ART adherence information, motivation, and behaviors and provider-patient relationships among new ART patients in Haiti

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Abstract

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Background: Previous research suggests that communication between provider and patient is associated with adherence to antiretroviral therapy (ART) among patients with HIV. Haiti has scaled up the use of ART, but studies suggest low adherence which threatens long-term viral suppression and risks treatment failure to first line regimens. Objective: This cross-sectional, descriptive study assesses baseline questionnaire data from new ART patients at two large treatment sites in Haiti and observation data of clinic visits. This study describes patients' communication with their provider; and their information, motivation, and behavioral skills and beliefs in medicine related to ART in the Haitian context. It also assesses the association between the perceived quality of patient-provider communication with those variables. Results: Patients reported high

information and behavioral skills for ART adherence as well as high belief in the necessity of medicine. The results suggest patient-provider communication is associated with adherence related information and motivation as well as beliefs in medicine but not with behavioral skills. This research provides the baseline for a provider-based intervention to reduce the incidence of ART treatment failure in Haiti.

I. Specific Aims

The purpose of this project is to:

1. Describe the levels of barriers and facilitators of ART adherence in new ART patients in Haiti as observed from questionnaires among patients who recently enrolled on HIV antiretroviral therapy (ART) in two large Haitian hospitals.
2. Determine if there are any associations between A.) patient-provider communication and B.) adherence related beliefs, information, motivation, and behaviors.
    a. Patient-Provider Communication as a predictor of Beliefs in Medicine
    b. Patient-Provider Communication as a predictor of Information, Motivation and Behavioral Skills
    c. Patient-Provider Communication as a predictor of Beliefs in Medicine when adjusting for potential confounders of age and sex and potential effect modifier of socioeconomic status
    d. Patient-Provider Communication as a predictor of Information, Motivation and Behavioral Skills when adjusting for potential confounders of age and sex and potential effect modifier of socioeconomic status
3. Describe patient-provider interaction and communication about ART adherence during routine clinic visits based on structured observation visits.

II. Background and Significance

The treatment of chronic diseases such as the Human Immunodeficiency Virus (HIV) has improved through long term therapies, however these therapies are only effective if patients take their medications as prescribed. The World Health Organization (WHO) defines adherence as, “the extent to which a person’s behavior—taking medication, following a diet, and/ or executing lifestyle changes—corresponds with agreed recommendations from a health care provider”(1). Consequences of poor adherence include poor health outcomes and increased health care costs(2).

With antiretroviral therapy (ART), HIV is a manageable chronic disease but requires optimal adherence to the medication(3). A high level of adherence (>90%) is required for ART to be effective depending on the regimen(4). The first line regimen recommended by the Ministry of Health in Haiti is TDF+3TC+EFV(5). Patients must maintain high treatment adherence to achieve durable suppression of viral load throughout this lifelong therapy(6). Adherence to the daily schedule of ART and lifelong retention in care are both critical to building strong HIV programs and achieving optimal patient outcomes(7). ART adherence is also key to achieving the second and third “90s” of the UNAIDS 90-90-90 campaign to end the AIDS epidemic (i.e. 90% on treatment and 90% virally suppressed)(8).

Despite widespread poverty and weak infrastructure, Haiti has made progress in addressing the HIV/AIDS epidemic as evidenced by declining HIV prevalence and deaths due to HIV/AIDS (9). The success of the HIV response is evidenced by decreasing the national HIV prevalence from a high of 6.2% in 1993 to 2.0% in 2017(6)(10). Haiti’s response to HIV has evolved along with the epidemic. Following the

2016 United Nations General Assembly High-Level Meeting on Ending AIDS, Haiti adopted the "Test and Start" strategy as national policy which led to an increase in HIV testing and initiation on ART(11). Prevention and testing services have increased and antiretroviral therapy (ART) is now available in every medical department due to international funding and national political commitment to the epidemic (9). The preferential first-line ART regimen in Haiti consists of efavirenz, lamivudine and tenofovir, which is available as a generic combination pill to be taken once daily, at a cost of approximately USD $138 per year. Second-line therapies are more expensive and newer medications are not yet available in generic formulations(6). Supporting adherence to ART is central to achieving viral suppression, positive health outcomes, and continued success of Haiti's HIV response.

Resource-limited settings, like Haiti, have unique challenges supporting ART adherence. Haiti has scaled up the use of antiretroviral therapy (ART) but studies suggest low adherence to ART which threatens long-term viral suppression and risks treatment failure to first line regimens(12). According to the "PEPFAR Haiti Country Operational Plan (COP) 2018-Strategic Direction Summary "62% of PLHIV were accessing ART and 64% had a suppressed viral load(13). In Haiti, a study of the HIV care and treatment cascade from 2005 to 2015 showed 19% cumulative retention of newly-diagnosed HIV patients on ART(14). While retention in care is not equivalent to adherence, it is related. A study on retention after ART initiation in a network of facilities in Haiti found that retention varied widely across facilities from 61.1% to 86.5%(12). A 2017 study found that expansion of HIV services across Haiti has been successful with increasing numbers of patients initiating ART and decreasing twelve-month mortality rates but no improvement in overall retention(12).

