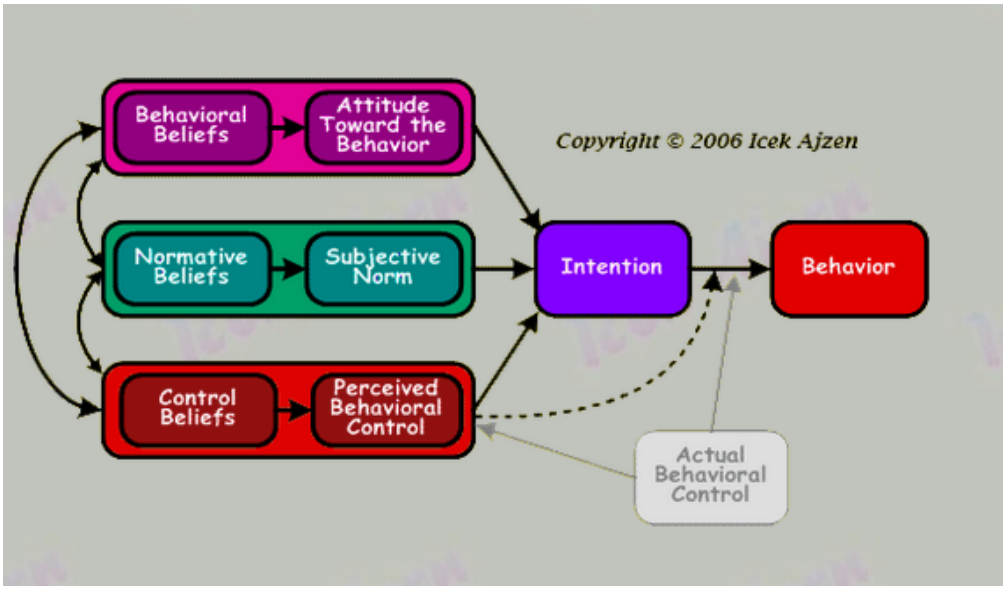


Figure 11: Theory of Planned Behavior

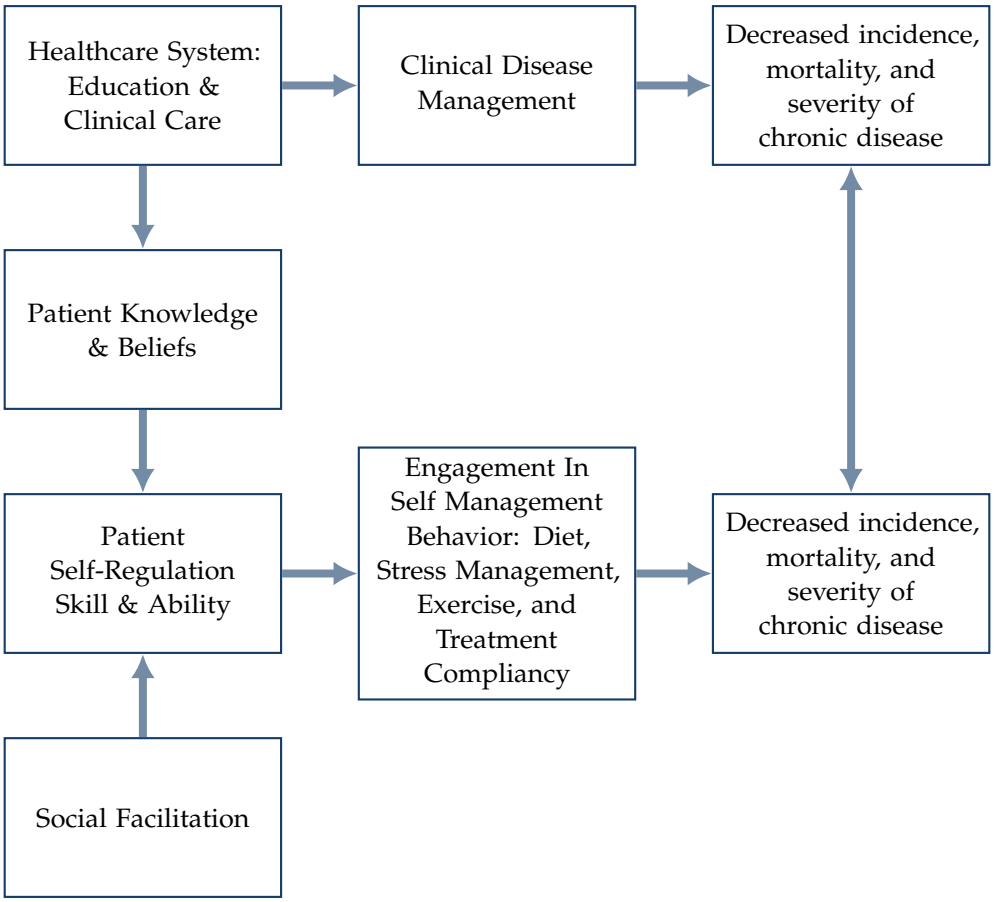


Figure 12: Amended Concept Model

Hypertension Database Instructions

Read First: The hypertension database is an absolutely vital tool that will not only allow for continuous monitoring of patient data, but also provide the basis for periodic clinic-wide monitoring and evaluation. It is essential to PID's medical functioning that the database is correctly and regularly updated. This document provides an explanation of how the database is organized, how patient information is input, and how one can troubleshoot common problems. Although thorough, this guide is extremely straightforward. One must be extremely careful to ensure data is entered in the correct cells, as any errors will have a significant impact on derived data trends. Periodically, the database should be crosschecked with paper records and corrected for human data entry errors.

Utility to Medical Professionals and Clinic Administrators: The hypertension database will allow us to use easily accessible patient data to inform our medical decisions. Practioners can track patient responses to specific medication regimens, identify incorrect or medically unadvisable prescriptions and medication substitutions, and monitor patient adherence to required monthly visits. On a clinic-wide level, we can regularly conduct macro analysis of patient data to observe the efficacy of interventions. This will provide vital information that can inform budgeting and clinic programming across a multitude of fronts.

Organization: The hypertension database is formatted for Microsoft Excel and Google Spreadsheets. It is organized so every row corresponds to a unique patient. By scrolling horizontally, one can chronologically view a patient's blood pressures. Similarly, by scrolling vertically one can view all the respective blood pressures recorded on a given date. The first four columns, respectively, indicate the patients, name, sex, birthdate, and whether or not they are diabetic. After the fourth column, the same sequence of four columns repeats: date, systolic blood pressure, diastolic blood pressure, and prescribed medication.

