

Influencing factors for access to hypertension care in Kenya; The possible role of eHealth

Development and application of a new access to care tool in a low and middle income country

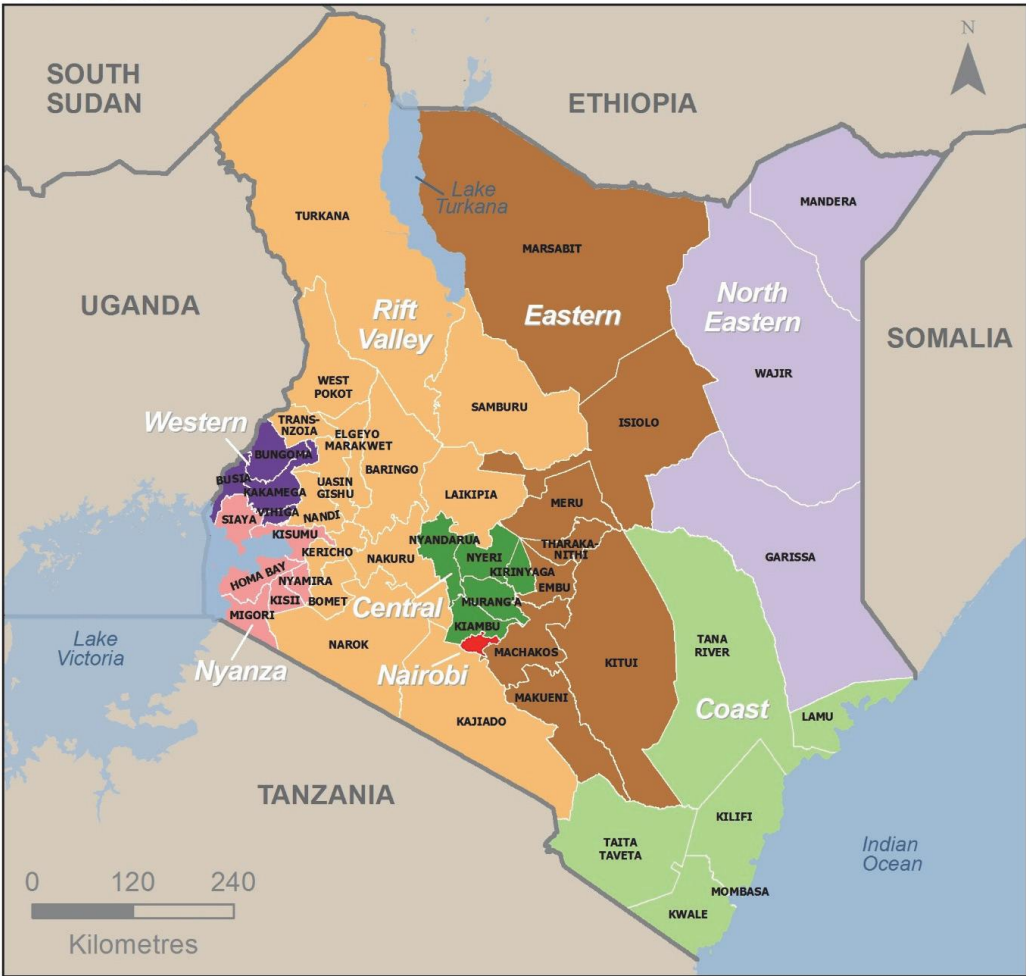
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Influencing factors for access to hypertension care in Kenya; The possible role of eHealth

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Declaration:

Where other people's work has been used (either from a printed source, internet or any other source) this has been carefully acknowledged and referenced in accordance with departmental requirements.

The thesis "Influencing factors for access to hypertension care in Kenya; The possible role of eHealth" is my own work.

Signature:.....

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Abbreviations

AHOHM	-	Application based HOme Hypertension Monitoring, the intervention developed by AHTI (see background)
AIGT	-	Dutch specialization for doctors in international health and tropical medicine
AMC	-	Amsterdam medical centre
AHTI	-	Amsterdam health and technology institute
AtC	-	access to care
AtHTNC	-	access to hypertension care
BP	-	blood pressure
CCM	-	chronic care model
CVD	-	cardio vascular disease
CVRM	-	cardio vascular risk management
FaB	-	facilitators and barriers
FoB	-	facilitator or barrier
GDP	-	gross domestic product
GP	-	general practitioner
GoK	-	government of Kenya
HBPM	-	home blood pressure monitoring
HCW	-	healthcare worker
HIV	-	human immunodeficiency virus
HS	-	health system
HTN	-	hypertension
HTNC	-	hypertension care
LMIC	-	low and middle income countries
LTFU	-	lost to follow-up
NA	-	not applicable
NCD	-	non communicable diseases
NGO	-	nongovernmental organization
WHO	-	World Health Organization

Abstract

Cardiovascular disease (CVD) and other non-communicable diseases (NCD) are on the rise in Kenya. While the mortality of NCD is expected to rise from 26% to 47% in the next 3 decades, there is a shortage of accessible good quality healthcare. Hypertension is the main risk factor for CVD, but access to hypertension care in Kenya is low as only 3,4% of people living with hypertension have adequately controlled blood pressure.

It is suggested that eHealth could play a role in addressing the treatment-gap in hypertension care. The Amsterdam Health and Technology institute tries to address this gap by developing a home based eHealth hypertension program.

In order to understand the potential impact of this program, the facilitators and barriers for access to hypertension care are explored through a literature review. After revising the theoretical framework by Lévesque of access to care, the findings from the literature search are analysed to determine the relative importance and interconnectedness of individual factors and to project the impact of the proposed eHealth intervention.

Main reasons for low access to hypertension care at the population level are poverty, low education levels and low awareness and knowledge about hypertension. At the health system level high economic costs, lack of basic equipment, shortage of well trained staff and stock-outs of essential medication are some main constraints. There are strong variations between different regions.