The WHO posits that medication adherence is affected by the following factors: regimen characteristics, various patient factors, the relationship between provider and patient, and the system of care(2). One meta-analysis found that the correlates most strongly associated with adherence were: adherence self-efficacy, current substance use, concerns about ART, beliefs about necessity/utility of ART, trust/satisfaction with the HIV care provider, depressive symptoms, stigma about HIV, and social support(15). This study will use measures concerning adherence self-efficacy, concerns about ART, and trust/satisfaction with the HIV care provider in its analysis.

Various social cognition models have been used to explain variation in medication adherence. One such model is Leventhal's Common Sense Model of Self-regulation (CSM) which suggests that adherence is heavily influenced by the patients' own beliefs and experiences of the illness(16). Decisions to take medication may be informed by beliefs about the medicines and beliefs about the illness they treat. Necessity beliefs and concerns about medications have been shown to relate to adherence in a range of chronic illness including HIV(17). Research suggests that beliefs about ART are associated with the patients' relationship with the physician(18).

Another conceptual model for ART adherence is the information-motivation-behavioral skills (IMB) model. The IMB model asserts that medication adherence information and motivation work through adherence behavioral skills to affect adherence behavior(19). The IMB model demonstrates that information is a prerequisite for adherence but is not sufficient in itself to change behavior. Motivation and the development of behavioral skills are key determinants of behavioral change(2). Even an

informed or motivated individual may have difficulty achieving optimal adherence if they lack the skills or self-efficacy required(20). In short, when individuals are informed and motivated, they enact skilled behaviors for adequately and consistently ensuring ART adherence(21).

Patient-provider communication is important for adherence related counselling and dialogue(22). Patient perception of physician communication behaviors is shown to be significantly positively associated with patient's adherence to treatment and training physicians to communicate better can enhance their patient's adherence(23)(24)(25). However, like ART adherence, provider communication about adherence is often suboptimal. One meta-analysis found that nonadherence is more than 1.47 times greater among individuals whose physician is a poor communicator, and the odds of a patient adhering are 2.16 times better if their physician is a good communicator(24).

There is limited information on the issues that affect adherence and the unique challenges to adherence in the Haitian context. The objective of this study was to identify modifiable factors in patient's information, motivation, and behavioral skills around adherence and their beliefs in medicine as well as in patient-provider communication. This study assesses the association of patient-provider communication with such correlates of adherence.

III. Methods

1.) Study setting and patient population

This cross-sectional descriptive study was conducted using baseline data from an ongoing feasibility study in Haiti titled, "Developing and Evaluating a Provider-Delivered National EMR Alert-based HIV ART Adherence Counseling Program in Haiti: iSanté Plus." It is an National Institutes of Mental Health (NIMH) funded R34 project which aims to improve routine ART adherence counseling and support services for ART patients to reduce patients' risk of ART treatment failure when using first line ART medications. It uses Haiti's electronic medical record (EMR) system, *iSante*, to deploy an EMR alert for those at risk of ART treatment failure based on poor adherence, coupled with a problem-solving approach for counseling patients to improve adherence.

Baseline data was collected for patients who have recently initiated ART. Patients were enrolled at the two study sites, the National University Hospital (HUEH) in Port-au-Prince and Justinien University Hospital (HUJ) in Cap-Haitien, which are two large, public tertiary teaching hospitals in Haiti. The parent study received IRB approval from the UW and the Haiti Ministry of Health's National Bioethics Committee.

Participants were recruited through medical staff at the hospital, in the community, and through flyers. Criteria for inclusion included that the patients-initiated ART within six months of first contact about study enrollment, were between 18-75 years of age with no severe cognitive impairment and anticipated being available for follow up 6-9 months after enrollment in the study. The recruitment aimed to reflect the demographic profile of all patients at the clinic. There were 128 patients enrolled at the two study sites from October 2017 to February 2018.

2.) Data collection activities and instruments

a. Questionnaires

The data used in the present study was obtained through questionnaires administered by local Haitian researchers at the time of enrollment in the parent study. Questionnaires were administered in Haitian Créole using the REDCap (Research Electronic Data Capture) mobile app loaded onto tablets. Total time required to complete the surveys was approximately 30-40 minutes per participant. The questionnaires included several validated questionnaires as well as questionnaires developed and adapted for the purpose of the study and for the Haitian context. All questionnaires were translated from English using professional translation and online translation tools and were reviewed for accuracy by bilingual Haitian study team members. The questionnaires included:

