

Implementing Screening for Hypertension in Archetypal HIV Primary Care: A Mixed-Methods Assessment

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Abstract

BACKGROUND:

High prevalence of HIV and hypertension in sub-Saharan Africa puts HIV-infected adults at high risk of end-organ complications. Both World Health Organization (WHO) and national guidelines recommend screening and treatment of hypertension among HIV-infected adults on antiretroviral therapy (ART). We evaluated the implementation of hypertension screening among adults on ART at three Uganda Cares Primary care facilities.

METHODS:

Using an explanatory mixed-methods approach we reviewed patient records, and interviewed both patients and providers during 2017 and 2018. We obtained demographics, clinical and blood pressure (BP) measurements via records review. We estimate the period prevalence of screening and use adjusted log binomial regression to evaluate for predictors of screening. In-depth interviews were analysed using a thematic approach to explain the observed prevalence and predictors of BP screening.

RESULTS:

Records for 1426 HIV-infected adults were reviewed. Patients had a median age of 35 years and 65% of them were female. Most were on ART (89% on first-line) with median duration was 4 years. Only 262 (18%) were overweight or obese with a body mass index (BMI) $>25 \text{ Kg/M}^2$. In 2017 or 2018 patients made a median of 3 visits and 783 patients had a BP recorded, hence a period prevalence 55%. Older age, male sex, more clinic visits, and clinic site were associated with screening in the adjusted analyses. Erratic BP screening was collaborated by patients' and providers' interviews. This was attributed to challenges that included; patient numbers, staffing, provider apathy, access to treatment, and availability and function of BP equipment.

CONCLUSION:

Almost half of regular HIV clinic attendees at these prototypical primary care HIV clinics were not screened for hypertension for a whole year. Improving BP screening requires attention to addressing modifiable challenges and ensuring local buy-in beyond just providing equipment.

Full Text

The high population prevalence of hypertension [1] in sub-Saharan Africa means 26 million HIV-infected adults are at risk for both hypertension and its related complications. Increasing access to Antiretroviral therapy (ART) for HIV-infected adults in sub-Saharan Africa is also likely to lead to increased burden of hypertension given better survival [2]. Compared to HIV-uninfected, studies have suggested HIV-infected adults with hypertension have a 40% to 70% higher risk for end organ complications [3-7]. Uniquely,

hypertension is a major potentially modifiable risk factor for these complications hence ought to be diagnosed, treated and controlled [8-12].

Identification of hypertension typically happens during primary care [13, 14] via routine blood pressure (BP) measurement [15]. Since most HIV-infected adults regularly attend HIV primary care clinics, such visits offer a unique opportunity for BP screening. Upon identification, management that mainly includes lifestyle modification and medications can then be initiated. If optimized, these interventions are sufficient and within the reach for most patients [16-19] to prevent related complications. Recent World Health Organization (WHO) [17, 20, 21] and Uganda National Antiretroviral therapy (ART) treatment guidelines [18], recommend screening and management of hypertension to further enhance longevity, and quality of life for HIV-infected adults. Such recommendations are based on evidence suggesting HIV-infected adults with hypertension have a higher risk of both cardio and cerebrovascular disease compared to HIV-uninfected patients [3-7, 22]. Notably, increasing age [23, 24]; impact of inflammatory processes (HIV viral replication and opportunistic infections) [25, 26], and also cumulative effects of ART use [27-29] could contribute to this risk. Effective screening programs therefore are needed within HIV primary care to identify and treat patients with hypertension to prevent related complications. With millions of HIV-infected adults accessing ART mostly through primary care, it is unclear how well these recommendations are being implemented given the various care models. Various models of integrating screening have been suggested [30], among these: combination with voluntary HIV counselling and testing [31], during HIV primary care visits [32, 33], and via community differentiated care delivery [32]. Rationale and effectiveness of various approaches are yet to be fully evaluated [34].

We performed an explanatory mixed-methods study to evaluate screening for hypertension among HIV-infected adults on ART and explored patients' perceptions and providers' practices regarding hypertension screening at HIV primary care clinics run by AIDS Healthcare Foundation (AHF) Uganda Cares.