Many factors cannot easily be influenced through the current setup of the eHealth intervention. This could be improved by making it adaptable to different settings and expanding its reach through a community based approach. Lastly a collaboration with civil state organisations and the government is needed to address factors out of reach of the intervention.

Key words; Kenya, Hypertension, Access to care, eHealth, home monitoring

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Personal introduction

In 2015 I was working as a specialist in tropical medicine and international health (AIGT) in a rural hospital in Tanzania. Next to working in surgical, maternal and neonatal care I was involved in projects aiming to improve care for the wider benefit of the hospital population. This and previous experience have stimulated my interest in public health and healthcare management.

After returning to the Netherlands I started a specialisation as a general practitioner (GP). During this specialisation I continued to be interested in international health. Therefore I decided to combine this with a master in international health. This thesis is the result of these combined studies.

During the process of deciding what to focus on in my thesis, it was clear that it should relate to both my specialisation as a GP and my previous job as an AIGT. After hearing a lecture by Steven van de Vijver concerning development of an eHealth solution for the treatment of hypertension in primary care in Kenya, I instantly knew this should be the topic for my thesis.

When I was working in Tanzania and during my work as a GP in the Netherlands I have seen the tragedy of people becoming disabled or dying from preventable cardiovascular disease (CVD). In both settings I have experienced the difficulties of treating patients with hypertension. Worldwide an estimated 17.5 million people die of CVD annually, while an estimated 1.1 billion people are living with hypertension which is the most important risk factor for CVD.(1)

The Amsterdam Health and Technology Institute (AHTI) is working on a solution for this immense problem. They are working on an eHealth intervention combined with home blood pressure monitoring (HBPM). This intervention will be tested in Kenya first and later in the Netherlands, China and the USA. Although similar interventions have shown to be effective, it has never been tested in this combination in these settings.(2)

This thesis will focus on facilitators and barriers (FaB) for access to hypertension care (AtHTNC) in Kenya and how an eHealth intervention may contribute to increased access by overcoming some of these FaB. Through this thesis I hope to contribute to developing an intervention that improves AtHTNC in Kenya.

Background

Geographic, cultural and political setting

Kenya is a country in eastern Africa at the Indian ocean situated around the equator with a mixture of highlands, lowlands, arid areas and areas with a tropical climate.(3) The official languages are English and Swahili, another 65 languages are used of which 59 are indigenous.(4) It has a diverse tribal culture with over forty recorded tribes.(5) As a former British colony Kenya officially reached independence in 1963 and currently is a democratic state. It is divided in 7 geographic regions which are subdivided in 47 counties.(3) The country has largely been politically stable apart from election-related violence in 2007 and 2017.(6)

Economy

Kenya is a lower middle income country (LMIC) with a Gross national income per capita of \$1.380.(7) Annual growth rate was 5,6% in 2015. The main economic activities are agriculture, infrastructure, financial services, tourism and ICT.(8) The government of Kenya (GoK) has made ICT development a priority and tries to profile it as the digital hub for Sub-Saharan Africa (SSA).(9) Although Kenya has a growing middle class (spending 2-20\$/day) of 44,9% of the population(10), an estimated 43,3% (2012 estimate) of the population is living below the poverty line.(11)

Education levels

Schooling levels in Kenya are relatively low. In 2014 11,1% (men) and 15,9% (women) had no education, 42,3% (men) and 42,5% (women) did not complete primary school, only 21,2% (men) 16,3% (women) completed secondary school or higher. Literacy (defined as the ability to read part of a simple sentence) in Kenya is 87,8% in women and 92,1% in men. However only 80% (women) 85,3% (men) could read a full sentence. The schooling and literacy levels are significantly lower with a rising age and in rural areas compared to urban areas.(3)

Infrastructure

Access to basic infrastructure varies widely. In 2014 85,7% of the urban population had access to improved drinking water and 73,8% to improved sanitation facilities, while this was 57% and 33,7% respectively for the rural population. 68% of urban and 13% of rural households have electricity.(3) There is high coverage for mobile technology as 88% of the population is connected to a mobile network, 50% has access to internet and 65% use mobile phone for cash transfers (Mpesa).(12)

Demography

Kenya has a population of approximately 48,5 million (2016) which may increase up to 77 million by 2030 at the current annual growth rate of 2.9%.(7) The average age of the population is low with 52% of the population aged below 20. Currently 25% of the population resides in urban areas which is expected to rise to 40% by 2040.(13) Therefore there will

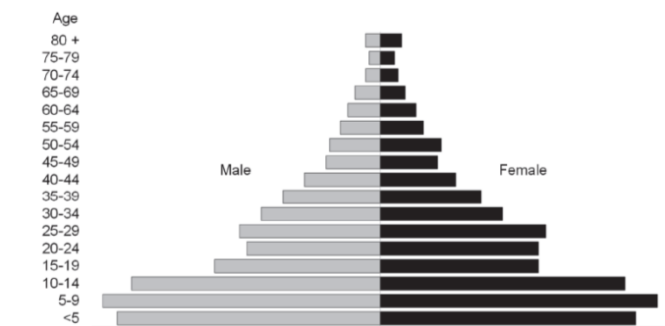


Figure 1 population pyramid from Kenya demographic and health survey 2014

be more than twice the number of people living in urban areas in the near future and they will be of an older age, which will have a strong influence on the epidemiologic transition.