Data Entry Instructions

1. Ensure the patient meets any one of the following criteria for being entered into the database:
    a. Patient has a blood pressure >140 systolic or >100 diastolic
    b. Patient has been prescribed hypertension medication
    c. Patient appears on a hypertension database record
    d. Patient has been verified to be in the program by Dr. Paul or Samuel
2. Use the Excel "Search Document" tool to search for the patient using the following method
    a. Search only the patient's first name. If no match:
    b. Search only the patient's last name. If no match:
    c. Check all names to verify the patient does not exist under a misspelled name. If a name is found and believed to be the patient under a misspelled name, verify it is in fact the same patient by matching the sex and birth dates, or by scrolling along the row of the

misspelled patient name to find a date and blood pressure and then cross-checking the originally written name in the paper database to the patients name. Do no create multiple rows for one patient.

3. If a Patient exists in the database, skip to step 4. If not, scroll the bottom of the first column and add the patient's name, sex, birthdate, and diabetes status.

4. Click on the patients name, so it is highlighted, then horizontally scroll across to the column corresponding to the date the patients blood pressure was taken. Do not enter a new patients first blood pressure in the first date column.

5. If a heading for the date exists skip to step 5. If not, copy one of the repeating four cell headers containing "Date", "Sys BP", "Dia BP", and "Med", by clicking the date cell to highlight it, holding down shift and clicking the med cell, so the 4x1 box of columns is highlighted. Then go to the next open cell to the right of last cell in the previous dates header, which will contain "Med". Paste the header, and correct the numbers by double clicking the cells and changing them, so they are next in the numerically ordered sequence of headings.