Methods

Overall design

Using an explanatory mixed-methods approach, we performed a cross sectional study to estimate prevalence of hypertension screening and its determinants, followed by in-depth interviews to explain the screening experience at the three HIV primary care facilities in Uganda. Participating clinics included; the urban St. Balikudembe market clinic, in Kampala city; semi-urban clinic at Masaka regional referral hospital in south central Uganda, and Kalisizo district hospital clinic, a rural hospital further south towards the Tanzania border. Between March 2018 and March 2019, we reviewed records for adults on ART seen during the previous calendar year. Visits were assessed for BP measurements and/or hypertension diagnosis. We then performed in-depth interviews on a random sample of the patients and providers to collaborate BP screening information learned.

Study population

We studied HIV-infected adults (> 18 years) on ART with at least 2 clinic visits in the previous calendar year. Out of 30,000 eligible patients, we drew a sample of 1,500 based on proportionate contribution to all eligible, by clinic site (Figure 1). During visits in 2017, we identified 825 records from Masaka and 225 from Kalisizo, then in 2018, 450 from St. Balikudembe clinic. For the in-depth interviews we interviewed a random sample of 30 patients (> 18 years) on ART with at least 2 clinic visits and 20 providers (doctors, nurses, clinical officers, clinic administrators) who had been employed and had worked at the clinic for at least a year in the study period.

Study Sites

Uganda Cares is a non-profit with over 15 years' experience, providing free HIV prevention, care and treatment services, as well as advocacy. Currently it operates and supports clinics in 23 districts within Uganda and with over 115,000 patients as of July 2021. As a program, Uganda Cares is intent on aligning care delivery with ambient guideline recommendations within its programs. Typically, clinics are staffed by clinicians mostly trained and experienced in providing HIV related care and treatment. At the time of this evaluation, BP machines and training to support BP measurement had been given to five Uganda Cares clinics, three of which were studied.

Patient record review

Using clinic identification numbers of the sample drawn, charts were identified and reviewed for evidence of BP screening on all visits in the previous calendar year. Specifically, data retrieved included; visit dates, demographic information, HIV treatment information, evidence of screening (BP measurements), hypertension diagnosis and/or record of treatment (prescription and or medication use). Data were abstracted on to a standardized questionnaire and later entered into a REDCap™ database via tablet.

In-depth interviews

Upon analysis of screening prevalence and predictors, we explored patients' perceptions and providers' practices based on the findings. A trained non clinical research assistant interviewed both patients and providers. A subset of patients was purposefully sampled based on whether they had been screened or not screened to understand the screening experience. Likewise, providers were purposefully sampled based on their roles in the clinic. During 20 to 30 minute interviews, interviewees responded to open-ended questions regarding how they had observed the implementation of BP screening during routine care at the respective clinic. Digital audio recordings of the interviews were transcribed in the language the interviews were conducted in. During transcription all personal identifiers were removed. Audio recordings, transcriptions, notes, and other related records were secured, only accessible by authorized persons.

Quantitative analysis

We summarised demographic data using descriptive statistics and estimated the period prevalence of screening with 95% confidence intervals as number screened for hypertension out of all in care with two

visits within a calendar year. Using modified poisson regression with robust variance, we evaluated predictors for screening to generate prevalence ratios (PR) adjusted for sex, age, clinic site, duration on ART, duration in care, clinic visits, and ART regimen. All analyses used STATA® software version 16.1

Qualitative analysis

We used a thematic approach to analyze the interviews. We read through the transcripts to familiarize ourselves with the data, then used deductive coding and analysis, whereby the codes and themes were derived more from concepts and ideas that were embedded in the tools used for data collection. De-identified transcripts were uploaded into ATLAS ® ti V8 software for coding. Once the coding process was completed, code reports were generated. Based on these code reports themes were identified, reviewed and refined.

Results

Quantitative findings

Out of the intended 1500, we identified 1,448 charts and 52 were missing (Figure 1). Of those identified, 1,426 were eligible for review while 22 were ineligible for various reasons (Figure 1). Majority of the charts were from Masaka (55%), a third from St. Balikudembe (30%) and the rest from Kalisizo (15%) (Table 1). Patients' median age was 35 years (Interquartile range (IQR): 29 to 43) and two-thirds were women (65%). Patients had been on ART for a median of 4 years (IQR: 2 to 6) with a median duration in HIV care of 4 years (IQR: 1 to 7). Almost all (1269, (89%)) were still on a first-line ART with a few on second line regimens. In the previous year, patients had a median of 3 visits (IQR: 2 to 6) to the clinic. Using data available, 262 (18%) patients were classified as overweight or obese (body mass index (BMI) > 25 Kg/M²).