Epidemiology and epidemiologic transition

In 2017 life expectancy at birth in Kenya was 64,3 years.(11) In 2010 the 6 main causes (combined >60%) of death and disability adjusted life years were HIV, Tuberculosis, malaria, lower respiratory tract infections, diarrhoeal disease and conditions arising during perinatal period.(14) NCDs in 2013 caused just 26% of mortality but they accounted for 50-70% of hospital admissions and 50% of inpatient mortality.(14) In 2014 mortality of CVD was estimated to be 8% of total mortality and prevalence of hypertension in population >18 years 28,7%.(15) In 2010 hypertension was estimated to cause 1,6% of all deaths and 3,1% of all disability adjusted life years in Kenya.(14)

According to estimates by the MoH mortality from NCD is expected to rise to 47% by 2030 due to the epidemiologic transition related to urbanisation and rising age of the population.(3,14) Mortality and morbidity of CVD in Kenya is rising, as well is the prevalence of hypertension.(15) This double burden of communicable and NCD is putting increasing strain on the Kenyan health system(HS).(16)

The importance of addressing NCDs is acknowledged by the MoH, which has set the target to reduce mortality of NCDs by 27% to 2.0 per 1000 persons in 2030.(14) In addition they embraced the WHO-goal to achieve a 25% relative reduction in the prevalence of raised blood pressure (BP) by the year 2025.(17,18) In line with this the “Pima pressure campaign” was launched to raise awareness for hypertension through mass media and measuring stations.(19)

Health system

The Kenyan HS consists of a public sector, a private sector and NGO based health facilities. In 2007 government facilities accounted for 74,3% of all outpatient visits and 67,5% of all hospitalizations, private clinics accounted for 12,1% of all outpatient visits.(20) The public HS consists of 6 layers, of which levels 1-3 are primary healthcare. The levels are: 1. Community services 2. Dispensaries 3. Health centres 4. Local hospitals 5. Regional referral hospitals 6. National referral hospitals.

The human resource deficit in the public HS based was estimated to be 70% for all healthcare workers (HCW) in 2013. The severity of the deficit differs per region.(21) Surprisingly another study found that utilization of health services is low in comparison to the number of HCW. The number of contacts was found to be 50-70% lower than the theoretical capacity at primary care level.(22)

Healthcare financing

In 2014/2015 government health expenditure at national level was 4% of total budget. If combined with expenditure at county level this was at a total of 7,5%.(23) The health system is decentralised. 40% of the total health budget was devolved in 2012-2013.(10) Expenditure is unevenly spread as some counties allocate ten times less per capita(4,50\$) than others(\$47,7). At county level 69,7% of the recurrent budget was used for wages and 7,8% was used for medication. There is a concentration of funds in hospitals, as 18,7% of the government health-expenditure is spent in three teaching hospitals.(23)

Healthcare financing in Kenya in 2011-2012 was 24% from public funds, 31% from donors and 42% from the private sector. From the private sector 76% came from out-of-pocket payments, 10% from private insurance and 14% from other sources.(24) Insurance coverage in Kenya is around 20% and is limited to urban areas and to formal sector employees.(14,25)

Problem statement and justification

Despite the significant impact of CVD and hypertension on the healthcare system and society of Kenya, control rates are low and the system is not well equipped for managing chronic conditions.(16) Amongst other, financial costs, lack of trained HCW and lack of a continuous supply of medication have been identified as bottlenecks in AtHTNC in Kenya.(16,26,27)

In 2015 the MoH conducted the national representative STEPwise survey for NCD's. This nationwide survey collected information of 4493 purposely selected households throughout the country.(16) Prevalence of hypertension (using anti-hypertensive medication / SBP \geq 140 and/or DBP \geq 90) was 23,8% for the adult population of which 8% had severe hypertension (defined as having SBP \geq 160 mmHg and/or DBP \geq 100 mmHg), but rose steeply to 43,6% for population aged 45-59 and 53,2% for population aged 60-69.(16)

Just 44,2% of the study-population was previously screened for hypertension. Of the people screened positive for hypertension in the survey 35,7% were aware of having hypertension, 7,9% were using medication 2 weeks preceding the survey and only 3,4% had an adequate BP during the survey.(16) This cascade of care is visualised in figure 2.