6. Scroll down the correct date column until the highlighted name of the patient is visible and click the cell where the column containing the proper date and the row containing the patients name.

7. Enter the date the blood pressure was taken, the systolic and diastolic blood pressure, and prescribed medication horizontally in the row containing the patients name using the following instructions. Enter systolic and diastolic blood pressures in different cells.

    a. In the medication column, write the name of the medication, its dosage in milligrams and how many times per day it's taken. Use commas to separate medications. (e.g.: HCTZ 25mg 1x daily, Atenolol 50mg 1x daily, Tylenol 500mg 3x daily)

    b. Dates should be entered in the format (mm/dd/yyyy)

    c. If a date cell is entered and returns a #### error try extending the width of the column.

    d. If a date cell is entered and returns the mm-d formatting, highlight the cell then click the "Format" menu option at the top of the document and click cell in the drop down menu. Under the date tab select the appropriate date format of mm/dd/yyyy

8. If the column is not wide enough to fit the data, type it anyway so it runs over into the next cell. Then click the arrow in the top left corner of the spreadsheet to the left of column A and above row 1 so all the cells are highlighted. Click the "Format" menu selection at the top of the window, the "Column" in the drop down menu, and then "Autofit Selection". The columns can also be manually lengthened by dragging them in the grey alphabetized header.

9. Search for the next patient

Interview Questionnaires

Hypertension/Diabetes Patients

1. Do you have a family history of hypertension/diabetes?
2. Do you have any other health problems? Smoke? Drink?
3. How do you manage your hypertension/diabetes at home? Does it impact your lifestyle?
4. How often do you check your blood pressure/blood sugar?
5. What has PID recommended you do for your hypertension/diabetes? Can you do this?
6. Do you always take your medication? Do you take any other medication?
7. What foods are you supposed to eat/avoid? Is it difficult to access/buy healthier recommended foods?
8. Do you exercise. How often?
9. What has PID done to assist you with your hypertension/diabetes? Do you believe these interventions are effective?
10. How can PID further help you manage your hypertension/diabetes?
11. Do you think foreign doctors understand your problems/situation effectively?
12. What are attitudes in your community concerning hypertension?

Haitian Healthcare Providers/Administrators

1. What do you think are cultural and social issues for the diabetes/hypertension clinic?
2. Do you think patients are willing to help themselves or only want medication?
3. Are families limited economically in their diet choices?
4. What are attitudes in the community concerning hypertension and diabetes?
5. Is there any form of public health education concerning hypertension and diabetes outside of PID?
6. Where can these individuals go besides PID? What services can the obtain there?
7. Do you think American healthcare providers understand the culture and society of Haiti well enough? What more should they know to treat patients?
8. How would you like to see PID improve its treatment of diabetes and hypertension patients?

American Healthcare Providers/Administrators

1. What do you think are cultural and social issues for the diabetes/hypertension clinic?

2. Do you think patients are willing to help themselves or only want medication?
3. What are the differences between the Haitian healthcare system and one in the US?
4. What are attitudes in the community concerning hypertension and diabetes?
5. Is there any form of public health education concerning hypertension and diabetes outside of PID?
6. Where can these individuals go for healthcare besides PID? What services can the obtain there?
7. Do you think Haitian healthcare providers completely understand the issues of hypertension and diabetes? What more should they know?
8. What information is important in a diabetes/hypertension education program
9. How often should patients be seen in the clinic?
10. How would you like to see PID improve its treatment of diabetes and hypertension patients?

Medical Director

1. What medications are prescribed to patients in each clinic
2. Do trends among prescription of these medications change with availability?
    a. How so?
    b. How often?
    c. What are potential complications?
    d. How does funding to the programs fluctuate?
3. What information is currently supplied to incoming American healthcare providers?
4. Do you think American healthcare providers are sufficiently knowledgeable about the Haitian culture, society, and economy in order to treat patients?
5. What are common complaints/suggestions of American healthcare providers
6. What kinds of public health education programs do you offer?
    a. Do you believe these programs are effective?
    b. How can they be improved?