- The patient-provider communication (PPC) questionnaire was based on seven previously tested multi-item scales to assess the quality of specific dimensions of the physician-patient relationship: general communication, provision of HIV-specific information, egalitarian decision-making style, overall satisfaction with care, willingness to recommend the physician to others, and trust in the physician, and the quality of adherence dialogue(25). The 30 questions offer Likert response options which vary based on the subscales.
- The LifeWindows Information Motivation Behavioral Skills ART Adherence Questionnaire (LW-IMB-AAQ) is a 32-item validated instrument developed as a measure ART adherence related strengths and weaknesses among patients in clinical care, following the constructs identified in the Information-Motivation-Behavioral Skills (IMB) model of adherence by Fisher et al(19). Each LW-IMBAAQ item represents a barrier within Information, Motivation and Behavioral skills. Total subscale scores of Information, Motivation, and Behavioral Skills questions can be used. Subscales are not intended to provide full representation of the IMB model of adherence, but do provide a brief measure of the level of informational, motivational, and behavioral skills deficits in the targeted population(26). The motivation scale is comprised of personal and social motivation related items. This includes items regarding attitudes/beliefs about ART medications themselves, attitudes/beliefs about adherence, and social motivation including items reflecting the patient-provider relationship(26).
- Beliefs about Medicine Questionnaire (BMQ) is comprised of two sections: the BMQ-Specific which assesses cognitive representations of medication prescribed for personal use and the BMQ-General which assesses beliefs about medicines in general. It has been validated for use in patients suffering from chronic diseases and previously used in Haiti(27). This study utilizes the BMQ-Specific which is comprised of 10 items and two sub-scales: Specific-Concerns which assess perceptions of adverse reactions and Specific-Necessity which assesses the patient's belief about their personal need to adhere to medication for present and future health(17)(28).
- Socioeconomic status (SES) was measured by the EquityTool for Haiti. EquityTool is a 13 question, country-specific tool, designed to assess individuals in low-and middle-income countries. It was designed by a collaboration of agencies to shorten and simplify the Demographic and Health Surveys (DHS) asset index questions(29). It offers national and urban wealth quintile scores. This study utilized the urban wealth quintile scores based on the geographic location of the study sites.

b. Observations

To describe patterns of interaction and communication between patient and provider during routine adherence counseling, semi-structured visit observation data was analyzed using forms recorded during 12 observation visits. These visits took place at the two study sites between April and June of 2017 and included 12 ART patients not among the 128 patients who completed questionnaires. Study staff obtained informed consent from health care providers and patients that participated in the visit observations. The criteria for inclusion was that the patient be an HIV patient being treated at the clinic, have started ART within the prior 12 months, and be between 18-75 years of age.

The study staff used a visit observation form for rapid assessment which included recording the type of adherence counseling that was observed, the duration of each step in the visit (such as registration, clinical evaluation, pharmacy, laboratory, etc.). The form also offered checkboxes to record observations of interactions and communication between the provider and patient related to adherence (checkboxes included: “count tablets”, “ask patient level of adherence”, “give patient instructions about ARV medication”, “check that the patient has understood”, “assess barriers”, “solve problems”, “other”). The study staff who conducted these observations noted actions and themes that arose during the visit and characterized the differing quality of interactions between the health care workers and the patient. Study staff also made note of the use of communication techniques such as use of open-ended questions, checking for understanding, and active listening. These forms were translated from French using online translation tools.

3.) Outcome measures and covariates

Table 1: Variables for analysis

Variable Name		Variable Description	Roll in Analysis
Patient-Provider Communication (PPC)			
	Overall Communication	5 item subscale from *Patient-provider communication questionnaire*	*Predictor*
	HIV-Specific information	4 item subscale from *Patient-provider communication questionnaire*	*Predictor*
	Adherence Dialogue	3 item subscale from *Patient-provider communication questionnaire*	Predictor
	Participatory Decision Making	7 item subscale from *Patient-provider communication questionnaire*	*Predictor*
	Overall satisfaction	4 item subscale from *Patient-provider communication questionnaire*	*Predictor*

	Willingness to recommend	2 item subscale from *Patient-provider communication questionnaire*	*Predictor*
	Trust in physician	5 item subscale from *Patient-provider communication questionnaire*	Predictor
Socioeconomic status (SES)		**Quintile score from Haiti specific Equity Tool SES questionnaire based on 2012 DHS**	**Covariate**
Age		**Numeric age of participant as reported during enrollment**	**Covariate**
Sex		**Sex of participant as reported during enrollment (1=Female, 0=Male)**	**Covariate**
Information-Motivation-Behavioral Skills (IMB)			
	Information	9 item subscale of *LW-IMB-AAQ* questionnaire	Outcome measure
	Motivation	10 item subscale of *LW-IMB-AAQ* questionnaire	Outcome measure
	Behavioral Skills	16 items: 14 item subscale of *LW-IMB-AAQ* questionnaire with additional 2 items added regarding religion	Outcome measure
Beliefs in Medicine (BMQ-Specific)			
	Specific-Concerns	5 item BMQ Specific-Concerns subscale	Outcome measure
	Specific-Necessity	5 item BMQ Specific-Necessity subscale	Outcome measure

4.) Statistical Methods

a. Descriptive analysis methods

All data were cleaned, coded and analyzed using R Studio version 1.1.419. Data analysis began with a descriptive examination of all variables, including frequency distributions, means, standard deviations, medians, and interquartile ranges for both individual questionnaire items and for multiple-item scales. Multiple item scales were scored and tested for internal consistency reliability. Scale reliability was acceptable if Cronbach's alpha is ≥0.7 or if prior research found similar internal consistency. The internal consistency scores were consistent with prior research and were deemed acceptable. There was a low Cronbach's alpha score for IMB-Information (α=0.48) but it was consistent with the LifeWindows Project's paper which also cited an internal consistency "that is expectedly low (α=0.59), as information about diverse aspects of one's ART regimen is not anticipated to be inter-related." The low Cronbach's alpha score for patient-provider communication scale regarding willingness to recommend was also expectedly low (α=0.2) due to the fact that it consists of only two items. A single survey item is unlikely to be capable of fully capturing the concept being

assessed(30). Individual items were examined as indicators of potential barriers or deficits and to help further describe the constructs measured by the scales.