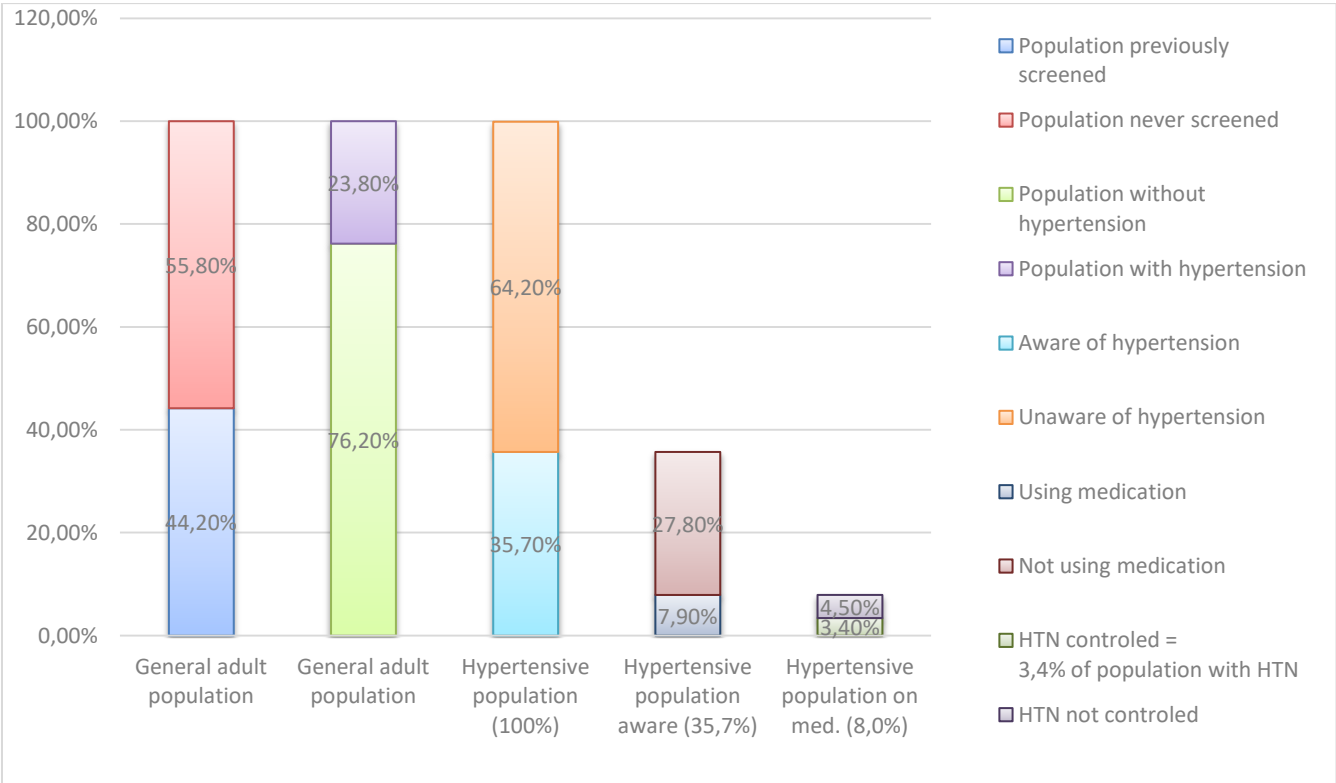


Figure 2 Cascade of care table for hypertension control in Kenya based on STEPwise NCD survey

Similar numbers were seen in a 2014 Nairobi-slum survey that found awareness rates of 20%, but significant higher medication-use of 39,5%.(28) A 2014 hospital based study showed BP control was achieved in only 33,4% of outpatient hypertensive patients.(29) In a 2015 study on hypertension and diabetes in the slums of Nairobi 90,9% of people were lost to follow-up after screening and virtually everyone had become non-compliant after 15 months of follow-up despite free care was provided.(30) It is clear that AtHTNC is low and drop-out occurs at various levels.

Access to care

Definitions for AtC usually include aspect relating to both the HS and the population. Dependent on the authors the emphasis lies more on the HS and utilization/delivery of care or the population and the potential to access care.(31,32) In a recent synthesis of literature on AtC by Lévesque access to care was defined as *“the possibility to identify healthcare needs, to seek healthcare services, to reach the healthcare resources, to obtain or use health care services, and to actually be offered services appropriate to the needs for care.”* The authors integrate aspects of the HS and the population into one framework which can be used to identify FaB to AtC.(31)

AtC is not determined by single factors resulting in a dichotomous yes or no outcome. Moreover it is a complex sum of push-factors (facilitators) and pull-factors (barriers) causing somebody to obtain AtC in varying degrees. Dependent on the context these factors can influence the population and/or the HS, they can be facilitators and/or barriers and frequently they interact. The level of access may differ per condition and treatment. For example access might be lower for stigmatized diseases or complex treatments because these properties are potential barriers.

From a public health perspective, AtC can be seen as the ability of the HS to meet the requirements and needs of the population it serves. From this perspective the ability of the HS to achieve adequate hypertension control in a population and AtHTNC by the population are two sides of the same coin. The complexity of this interaction is reflected in the examples presented in textbox 1.

Textbox 1; examples of interactions between the health system and population characteristics

- Distance to health facilities can be a barrier, but if the population has access to transport, this may not be a problem
- Free services are usually considered a facilitator, but if it causes long waiting times and stock out of essential medicine, people may lose trust and turn to alternative medicine
- Knowledge can be a facilitator but if the knowledge is false or outdated it may be a barrier

The steps defined by Lévesque(31) can be seen as a chain of sequential steps whereby each step has to be taken. At every point barriers may impede someone from proceeding to the next step, thereby blocking AtC. Therefore even one critical barrier (e.g. no medication available) can block access to adequate healthcare. More likely it will be a sum of various factors which change over time.

Designing a new intervention for hypertension care in Kenya

In Kenya a good system for HTNC is lacking. As part of the national strategy for prevention and control of NCD the GoK has committed itself to establish a chronic care model (CCM) for service delivery at the primary healthcare level.(18) Therefore, any solution for improved HTNC should be based on this model to improve chances of successful development and implementation. The chronic care model has six components which are described in table 1.(33)

Community resources and policies	Provider organizations need linkages with community based resources like home-care or patient organisations
Healthcare organisations	Chronic care should be set as a priority. If purchasers and insurers do not reward chronic care quality, improvements are difficult to sustain
Self-management support	Patients become the principal caregivers, which involves helping patients and their families acquire the skills and confidence to manage their chronic illness, provide self-management tools and routinely assess problems and accomplishments
Delivery system design	Create a separation in chronic and acute care. Let physicians concentrate on complicated cases and let non-physicians do routine care, organise routine visits and support patient self-management.
Decision support	Evidence-based clinical practice guidelines should be integrated into daily practice. Integrated care should ensure easy access to and consultation of specialists
Clinical information systems	As reminder systems to comply with guidelines, provide feedback to physicians, for planning patient care and conducting population-based care

eHealth

It is frequently suggested that eHealth solutions can play a major role in chronic care and improving HTNC.(34–36) The WHO even states that universal health coverage cannot be achieved without the support of eHealth.(37) Amongst other things eHealth improves efficiency of healthcare, promotes information exchange between healthcare workers and patients, promotes adherence and makes healthcare available at distant places.(36,38) But as described by Labrique et al. eHealth is used in many other applications (see figure 3).(38)

1	Client education & behaviour change communication (BCC)	7	Provider-to-provider communication User groups, consultation
2	Sensors & point-of-care diagnostics	8	Provider workplanning & scheduling
3	Registries / vital events tracking	9	Provider training & education
4	Data collection and reporting	10	Human resource management
5	Electronic health records	11	Supply chain management
6	Electronic decision support Information, protocols, algorithms, checklists	12	Financial transactions & incentives

Figure 2; 12 applications for eHealth as described by Labrique et al, figure modified from original article

The GoK has made eHealth a priority in healthcare which is in line with the strategy to become the ICT-hub of Africa.(14,39,40) This is also reflected by the high number of eHealth projects initiated in Kenya.(41) One study found that even in rural settings with 19% electricity coverage, patients were able to have permanent access to receive text messages.(42) Therefore eHealth could be an important tool that should be considered in any intervention in Kenya.