Period prevalence of screening

Of the 1426 patients, 783 had at least one BP measurement recorded at a clinic visit in 2017 or 2018. This represents a period prevalence of 55% (95% CI: 52% to 57%) (Table 2). Screening prevalence was highest in Masaka 67% (95 CI: 64% to 71%) and lowest in Kalisizo 4% (95% CI: 1.9% to 7.4%) (Table 2). Older adults (>55 years) had a higher screening prevalence at 55% (95% CI: 46% to 67%) compared to other age groups. Among the 783 patients with at least one BP measurement, 183 patients had reading in the pre-hypertensive range according to the Joint National Committee on Prevention, Treatment of High Blood Pressure (JNC 7) definition [19] corresponding to a period prevalence of 23% (95% CI; 21 to 26) (Table 2). Another 218 patients, had readings in the hypertensive range (28% (95% CI; 25 to 31)).

Determinants of hypertension screening

After adjusting for age, clinic site, duration on ART, duration in care, and ART regimen via modified Poisson regression; compared to women, men were less likely to be screened for hypertension with a PR

of 0.85 (95% CI: 0.78 to 0.94; $p=0.001$) (Table 3). Also, for every 10-year increase in age, the prevalence of screening increased 1.07 times (95% CI: 1.03 to 1.13; $p=0.001$) after adjusting for sex, clinic site, duration on ART, duration in care, and ART regimen. Further, patients were more likely to get screened if they attended more clinic visits since every 5 clinic visits attended increased likelihood of screening 1.84 fold (95% CI: 1.65 to 2.05); $p<0.001$), adjusting for sex, age, clinic site, duration on ART, duration in care, and ART. Screening prevalence also depended on clinical care site. Compared to Masaka, patients in Kalisizo (PR 0.06 (95% CI: 0.03 to 0.1; $p<0.001$)), and St Balikudembe (PR 0.85 (95%CI: 0.77, 0.93; $p<0.001$)) were less likely to be screened after adjusting for sex, age, duration on ART, duration in care, clinic visits, and ART regimen.

Qualitative findings

We performed 50 in-depth interviews among 33 patients and 17 health care workers (Table 4) across all sites. Of these, 21 were conducted at Masaka, 19 at St. Balikudembe and 10 in Kalisizo. Overall 69% (23) of patients and 65% (11) of providers were female.

Patients' perception of Screening practice

Generally, patients reported inconsistent screening for hypertension as demonstrated by these quotes:

"...regarding hypertension whenever I come to the clinic, I am not screened for hypertension... but there is a season when all patients are screened for hypertension" (PM012)

"They are inconsistent, sometimes you come and they check but sometimes they don't check." (PSB008)

Screening depended on various influences, such as previously diagnosed hypertension as illustrated here:

"I have had hypertension for 13 years. Whenever I come to the clinic my blood pressure is measured. Sometimes when I come to the clinic I am not screened for hypertension but most of the times we are screened." (PM012)

At St. Balikudembe clinic, another noted that screening has changed overtime with reduced frequency more recently.

"...They were checking sometime back but they have not been checking me these days" (PSB005)

While in Kalisizo another reported that screening only started recently.

"They have just started screening for hypertension when you visit the clinic... Sometimes they screen for blood pressure" (PK005)

Screening seemed more likely when patients came to clinic earlier in the day.

"Most of the time when I come to the clinic I must be screened for hypertension; this is why I come early so that I can be screened." (PM008)

Notably, upon screening, patients reported insufficient provider communication regarding findings. Some patients perceived not communication, in some instances, as an indicator of normal BP status:

"They never told me. After screening he just told me move to this next point." (PM003)

"If they have not told me anything, it means I don't have [high blood] pressure." (PSB006)

Patient's perceived benefits of screening

Patients reported that routine screening is not only informative of one's health status but is also the gateway to hypertension treatment.