b. Analysis of associations

Linear regressions were performed to determine the association between patient-provider communication and the outcome measures of information, motivation and behavioral skills as well as beliefs in medicine. Questionnaire results were represented as variables with values on a continuous scale. Robust standard errors were used to account for heteroskedasticity. The primary model used the aggregate score of the seven scales of the PPC questionnaire. Separate linear regression models were conducted for each of the seven sub scales of PPC for each of the five outcome measures. Adjusted models were used to account for potential confounding by SES, age, and sex. Missing values were omitted from the analysis on a case wise basis. An alpha of 0.05 was set *a priori*. A Holm correction was used due to the multiple comparisons of the sub scales. This adjustment of the p-value controls the false discovery rate (FDR), the proportion of false positives (Type I error) among significant results(31).

c. Scoring

Participants rated their communication with their HIV providers in the patient-provider communication questionnaire which is comprised of seven sub-scales. The scoring followed the example of Schneider et al(25). Scoring was based on Likert responses one to five, one representing an answer reflecting poor/low quality communication and five reflecting excellent/high quality communication. Twenty-nine questions offer five Likert response options such as “excellent”, “very good”, “fair”, and “poor” or “very often”, “often”, “sometimes”, “rarely”, and “never”. The final question asked the participant to rate how much they trust their providers on a scale from one to ten. The responses of this question were adjusted to a scale of 0.5 to five.

The LW-IMB-AAQ questionnaire was scored according to the LifeWindows Project Team scoring suggestions(26). The questionnaire contains nine items to measure adherence related information such as skipping or missing pills and side effects. There are ten items to measure adherence related motivation including attitudes about ART and ART adherence. There are 14 items to measure behavioral skills required for ART adherence. For the Information subscale only “strongly agree” or “strongly disagree” responses were scored with a value of one; all other response values were scored as zero. Motivation responses were scored one to five where larger values reflect larger amounts of motivation towards adherence, items reflecting deficiencies were reverse scored prior to summing. Behavioral skills questions were summed to represent a total behavioral skills score.

Response to each statement of the BMQ-Specific questionnaire followed the example of Horne et al. and were scored on a 5 point Likert scale using a sum of the response values (17). A higher score signals stronger belief. Analysis was conducted separately for the two subscales for Concern (five questions) and Necessity (five questions), with a score range of 5-25 points.

Socioeconomic status was assessed using the wealth quintiles derived from the EquityTool for Haiti, using guidance to calculate urban wealth quintiles(29). The first quintile is the poorest quintile and quintile five is the wealthiest.

For the sake of comparison among the different questionnaires, mean and median total scores were transformed into a 0-100 point score. Total median scores greater than 75 points or above were considered to be representative of a high rating and scores below 50 points were considered to be representative of a deficiency. Individual item responses were examined in an exploratory manner in order to identify possible areas of strength and improvement. Responses were considered to demonstrate room for improvement when: <10% of respondents gave an "excellent" rating; >%5 gave a "poor" rating; or >20% gave a rating of "fair or poor"." Responses were considered to demonstrate notable strengths when >50% gave a rating of "very good or excellent" or <10% gave a rating of "fair or poor".

5.) Analysis of observed visit checklists

Thematic content analysis of patient-provider communication about ART adherence was conducted by coding the semi-structured observation tool. Descriptive statistics were used to examine the amount of time spent on adherence communication and the types of adherence-related communication or activities during the clinical visits.

IV. Results

The mean age of the 128 participants was 37.9 years and 56.8% of participants were female. 28.7% of participants scored in the bottom quintile of the wealth index (see distribution in Chart 1). Table 2 reports summary statistics of the measured variables.

Chart 1: Total EquityTool wealth scores

Table 2: Total scores of questionnaire sub-scales*

Scale	n	NA	Cronbach's std alpha	Mean	Std Dev	Median	IQR

PPC Overall Communication (5 items)	128	2	0.83	59.75	14.3	52.5	25
PPC HIV-Specific Information (4 items)	128	10	0.83	58.63	14.94	50	18.75
PPC Adherence dialogue (3 items)	128	0	0.82	59	16.75	50	25
PPC Participatory Decision making support (7 items)	128	1	0.86	44.57	22.11	50	32.14
PPC Overall Satisfaction (4 items)	128	0	0.9	60.69	15.75	56.25	25
PPC Willingness to recommend (2 items)	128	0	0.2	76.88	20.4	80	40
PPC Trust in provider (5 items)	128	1	0.66	70	13.07	65.85	19.51
IMB Information (9 items)	128	0	0.48	80.21	14.44	77.78	11.11
IMB Motivation (10 items)	128	0	0.73	62.93	24.33	66.67	33.33
IMB Behavioral skills (14 items)	128	4	0.87	75.64	21.57	85.71	21.43
BMQ Necessity (5 items)	128	0	0.73	83.55	11.85	80	20
BMQ Concern (5 items)	128	0	0.6	50.45	17.75	50	30

NA= Missing value
*Total scores were transformed to a 0-100 point scale.

1.) Patient-Provider Communication

The PPC scale regarding participant willingness to recommend their providers received a high median rating (80%). The scales regarding participatory decision making in HIV care, HIV-specific information, and adherence related-dialogue yielded the lowest median ratings (50%).