The intervention

In an attempt to address global issues pertaining to access to and quality of HTNC, AHTI is developing an application based tool for primary care that should enable distance monitoring of BP and electronically connect patients to their provider. This eHealth intervention uses important aspects of the CCM. The application based home hypertension monitoring intervention (AHOHM) is expected to contain the following aspects(2);

- A BP machine for home-monitoring of BP by patients
- A mobile device based application including;
 - A patient module with;
 - The ability to document BP
 - Information regarding hypertension
 - Supportive behavioural change messages
 - A provider interface with;
 - an overview of patient information and BP values
 - the possibility to document information
 - a decision support system

The anticipated benefits are(2):

- Patients to be more involved in their treatment for higher adherence
- BP values for guidance of treatment will be more accurate and more readily available
- Saving time by reduced number of visits and less procedures during clinic visits
- Improved compliance to guidelines by providers
- Decreased costs to society due to more efficient care and better hypertension control

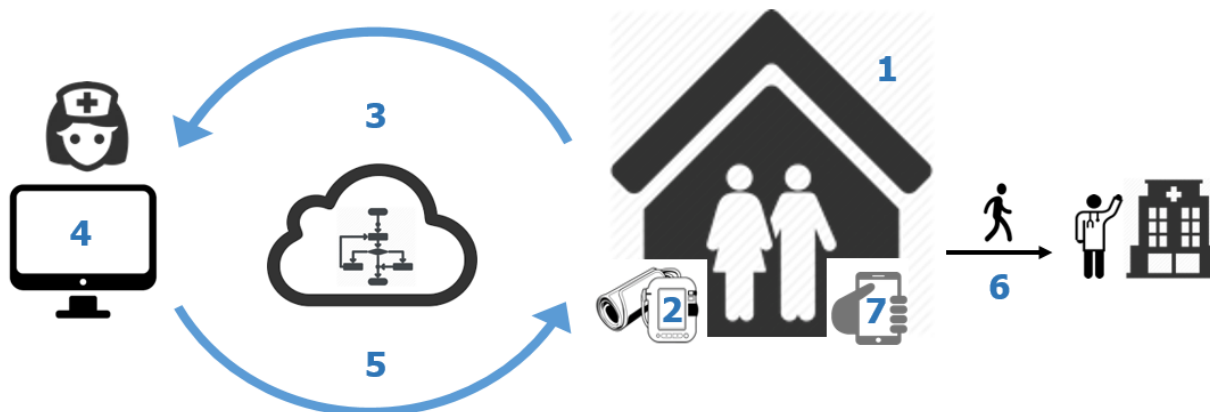


Figure 3; Schematic presentation of the proposed intervention by AHTI (AHTI internal communication)

1) patient measures BP at home; 2) after each measurement, patients enter BP-data in the application; 3) the application transfers data to the clinic; 4) BP-data will appear on the dashboard of the clinician, patients will be categorized based on their BP-values; 5) If BP-values warrant, patients are asked to visit the clinic; 6) the clinician decides when the patient needs to visit the clinic using the decision support system; 7) behavioural incentives appear at the mobile application

Research question

It is important to understand why AtHTNC in Kenya is currently so low and which FaB play a role. Firstly to allow for adaptation of the eHealth intervention to better address these FaB. Secondly this is needed to understand what effect can be expected of AHOHM on AtHTNC. All FaB's are important including the ones which are not addressed, as these may influence outcomes of the intervention. If all steps in the chain of AtHTNC would be optimized but a critical barrier (e.g. no medication available) is not addressed, the overall impact of the intervention will be low despite making big improvements. Therefore a thorough understanding of this process is essential.

Research question: What are barriers and facilitators for access to hypertension care in Kenya and what are the possible effects of an application based home monitoring intervention on access to hypertension care?

Objectives

General objective: To identify influencing factors for access to hypertension care in Kenya and to see how an application based home monitoring intervention could influence access to hypertension care in Kenya.

Sub-objectives:

1. To identify facilitators and barriers for AtHTNC for the Kenyan hypertensive population
2. To evaluate and redesign the existing Lévesque framework to adapt it for our purposes
3. To analyse to what extent AHOHM addresses the barriers and facilitators to hypertension care for the Kenyan hypertensive population
4. To make internal and external recommendations for further development and implementation of the proposed intervention in Kenya to improve AtHTNC

Methods

The research question will be answered through a literature search because this was considered most suitable and feasible. Based on an initial review of literature it was established that too little evidence is available to focus exclusively on AtHTNC in Kenya. Therefore the focus was broadened to finding articles related to AtC in Eastern Africa. The results of this literature search will be used to analyse the FaB for AtHTNC.

Search strategy

A literature search was conducted in PubMed on 15th of November 2017 for literature regarding access to healthcare and hypertension care in Kenya. The objective of the search was to get a comprehensive view of AtC and/or HTNC in Kenya.

Search: (access OR hypertension) AND (Kenya OR "east Africa" OR "eastern Africa" OR "east African community" OR EAC).
Filters used: full text, published in the last 10 years, humans and English. This resulted in 939 articles. It was decided not to expand the search strategy to find more articles because of time and analytical capacity constraints. The search strategy is described in figure 5.