"It is good [to screen] because when you know your health condition, you are better than a person who does not know" (PSB003)

Absence of anti-hypertensive medication at the HIV clinics, and medication cost were also noted as potential impediments to deriving full benefits of screening.

"...It would be better to get all the medication from this clinic also..." (PM008)

Providers' perspectives on screening

Most providers recognized the importance of screening for hypertension among HIV-infected adults on ART.

"...We don't have the statistics here but based on my own experience I think out of 10 patients I see in a day, 3 of them are hypertensive." (HWSB002)

They reported however that screening was not necessarily emphasized across clinic facilities. For instance, the Masaka clinic allocated a day per week to screen older adults for hypertension among other issues.

"Right now, we are seeing many cases among the elderly. That's why we have decided to allocate a day in the week on Wednesday which is for seniors... so that they don't miss those routine services like BP, RBS [Random Blood Sugar] ..." (HWM004)

Providers stated some challenges that impeded regular screening, among them: the high patient numbers, limited staff and, few and/or defective BP machines. Providers stated:

"Some patients are not screened because we are busy, [and] we have to change, sometimes we divide ourselves." (HWK004)

"...But then there are days that are actually very heavy [with many clients] and basing on the staffing, it makes it hard [to] screen everyone." (HWK001)

“The challenge is once in a while, the [B.P] machine is down and the nurse is over whelmed so they say no... By the time we get the cells [batteries], more than 20 patients have gone [without screening]” (HWSB002)

Providers’ apathy was a reason for failing and inconsistent screening.

“I know what the ideal is, only that sometimes it is not done due to some laxity...sometimes they screen then next week they don’t.” (HWK002)

“Some health staff, feel like rushing clients and so they miss taking their blood pressure” (HWM004)

Providers also recounted that screening without access to anti-hypertensive medicines is a big challenge, suggesting that even just providing essential drugs would be a good start.

“...but the biggest challenge is we lack the essential hypertensive drugs... I think if you can give someone nifedipine they can buy the rest a few drugs not all drugs” (HWSB002)

Notably, BP measurements were documented for action by clinicians, even when the patient was not meant to see a clinician

“...For those who go through the “fast track”, we just write their [ART] drugs in the dispensing sheet. ...we record the weight and the BP such that if there is anything wrong then that patient immediately goes back to the clinician” (HWM004)

We observed a lower likelihood of screening among men. Providers reported that most men requested many months’ worth of ART hence made fewer clinic visits

“... for men; they may ask for more than three months of drugs due to the nature of their work... but for women, if you tell them I want to see you after one month, they have no problem with that.” (HWM004)

Discussion

Screening by routine BP measurement is a critical initial step in identifying undiagnosed or poorly controlled hypertension and initiating its management especially among high risk groups such as HIV-infected adults. Primary HIV care provides an ideal setting for this screening [31, 32]. Using a mixed methods approach, we evaluated screening implementation within routine HIV care at three prototypical clinics run by Uganda Cares, including; urban, semi-urban and rural clinics. First we estimated the prevalence of screening and its determinants, then we explored patients’ and providers’ perceptions to clarify observed screening prevalence and determinants.

Among these HIV-infected adults on ART, just over a half (55%) were screened for hypertension at a clinic visit made in the prior year (2017 or 2018). Screening frequency was higher than what was reported in a clinical trial in Eastern Uganda [35] which had a lower (28%) prevalence of screening between 2014 and 2017 for a similar population [36]. We also observed wide variation between the three facilities in our

study ((4% to 67%), Table 2). This dissimilarity between studies and within our study sites at best illustrates erratic implementation of screening at most HIV care facilities in the region. Disparity in screening practice is supported by the interview findings from patients who stated screening being done haphazardly across and even sometimes within clinic. Providers also reported several unique challenges that could in part explain this variability and we discuss them below. Overall, screening was suboptimal despite patients regularly attending clinics, representing a squandered opportunity to identify either undiagnosed or uncontrolled hypertension. Particularly almost a third (28%) of measurements revealed elevated BPs, hence requiring attention. Realising screening benefits would therefore require systematic investment in approaches to enhance and routinize consistent implementation.