In the first scale regarding overall communication, areas of possible improvement were “demonstrating caring, compassion and understanding” and “giving…the facts about the benefits and risks of treatment”, where only 8 (6.3%) and 5 (3.9%) out of 128 respondents gave “excellent” ratings.

In the second scale regarding HIV-specific information, possible strengths included talking with patients about their sex life and “asking [them] about stresses in [their] life that may affect [their] health”, as only 8/128 (6.3%) and 12/128 (9.4%) respectively participants gave “fair” or “poor” ratings for this item.

In the third scale regarding adherence dialogue, an area of possible improvement was “helping [them] solve problems [they] have taking [their] antiretroviral medicines the right way” as only 6/128 (4.7%) rated their HIV providers as “excellent” for this item. However, “giving [them] information about the right way to take [their] antiretroviral medicine” could be a strength as 64/128 (50%) participants rated their provider as “excellent” or “very good.”

The fourth scale regarding participatory decision-making support addressed egalitarian decision making around treatment choices and preferences received a notably low median score (50%). 57/128 (44.5%) said that their provider “rarely” or

"never" offers choices in their medical care. A similar number, 58/128 (45.3%), said their provider "rarely" or "never" takes their preferences into account when making treatment decisions.

The fifth scale concerning overall satisfaction with their providers asked participants to rate the personal manner and skills of their provider. Communication skills (listening carefully, answering questions, giving clear answers) appeared to be an area for improvement as only 9/128 (7%) rated their provider's as "excellent."

The sixth scale asked participants two questions regarding participants' willingness to recommend their providers and received a high median score (80%). This strength is also exemplified by the 69/128 (53.9%) participants who responded that they would recommend their providers.

The seventh scale regarding trust in provider aimed to determine how strongly the participant trusted their providers. A potential strength is revealed by the fact that 120/128 (93.8%) participants "strongly agreed" or "agreed" that their doctors care as much about their health as they do.

The patient-provider communication questionnaire results should be considered in conjunction with observational data from routine visits at HIV clinics at the two study sites. Patients followed spent an average of 2 hours and 42 minutes during a routine visit which often included interacting with clinic staff in reception and triage, nurse or doctor during a clinical evaluation, pharmacist, laboratory technician, psychologist, and social worker. During a routine visit, patients spent an average of 22 minutes with clinical staff for the clinical evaluation portion of the visit. This time ranged from a 4-minute to a 44-minute clinical evaluation. Only three out of twelve clinical evaluation providers were characterized as presenting poor communication overall by the study staff. One provider out of the twelve observed visits counted tablets, 10/12 asked the patient about their level of adherence, 11/12 gave the patient instructions about ARV medication, 5/12 check to make sure the patient understood, and 4/12 assessed barriers to adherence, and 2/12 helped problem solve.

Patterns found in the observations regarding communication around adherence include the use of questioning around when the patient takes the medicine (ex. time of day?), and if ever forget to take their medicine, how they remember (ex. do they use a phone alarm or ask a friend to remind them?) There was often questioning or discussion of side effects and missed doses. Infrequently, lab tests and viral load data was explained. A few providers employed the use of a poster with stylized images of a body with vs. without viral suppression as an aid to explain adherence.

2.) Observations: Patient Visit Characteristics

Table 3: Adherence related communication during routine visit

	Count Tablets	Ask Patient level of adherence	Give patient instructions about ARV medication	Check that the patient has understood	Assess barriers	Solve Problems
Registration/Reception	*NR*	*NR*	*NR*	*NR*	*NR*	*NR*
Triage	*NR*	*NR*	*NR*	*NR*	*NR*	*NR*
Clinical Evaluation	1	10	11	5	4	2
Pharmacy	1	2	5	0	0	0

Lab	*NR*	*NR*	*NR*	*NR*	*NR*	*NR*
Psychosocial services	0	1	1	1	1	0
Support services	0	1	1	1	0	0

NR = Not reported

*Observations recorded from 12 clinic visits. No adherence related communication was observed during reception, triage, and laboratory stages of the visit.

3.) IMB Information

The IMB Information scale proved to be a strength through high median ratings (77.8%). Several specific items had notably strong responses while several others had notably low responses. Good adherence related information was demonstrated by questions asking participants if they understood the possible side effects of ARVs and how each HIV medication works to fight HIV to which 121/128 (94.5%) and 115/128 (89.8%) participants responded in the affirmative that they "somewhat agreed" or "strongly agreed". Questions demonstrating weak information included that only 74/128 (57.8%) disagreed with the statement that "Skipping a few of my HIV medications from time to time would not really hurt my health." Similarly, 50/128 (39.1%) participants somewhat agreed with the statement that "as long as I am feeling healthy, missing my HIV medication from time to time is OK."

4.) IMB Motivation

The motivation scale received a moderate median total score (66.7%) which signals that there is room for improvement. Individual items intended to measure social motivation revealed specific deficiencies. 75/128 (58.6%) agreed with the negative statement "My healthcare provider doesn't give me enough support when it comes to taking my medications as prescribed" revealing a need for improvement of social motivation from providers. 78/128(63.1%) disagreed with the statement "Most people who are important to me who know I'm HIV positive support me in taking my HIV medications" revealing a need for improvement of social motivation from patients' loved ones. Interestingly, 7/128 responded that "no one that I care about knows I am HIV positive" which may indicate a lack of disclosure to loved ones.