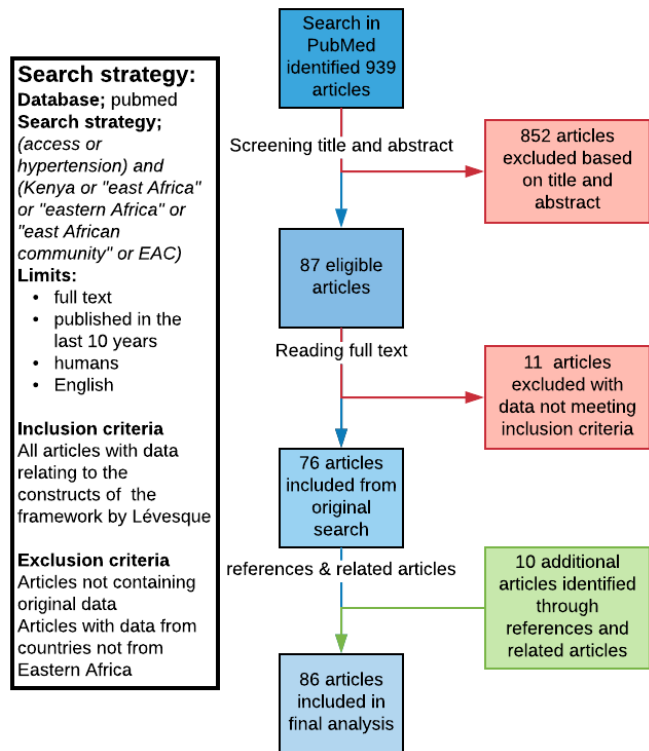


Figure 4; flow chart of search strategy

Analytical framework

It was decided to use the conceptual framework for AtC by Lévesque et al. because it uses a broad definition of AtC.(31) This allowed for a broad analysis of FaB for AtC in Kenya.

This holistic model was synthesized from several other frameworks, amongst which the influential and widely cited paper by Thomas and Penchansky.(31,32)

In the framework five dimensions of accessibility of the HS are set of against corresponding abilities of the population. A step in the chain of AtC can be taken if the match between the HS and the population is favourable. The chain starts at healthcare needs, and will pass through 5 progressive steps to healthcare consequences. This chain of AtC is graphically shown in figure 6.

Through this framework the interaction between population characteristics and matching HS characteristics can be analysed in relation to AtC.(31)

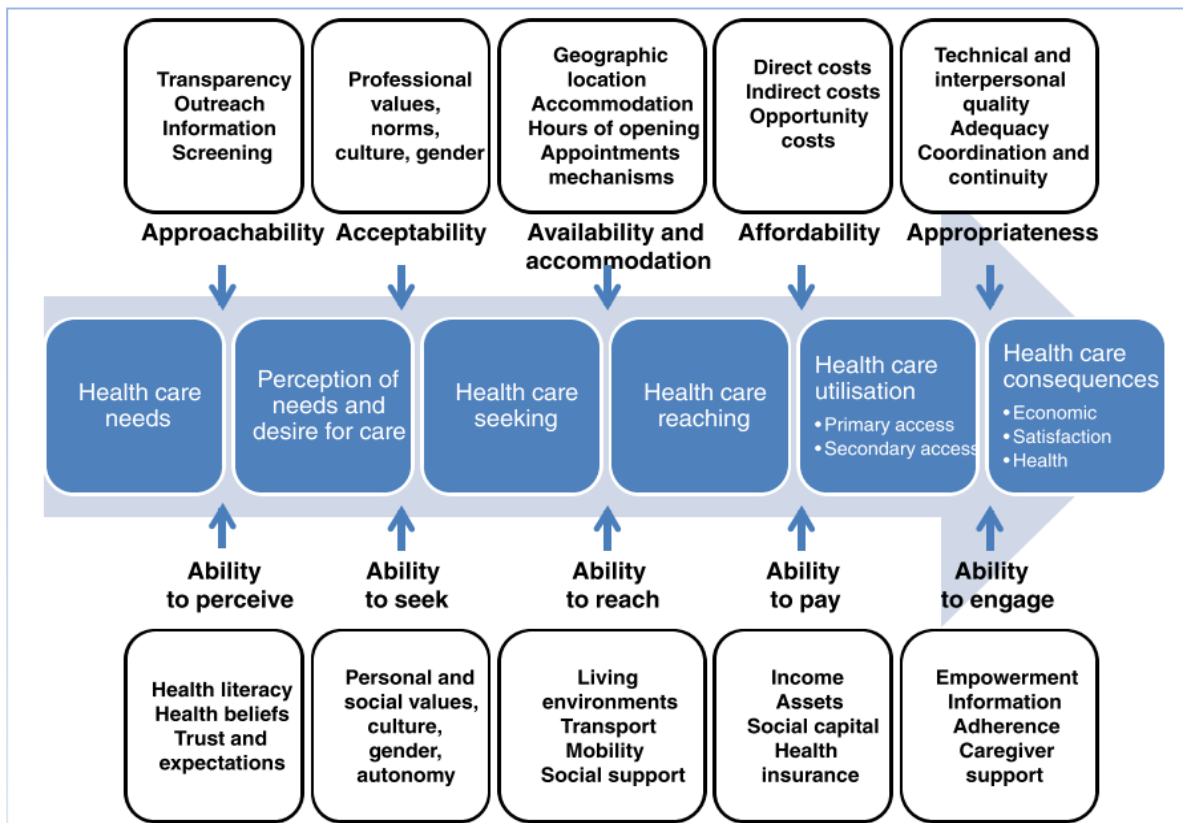


Figure 5 Conceptual framework of access to health care by Lévesque et al

Data analysis

The articles were screened for all types of FaB for AtC. If results from multiple countries were reported only data from Kenya were included. These FaB were coded according to the constructs of the framework into an Excel sheet. If a FoB could not be classified into the constructs, a new category was made to avoid forced classification. The results were organised according to the structure of the framework by Lévesque.

Following collection and deductively organising data a qualitative analysis was done to evaluate the framework for completeness and applicability for our research question. Through inductive thematic content analysis new themes and structures were identified to improve the framework. This resulted in significant changes in the framework which will be discussed in the first section of the discussion.

After adjusting the framework an analysis was done to interpret findings according to the new framework. During the analysis more emphasis was put on articles and data from Kenya and articles related to hypertension, CVD and other chronic conditions to enhance representativeness. Because the results from the literature search provided both qualitative and quantitative information an integrated analysis was done combining both forms of data. In general a representative sample of studies are quoted.