Sex, older age, more frequent clinic visits and clinical site were statistically significant predictors of screening in adjusted models (Figure 2). Previous studies have documented predictors for hypertension, but not for its screening [37]. Therefore, interviews with providers and patients were critical in clarifying these observations. First, we established that men were less likely to get screened because of more work commitments and even took ART for many months hence made fewer clinic visits (Figure 2). Previously, this has been observed and reported [38-40]. Further, older adults had a higher likelihood of screening because they are given priority with special clinic days. The Masaka clinic dedicated a day to focus on their care. Besides, we learnt that those known to have hypertension are likely to be screened either because patients requested or clinicians managing patients with hypertension take a BP measurement prior to prescribing medicines. Since risk of hypertension increases with age, older adults are likely to be screened for the same reasons [41]. Moreover, more frequent visits predicted screening because higher clinic visit frequency increases propensity of being screened, even during non-clinician visits. HIV care programs are moving towards Differentiated Service Delivery (DSD) models for sustainable care delivery [30]. Most of these models require patients to make fewer clinic visits or spend less time at clinics and hence less likely to be screened. As such, DSD implementation should figure out how to accommodate for hypertension screening. Lastly, patients at Masaka were more likely to be screened compared to the other two sites. Site level differences gleaned from the interviews suggest that organisational importance attached to screening is critical to its implementation. While for instance a dedicated clinic was established weekly to attend to health issues for older adults in Masaka (including hypertension), in Kalisizo an apathetic attitude hampered screening efforts. Congested clinics with few clinicians, could have contributed to inconsistency screening since patients and providers noted that measurement varied with the time of day and how full the clinic was. This has previously been suggested as a challenge [14, 31]. Importantly, all three facilities had similar equipment and support from Uganda Cares to implement screening, but we found varying frequency. This suggests a need to identify and address unique local challenges to ensure optimal implementation. The interplay of these determinants and how they could explain the observed screening for hypertension are summarised via a logic model (Figure 2).

Both patients and providers mentioned the need for BP screening with proximity to treatment. BP screening with access to antihypertensive treatment has heretofore been suggested for HIV-infected patients [32, 33]. Indeed, screening is useless if patients cannot appropriately access therapy. Presently, patients screened and diagnosed with hypertension or assessed to have poor control in HIV primary care

are referred to either privately purchase or obtain free medicines at a government facility. Besides requiring another clinic visit on a different day, these facilities are prone to stock-outs of medications. Patients therefore opt to purchase medicines out-of-pocket which is unsustainable for most due to cost [42]. Inaccessible treatment is likely a disincentive for consistent screening by both providers and patients. A robust hypertension screening program in HIV primary care requires linkage to sustainable treatment.

Our study did have some limitations. First, while Uganda Cares provides ideal HIV care, our findings might not fully represent all HIV care facilities in Uganda. Nonetheless, the clinics represented here on average epitomize what could happen if similar equipment and support were provided to similar HIV clinics. Secondly, we relied on clinic records for evidence of hypertension screening and could have missed other screening performed and not recorded. Interviews with providers informed us that overall, records are kept well and hence at best represent practice at the facilities. Also data integrity is part of the institutional culture at Uganda Cares, a participating site for International Epidemiologic Databases to Evaluate AIDS consortium [43]. Therefore, our estimated prevalence of screening could be an underestimate but still likely below the ideal 100%, given patients' and provider's consistent collaboration of a suboptimal performance.

There are several implications of our findings. We observed suboptimal screening for hypertension which varied widely between sites due both modifiable and non-modifiable reasons. We also identified what could make screening more or less likely. Attention to modifiable challenges specifically: patient numbers, staffing, provider apathy, access to treatment, and availability and functionality of BP machines could improve screening. Provider motivation should be a key target as shown by the logic model (figure 2). A second target from the logic model is increasing opportunity for screening. Therefore, increasing likelihood of screening even within DSD care is advised since more visits predicted screening and men (with fewer visits) were screened less. Opportunity is enhanced by making sure that there is functional equipment. Lastly organisational capacity is critical to institutionalization of screening practice and hence helps perpetuates its implementation.

Conclusion

We observed sub-optimal BP screening among adult HIV-infected regular clinic attendees on ART in routine HIV primary care. Sex, age, clinic visits and clinical site were statistically significant predictors of hypertension screening in adjusted models and this was collaborated by the interviews with patient and providers. Prevalence of screening was inconsistent and varied across clinical sites largely due to modifiable factors. These included; patient numbers, staffing, provider apathy, access to treatment, patient knowledge, and availability and function of BP equipment.