5.) IMB Behavioral Skills

The behavioral skills scale of the LW-IMB-AAQ proved to be a notable strength through a high median rating (85.71%). Participants demonstrated high self-efficacy and skills around adherence related behaviors. For example, 110/127 (86.7%) responded that it was "easy" or "very easy" to stay informed about HIV treatment and 111/128 (86.7%) responded similarly regarding getting HIV medication refills on time. Respondents also exhibited strong behavioral skill scores regarding managing side effects, remembering to take meds, and making HIV medications part of their daily life. 115/126 (91.3%) of respondents responded that they find it "easy" or "very easy" to take their HIV medication when they feel good physically and do not have any symptoms of their HIV disease and likewise 115/128 (89.8%) responded the same even when they do not feel good physically. The vast majority of respondents (120/128, 93.8%) felt that it is easy to talk to their provider about their HIV medications. One item was excluded from the total score per the developer's instructions may signal a deficit in behavioral

skills: 54/128 (42.2%) agreed that they experience difficulty in taking their HIV medications when drinking alcohol or using drugs.

6.) Beliefs in Medicine: Necessity and Concern Scales

On the Necessity scale of the BMQ, a high median total score (80%) demonstrated a high belief in medicines to support present and future health. A majority of participants (124/128, 96.9%) agreed with the statement that "my health at present depends on my medicines" and a similarly high percentage (122/128, 95.3%) agreed with the statement that "my health in the future will depend on my medicines."

On the Concern scale of the BMQ, a low median total score (50%) demonstrated high levels of concern regarding possible adverse effects of ART. This barrier is evidenced by a majority of respondents (70/128, 54.7%) agreeing with the statement "I sometimes worry about long-term effects of my medicines." 64/128 (50%) participants agreed with the statement that their "medicines are a mystery" to them revealing another area for improvement.

7.) Regression Analyses

The unadjusted primary model (Table 4) shows that aggregate scores of the PPC questionnaire were strongly positively associated with scores on the IMB Information and Motivation scales, as well as with both BMQ Necessity and Concern scales. However, the magnitude of the effect on total scale score is small. For example, with every one point increase in the aggregate score of PPC there was a 0.045 increase in the IMB Information scale score. There was no significant association found with the IMB Behavioral Skills scale.

Table 4: Unadjusted primary regression model

Outcome	Coefficient	95% CI Low	95% CI High	p-value
IMB Information	**0.045**	0.020	0.069	**p<0.001**
IMB Motivation	**0.082**	0.040	0.124	**p<0.001**
IMB Behavioral Skills	0.052	-0.019	0.123	0.15
BMQ Necessity	**0.098**	0.066	0.130	**p<0.0001**
BMQ Concern	**0.127**	0.069	0.185	**p<0.0001**

After adjusting the primary model for possible confounding by the variables of age, sex, and socioeconomic status (SES) as well as effect modification by SES (Table 5); a positive association was found between PPC and all outcome measures. There also appeared to be a significant negative association between the variable of sex and scores on the BMQ-Concern suggesting that female respondents expressed more concern (β= -1.72) regarding their medicines than male respondents.

Table 5: Adjusted primary regression model

Outcome	Predictor	Coefficient	95% CI Low	95% CI High	p-value
IMB Information	**Patient-provider communication**	**0.038**	**0.012**	**0.064**	**p<0.01**
	SES	-1.007	-4.497	2.483	0.57

	Age	0.004	-0.020	0.029	0.73
	Sex	-0.244	-0.702	0.213	0.30
	Patient-provider communication x SES	0.011	-0.022	0.045	0.51
IMB Motivation	**Patient-provider communication**	**0.085**	**0.051**	**0.120**	**p<0.0001**
	SES	4.377	-1.788	10.541	0.16
	Age	0.025	-0.018	0.067	0.25
	Sex	0.030	-0.791	0.851	0.94
	Patient-provider communication x SES	-0.043	-0.103	0.018	0.16
IMB Behavioral Skills	**Patient-provider communication**	**0.061**	**0.001**	**0.120**	**p<0.05**
	SES	4.715	-5.535	14.964	0.36
	Age	0.035	-0.031	0.101	0.30
	Sex	0.279	-0.967	1.524	0.66
	Patient-provider communication x SES	-0.043	-0.144	0.057	0.39
BMQ Necessity	**Patient-provider communication**	**0.092**	**0.057**	**0.127**	**p<0.0001**
	SES	0.388	-4.835	5.611	0.88
	Age	0.018	-0.024	0.061	0.39
	Sex	0.320	-0.489	1.128	0.43
	Patient-provider communication x SES	-0.003	-0.053	0.046	0.90
BMQ Concern	**Patient-provider communication**	**0.127**	**0.072**	**0.183**	**p<0.0001**
	SES	2.680	-5.958	11.319	0.54
	Age	0.028	-0.046	0.103	0.45
	Sex	**-1.724**	**-2.994**	**-0.454**	**P<0.01**
	Patient-provider communication x SES	-0.036	-0.120	0.047	0.39

Separate regression models were conducted comparing each PPC sub-scale with each of the five outcomes measures, and adjusted for the covariates of age, sex and SES. Strong positive relationships were found between five of the patient-provider communication subscales and IMB Information and Motivation. All but one scale of the PPC questionnaire produced null relationships with the IMB Behavioral skills scale. The PPC scale regarding overall communication was significantly positively associated with all outcome measures. The PPC scale regarding participatory decision making did not exhibit relationships with any outcome measures. The PPC scale regarding overall satisfaction was only significantly positively associated with one outcome measure, the BMQ Concern scale.