Study results

In total 86 articles were included in the analysis. The diversity of the studies was high with a mixture of qualitative(23), quantitative(52) or mixed methods(11) studies. 17 studies were specifically on hypertension. The other studies were related to HIV(21), maternal care and family planning(21), paediatric conditions(14), AtC and the HS(10) or other conditions(3).

Of the 17 studies on hypertension, 11 were from Kenya. Two Kenyan studies reporting on the broadest number of constructs(> 20) 4 studies were from the AMPATH site in Western Kenya, including the two broadest studies reporting on >20 constructs.(37–40) Four studies were from the slums of Nairobi(28,30,47,48), and the three remaining quantitative studies were from the rest of Kenya.(16,29,49). The 6 other studies on hypertension were from neighbouring East African countries.

The majority of the FaB identified could be classified into the constructs of the framework by Lévesque. The results of this analysis are tallied in table 1. On each part of the framework studies were found reporting related facilitators or barriers, except for social capital (4B-III).

The frequency of reporting the various constructs as a FoB ranged from 0–39 times with a median of 12 studies per construct. The constructs which were most frequently mentioned were; direct costs(39), geographic location(35), technical and interpersonal quality(30), assets(29), health beliefs(28), accommodation(24), health literacy(23), trust and expectations(23), culture of the HS(22) and living environment(20).

There were a wide variety of studies that reported barriers for accessing healthcare that did not fit the constructs of Lévesque. These were arranged into the following constructs;

- Emotional factors(43,50–56)
- Behavioural factors
 - Individual behaviour(44,55–59)
 - Behaviour influencing factors of the HS(44,51,54,55,60–65)
- Previous experiences(52,58,66–70)
- Education levels(42,52,57,59,71–79)
- Household composition and family size(57,58,68,69,73,80)
- Age(29,59,67,72–75,81–83)
- Disease related factors(44,52,54,56,57,62,63,66,72–74,83–87)
- Competing interests(29,44,52,55,56,60,63,69,74)
- Organisation of the HS(80,88)

The FaB identified within these new constructs will be described after describing the constructs of the Lévesque model. The relevance and place in relation to the constructs by Lévesque will be discussed in the discussion.

Table 2; overview of articles reporting on specific constructs of healthcare						
Construct	Sublevel	Reports on hypertension Kenya	Reports on hypertension other countries	Reports on access to care Kenya	Reports on access to care outside Kenya	
Healthcare needs						
A. Approachability (Health system)	I. Transparency			(53,63,87,89,90)		
	II. Outreach	(43,44)	(91)	(55,89)		
	III. Information	(43,44)		(53,55,64,89)		
	IV. Screening		(84)			
B. Ability to perceive (Population)	I. Health literacy	(43,44,47,49)	(91,92)	(51,53–55,65–70,78,87,89,90,93,94)	(95)	
	II. Health beliefs	(28,43,44)	(52,91,92,96)	(53–55,57,62,65,68–70,83,85,87,93,94,97–100)	(60,95,101)	
	III. Trust and expectation	(43–45)	(96)	(51,53–55,62,64,68,69,78,79,87,89,93,94,98,102)	(60,95,101)	
Perception of needs and desire for care						
A. Acceptability (Health system)	I. Professional values	(43,44)		(51,64,69,87,90,102–104)	(95)	
	II. Norms	(43,44)		(50,54,64,65,69,78,87,90,103,105)	(60,95)	
	III. Culture	(43,44)	(52,91)	(51,53–55,61,63–65,68,69,85,87,90,102–104)	(60,95)	
	IV. Gender			(54,69)		
B. Ability to seek (Population)	I. Personal and social values	(44)	(91)	(50,51,62,65,87,90)	(60,95)	
	II. Culture	(43,44)	(84)	(51,53,56,57,62–64,69,85,89,90)	(60,95)	
	III. Gender	(16,43,46,48,49)	(52)	(53,61,68–70,83,86,87,90,94,98,106)		
	IV. Autonomy	(43)		(53,55,59,65,69,79,89,94,98)	(95)	
Healthcare seeking						
A. Availability and accommodation (Health system)	I. Geographic location	(43,44)	(84,91)	(50,51,53–57,64,65,67,69–72,75,76,79,86,87,89,93,97,98,102,106–110)	(60,101)	
	II. Accommodation	(43,44)	(91)	(27,51,53,55,63–66,68,69,74,78,85,87,89,104,105,110–112)	(60)	
	III. Hours of opening			(50,62,74,87,108,110)	(60)	
	IV. Appointment mechanisms			(64,90,112)		
B. Ability to reach (population)	I. Living environments	(43)	(113)	(54,57,58,62,64,67,69,71,77,78,83,86,87,89,102,110,111,114)	(81)	
	II. Transport	(44)	(52)	(50,51,53,54,57,62,63,66,69,78,90,102,110,112,114)	(60)	
	III. Mobility	(43)		(51,55,56,63,69,85,89,110,115)		
	IV. Social support	(43,44)		(53–55,61–63,69,85,89,90,93,94)	(60)	
Healthcare reaching						
A. Affordability (Health system)	I. Direct costs	(30,44,46)	(84,91,92)	(20,27,50,51,53,57,62,63,65,66,69,75,78,85,87–90,93,94,97,98,102,105,107,110,111,114,116–118)	(60,101)	
	II. Indirect costs	(43)	(52,84)	(51,54,56,63,64,69,85,87,102,110,112,114)		
	III. Opportunity costs	(43,44)	(52)	(51,56,64,85,112)	(60)	
B. Ability to pay (population)	I. Income		(52)	(27,50,59,65,68,73,76,79,80,90,114)		
	II. Assets	(16,43,44)	(91,92)	(51,53–55,57,59,67–73,77,79,83,87,97,102,106,110,111,114)		
	III. Social capital					
	IV. Health insurance			(57,77,90)		
Healthcare utilisation primary and secondary access						
A. Appropriateness (Health system)	I. Technical and interpersonal quality	(43,44,46)	(84,91,113)	(51,57,62,65,68,69,74,78,88–90,97,98,102,105,107–111,119–121)	(60)	
	II. Adequacy	(43,44,46)	(84)	(66,69,82,90,97,102,103,108–111,119)	(60,101)	
	III. Coordination and continuity	(44,46)	(84)	(53,66,68,69,80,87,88,105,108,111,116,121)	(60,101)	
B. Ability to engage (population)	I. Empowerment	(46)	(84)	(55,104)		
	II. Information	(43,44,46,47)	(84)	(62,65)	(60)	
	III. Adherence	(28,30,44,46–48)	(84,92)	(74,82,85,104)	(60)	
	IV. Caregiver support	(44)		(63)		
Healthcare consequences						
	I. Economic			(65,114)		
	II. Satisfaction	(44)		(53,87,88,104)	(95)	
	III. Health	(44,46,48)	(84,92)	(56,63,65,66,87,94,104,122)		