Declarations

Ethics approval and consent to participate

This study protocol was reviewed and approved by the Makerere University College of Health Sciences School of Biomedical Sciences Higher Degrees Research and Ethics Committee (Protocol No. SBS-HDREC-489) and the Uganda National Council of Science and Technology (UNCST) (Protocol No. HS118ES). All interviewed participants provided signed written informed consent to participate in this study and the study was performed in accordance with relevant guidelines and regulations (e.g. Declaration of Helsinki).

Consent for publication

No individually identifiable data is provided.

Availability of Data and Materials

The datasets analysed during the current study are not publicly available due to the governing policies of the AHF-Uganda Cares program but are available from the corresponding author on reasonable request.

Competing Interests

The authors declare that they have no competing interests.

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Author's Contribution.

L.B: Participated in the conceptualization, methodology, formal analysis, Writing-Original draft and Project administration. L.N: Led the data collection, data entry, contributed to project administration. G.B: developed data management software, contributed to data curation and quantitative data analysis. P.L.A: Contributed to the study conceptualization, writing-review and editing and supervision. A.K: Contributed the mixed-methods Conceptualization, qualitative data collection and analysis, writing-review and editing. E.G: Contributed to the overall conceptualization, funding acquisition, writing-review and editing, data visualization and supervision. A.S. Led the overall conceptualization, methodology, project administration, data analysis, writing-review and editing, data visualization, funding acquisition, validation and supervision.

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Tables

Table 1: Characteristics of HIV-infected adults on antiretroviral therapy with clinic visits in 2017 or 2018 whose records were reviewed for evidence of blood pressure screening at three AIDS Health Care Foundation (AHF) supported primary care facilities in Uganda.

Characteristic	N=1426
Age, years*	35 (29-43)
Male Sex	35%
Duration on ART, years*	4 (2-7)
Duration in Care, years*	4 (2-7)
Second line ART use*	11%
Clinic Location	
Masaka	55%
St. Balikudembe	30%
Kalisizo	15%
Body Mass Index (BMI) category[†], Kg/M²	
<19	28%
19-24	54%
25-30	15%
≥30	3.4%
Number of clinic visits per patient in 2017*	2 (2-3)

* Median (Interquartile Range)

[†] Missing for 51% of patient records

Table 2: Period prevalence of blood pressure screening, and grade of hypertension among HIV-infected adults during 2017 or 2018 seen at any one of three HIV primary care facilities in Uganda.

	Screening	Pre-Hypertension	Hypertension
	N=783	N=183	N=218
Overall	55% (52 to 57)	23% (20 to 26)	28% (25 to 31)
Sites			
Masaka	67% (64 to 71)	22%(19 to 26)	30% (26 to 34)
St. Balikudembe	57% (52 to 62)	26% (21 to 32)	23% (18 to 29)
Kalisizo	4% (1.9 to 7.4)	13% (1.7 to 54)	63% (24 to 87)
Age group			
18-35	54% (50 to 58)	23% (19 to 28)	16% (13 to 20)
36-55	55% (52 to 59)	24% (20 to 29)	35% (30 to 40)
>55 years	57% (46 to 67)	15% (7.0 to 28)	60% (45 to 72)

Table 3: Adjusted and unadjusted Prevalence Ratios (PR) for blood pressure screening during a clinic visit between 2017 or 2018 among HIV-infected adults on antiretroviral therapy at three HIV primary care facilities in Uganda.

Characteristic	Unadjusted		Adjusted	
	PR (95%CI)	P-Value	*PR (95%CI)	P-Value
Male, sex	0.88 (0.70-1.00)	0.02	0.85 (0.78-0.94)	0.001
Age, per 10-Year increase.	1.05 (1.00-1.10)	0.04	1.07 (1.03-1.13)	0.001
Duration on ART	0.99 (0.98-1.00)	0.3	0.99 (0.97-1.02)	0.7
Duration in Care	0.99 (0.98-1.01)	0.5	1.01 (0.98-1.03)	0.5
Clinic visits, per 5 clinic visits	0.82 (0.74-0.91)	<0.001	1.84 (1.65-2.05)	<0.001
Clinical site				
<i>Masaka</i>	Ref		Ref	
<i>Kalisizo</i>	0.06 (0.03-0.10)	<0.001	0.03 (0.02-0.07)	<0.001
<i>St. Balikudembe</i>	0.85 (0.77-0.93)	0.001	0.70 (0.63-0.78)	<0.001
Second line ART	1.20 (1.01-1.32)	0.03	0.92 (0.81-1.05)	0.2