The interaction term of the PPC scale of trust of provider and SES had a statistically significant negative association with the outcome measure of motivation. This indicates that association between trust of provider and motivation was more strongly positive among those with the lowest SES quintile compared with those in the highest SES quintile.

Table 6: Associations found in adjusted sub scale regression models

Patient Provider Communication Scale (Predictor)	Outcome Measures				
	IMB Information	IMB Motivation	IMB Behavioral Skills	BMQ Necessity	BMQ Concern
Overall Communication	+	+	+	+	+
HIV-Specific Information	+	+	0	+	0
Adherence dialogue	+	+	0	+	+
Participatory Decision making	0	0	0	0	0
Overall Satisfaction	0	0	0	0	+
Willingness to recommend	+	+	0	+	+
Trust in provider	+	+	0	+	+

+ = $p<0.05$
0 = N.S.

V. Discussion

This study used questionnaire data from new ART patients in Haiti to describe the barriers and facilitators to ART adherence as well as assess associations between patient-provider communication and adherence related beliefs, information, motivation, and behaviors. These questionnaires are composed of sub-scales which measure different constructs of adherence related beliefs and attitudes. The Creole translations of the questionnaires used in the present study showed high reliability.

This study demonstrates an association between PPC and IMB and between PPC and BMQ in the Haitian context. Patients reported positive perceptions of their HIV care providers. However, aspects of PPC which could be strengthened appear to be participatory decision making, HIV-specific information, and adherence related problem solving. Overall, patients reported positive attitudes and beliefs regarding IMB, but deficits were observed regarding information about skipping/missing doses or taking medication with alcohol/drugs as well as a lack of social motivation for adherence from providers and loved ones. The concern dimension of BMQ also demonstrated a need for reinforcement to address patients' worries regarding ART.

The participants' responses regarding communication with their providers demonstrated a lack of collaborative, egalitarian decision-making. This finding is consistent with the clinic visit observations which revealed that communication about adherence was typically one-sided, consisting of closed ended questions about pill taking behaviors and side effects. Infrequently, providers checked for understanding, helped problem solve, or assessed barriers to adherence. However, it is also possible that some items of this PPC scale were not appropriate for the Haitian context. For

example, one item asked about level of control over treatment decisions. This may have caused confusion as choice between treatments may not be a reality at these facilities.

Despite the lack of shared decision making, participants expressed high willingness to recommend their providers to other patients. This is a notable strength because there is evidence to support that trusting relationships with providers promote higher levels of adherence(15). Further study is necessary to determine if this is a function of the respect that medical professionals hold in Haiti or the perceived quality of the individual-level patient-provider relationship based on interactions and communication.

Multiple linear regression analyses suggest that patient-provider communication is associated with adherence related information and motivation as well as the belief in medicine. A majority of the PPC constructs are shown to be associated with IMB and BMQ constructs in the Haitian context. This finding supports the development and use of provider-based interventions to strengthen ART adherence of new ART patients in Haiti. The fact that the scales of IMB behavioral skills, PPC participatory decision making, and PPC Overall satisfaction subscales produce few significant relationships is potentially due to the fact that this study used baseline data from new ART patients. Follow up questionnaires will determine whether or not these are persistent relationships.

The IMB model has been used to explain and promote medication adherence among patients but had not previously been applied to new ART patients in the Haitian context(19,20). In this sample, patients reported high information and behavioral skills, but deficits were observed regarding information about skipping/missing doses or taking medication with alcohol/drugs as well as a lack of social motivation for adherence. During clinic visit observations it was recorded that providers frequently asked patients about their pill taking routine. However, the questionnaire data suggests a need for providers to check for understanding to ensure patients have the correct information for achieving optimal adherence to their regimen.

This research suggests that IMB motivation is a barrier to ART adherence in the Haitian context. Participants perceive less social motivation both from providers and other people in their lives. Over half of participants expressed that they do not get enough adherence related support from their providers. Interventions are needed to help providers address this barrier and counsel their patients to attain the supportive relationships they need to be adherent. Patients may need guidance on the positive impacts of social motivation on their ART adherence.

Beliefs in the necessity of medicine as well as concerns about medicine have been associated with ART adherence(17)(28). A previous study found belief in the medication regimen was predictive of the Haitian participants' adherence(27). In the current study, participants reported strong beliefs around the necessity of medicines, but also strong concerns about their side effects and long-term use. This reinforces the importance of educating patients about their medications to assuage patients' concerns and thereby enhance adherence.

The data used in this research was part of a longitudinal study which aims to assess if new ART patients' perspective of the quality of patient-provider communication as well as information, motivation, behavioral skills around adherence and beliefs in medicine change over time. It is important to note that communication between provider and

patient is only one piece of the adherence puzzle; stigma, social support, and poverty may also affect HIV patients' ability to be adherent to their ART.

PPC HIV-specific information, PPC adherence dialogue, PPC participatory decision making, and BMQ Concern were identified as the lowest of the measured subscales. IMB Motivation was also notably lower than the other scales of LW-IMB-AAQ. Because IMB and BMQ are known to be associated with ART adherence, the present results suggest that IMB Motivation and BMQ Concern can be targeted to increase adherence in the study population. The PPC subscales of overall communication, adherence dialogue, willingness to recommend and trust in provider are shown to be associated with both IMB Motivation and BMQ Concern and therefore present a good starting point for such a provider-based intervention.

Interestingly, PPC participatory decision-making was not associated with any of the outcome subscales of IMB or BMQ. This suggests that interventions to improve participatory decision making would not impact ART adherence in the current population. However, this lack of association may also be explained by questionnaire items that may not be appropriate for context of these treatment sites. The strengths and weaknesses of these correlates of adherence among new ART patients may guide future interventions in effective ART adherence counseling.

VI. Limitations

This cross-sectional descriptive study used data collected from HIV patients who recently initiated ART at two large hospitals in Haiti. The cross-sectional nature of the study design limited the ability to determine the direction of the causation. Limitations related to the validity of the instruments also exist, since validity of several of the instruments has not been tested in the Haitian context or in Haitian Creole. For example, it is not clear that questions on trust of the provider, willingness to recommend, and shared decision making were relevant in this context or at these treatment sites. P-value adjustments for multiple comparisons may have increased the risk of Type II errors.

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VIII. Appendix

Table 7: Spearman Correlation Matrix of all variables

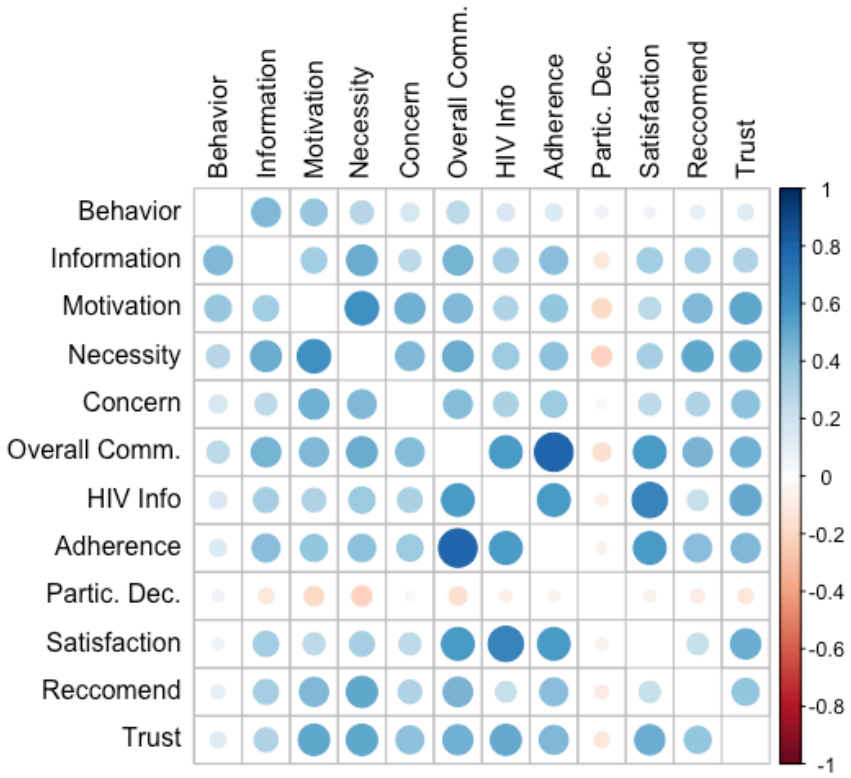

Table 8: Adjusted regression models for each subscale of the predictor

	Outcome Measures					
Patient Provider Communication scale (Predictor)	IMB Information		IMB Motivation		IMB Behavioral Skills	
	Coefficient	P-value with Holm correction	Coefficient	P-value with Holm correction	Coefficient	P-value with Holm correction
Overall Communication	0.183	p<0.001	0.380	p<0.0001	0.283	p<0.05
HIV specific information	0.138	p<0.05	0.300	p<0.01	0.231	0.22
Adherence dialogue	0.236	p<0.001	0.400	p<0.001	0.227	0.34
Participatory Decision Making	-0.022	1.0	-0.075	0.106	0.030	1.0
Overall Satisfaction	0.131	0.096	0.179	0.122	0.050	1.0
Willingness to recommend	0.346	p<0.05	0.891	p<0.01	0.267	1.0
Trust in provider	0.163	p<0.01	0.426	p<0.0001	0.194	0.51

	Outcome Measure

Patient Provider Communication scale (Predictor)	BMQ Necessity		BMQ Concern	
	Coefficient	P-value with Holm correction	Coefficient	P-value with Holm correction
Overall Communication	0.372	p<0.0001	0.547	p<0.0001
HIV specific information	0.300	p<0.05	0.382	0.07
Adherence dialogue	0.378	p<0.05	0.610	p<0.001
Participatory Decision Making	-0.069	0.3504	-0.025	1.0
Overall Satisfaction	0.233	0.1001	0.348	p<0.05
Willingness to recommend	1.064	p<0.0001	0.810	p<0.05
Trust in provider	0.460	p<0.0001	0.588	p<0.0001

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