*Adjusted for sex, age, clinic site, duration on ART, duration in care, Clinic visits made, and ART regimen using modified Poisson regression with robust variance

Table 4: Participants for the in-depth interviews regarding blood pressure screening measurements at three HIV primary care facilities in Uganda

Site	Patients	Health care workers			Overall
		Nurses	Medical officers	*Other	
Masaka	14	3	2	2	21
St. Balikudembe	13	2	1	3	19
Kalisizo	6	1	2	1	10

*Includes clinical officers, dispensers and counsellors

Figures

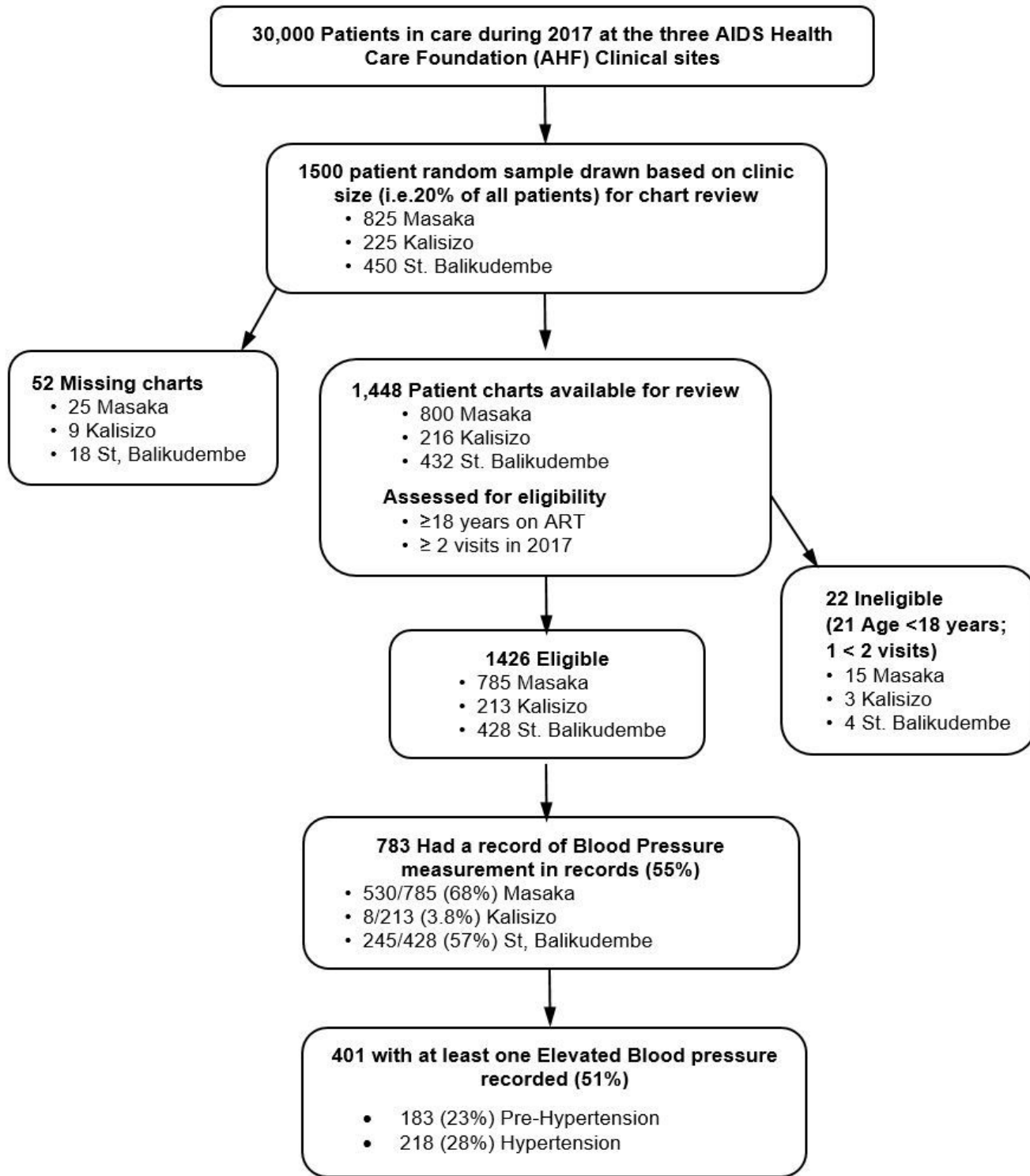


Figure 1

A flow diagram summarizing sampling from the HIV clinics and enrollment into the study.

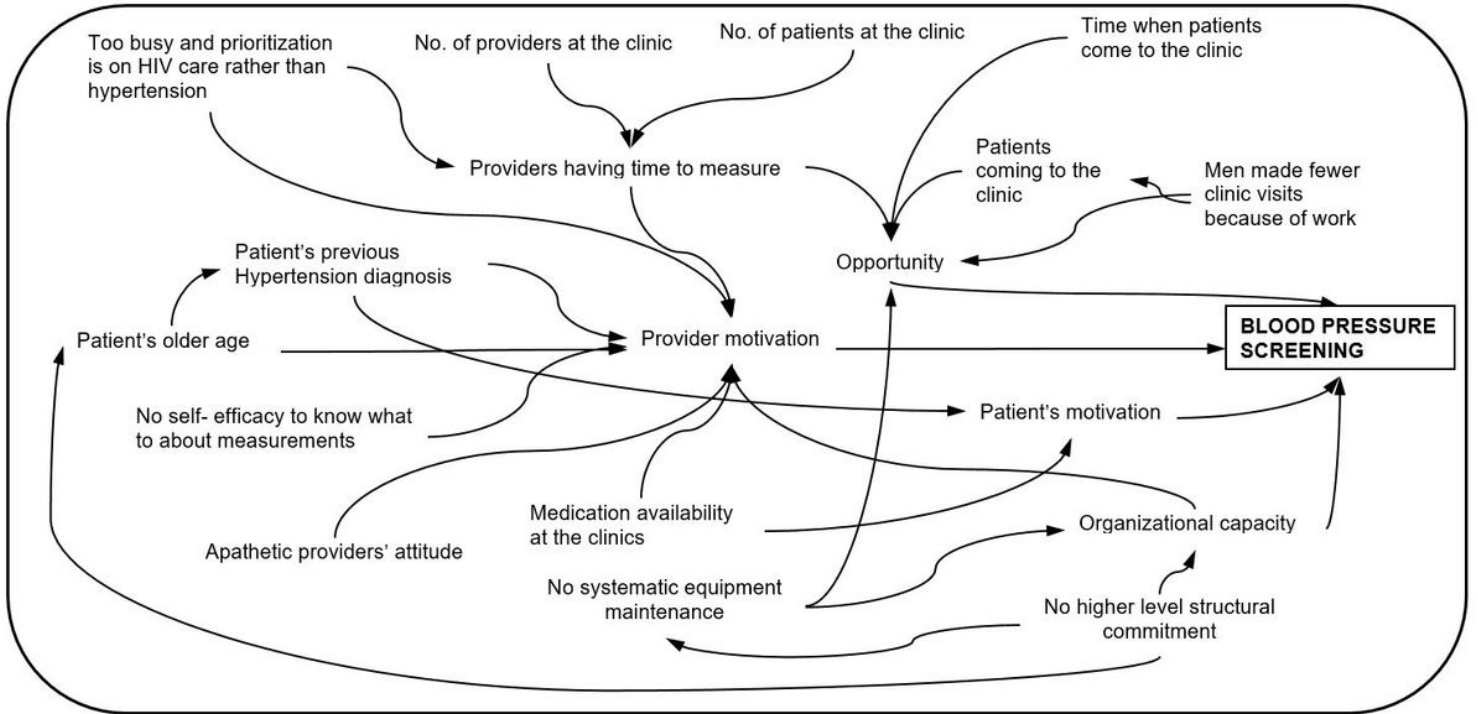


Figure 2

Logic model of factors determining blood pressure screening at the studied facilities.