- **Healthcare needs**

- A. Approachability**

Relatively few studies reported on the approachability of the HS. Only 11 studies reported FaB on any of these constructs and these were mainly qualitative studies. Main themes were that prices and procedures at health facilities were not transparent causing people to avoid clinics out of fear of incurring high costs(53,63,87) and lack of information regarding condition or procedures withheld people from seeking healthcare.(43,53,55,89,123)

An interesting finding presented by a Ugandan study was that people were more inclined to use alternative medicine because of commercials by providers of alternative medicine.(91)

- B. Ability to perceive**

A total of 40 studies (47% of all studies) reported on constructs of the ability to perceive, of which 10 hypertension-studies. Most studies reported lack of knowledge, misinformation, lack of trust in the HS and low expectations of treatment as barriers. In addition to that there were several studies reporting good knowledge, trusting the health facilities and populations perceptions that traditional medicine to be outdated and unnecessary as facilitators for AtC.

The hypertension studies reported low levels of knowledge regarding hypertension and CVD almost universally.(43,44,47,91,92) For example in one study many people were unaware hypertension can be asymptomatic.(91) A qualitative clinic-based study among patients with high therapy adherence showed that 47.1% of patients reported there is no link between hypertension and CVD, while 14,5% said they don't know.(47) So even among patients who reported to be highly motivated to take their medication, knowledge regarding HTN and the link with CVD was low. Lack of knowledge of the HS could also be an important barrier as was shown by a multi-country study whereby caregivers avoided going to a health facility if they were unaware of exemption policies.(53)

Health beliefs were found to be important barriers as 4 hypertension-studies mentioned people believing in witchcraft or traditional medicine, with 1 Ugandan population based survey reporting 29% usage of traditional medicine in hypertensive patients.(28,44,91,96) This is significantly higher than the 1,1% reported among patients using medication for hypertension in the Kenyan STEPwise survey.(16) Some studies reported patients believed not to need testing or treatment because they did not experience any symptoms(43,52,92), or believed they had a low risk of disease.(83)

Trust and expectations varied significantly with studies. While it was frequently reported that patients in general preferred biomedical medicine in maternal care and HIV care(51,62,69,89,98), in the qualitative studies regarding hypertension patients stated to have low expectations with regard to effect of biomedical medicine in the treatment of hypertension.(43,44) Lack of trust in health facilities was frequently mentioned(78,87,95,124), but also lack of trust in traditional medicine was mentioned.(62,94) Lack of trust may have a negative impact on patients as one study reported that patients who did not trust the HS contacted multiple providers which resulted in higher costs.(87)

- **Perception of needs and desire for care**

- A. Acceptability**

26 studies (4 hypertension studies) reported on the acceptability of the HS with a majority focussing on the culture of the HS. There were no major differences between hypertension and non-hypertension studies. Some themes could be identified as FoB. Firstly corruption was cited by several studies, whereby people had to pay extra or family members of HCW got privileges. (43,65,78,87,90,123) One study mentioned that some health providers purposely exploited the vulnerability of HIV infected people. (95) Also significant worries existed with respect to confidentiality, integrity and privacy especially in HIV related studies.(102,104,105,123) Another aspect of HCW that was mentioned was that they were slow to react to (emergency) healthcare needs and high absenteeism of HCW.(43,54,69,87)

However, most striking with respect to the acceptability of the HS was the almost universal reporting of bad attitudes, bad communication skills, scolding and judgmental attitudes of HCW in the formal HS. This was reported as a reason to stop treatment in HIV and HTNC (43,44,51,60,85,90), but also as a reason to prefer self-medication.(91) While a supportive attitude was mentioned as a stimulus for continuing treatment.(55,60,104) Gender influences were reported by 2. Interestingly enough, pregnant women from these studies reported to prefer male HCW. (54,69)

- B. Ability to seek**

37 studies (8 hypertension studies) reported on the constructs of the ability to seek. Most reported on gender or culture related issues. Main barriers were stigma's in HIV and pregnancy at young age.(62,64,65,85) The perceptions that healthy women should deliver with a traditional birth attendant and should appear strong for their environment(50,60,69) but also religious believes were reported as barriers.(57,89) One hypertension study reported elderly might avoid healthcare because they could feel burdensome to their families.(43) Many studies reported traditional medicine and biomedical medicine to be used concurrently or serially dependent on the attributed cause.(28,44,91,94,96) Attribution of disease to a supernatural cause was found to increase the odds of delayed presentation.(95,98)

With respect to gender many studies reported differences between male and female (sex) participants but not the reasons behind it (gender). In general women were reported to be more frequently enrolled in HTNC than men, which was attributed to sexual and reproductive health related contacts with the health system.(46,48,52) Female subjects were 4 times more likely to be aware of and use medication for hypertension in one study.(49) In the STEPwise survey women were twice as likely to be on treatment compared to men.(16) With respect to health related decisions it was found that women were frequently dependent on their husband or other family members for decisions and financial support.(43,53,65) In HTNC it was reported that men usually delay seeking treatment until they experience severe disease.(43)

In a study about family planning it was found that increased autonomy resulted in increased access.(79) Lack of autonomy was reported by several studies, whereby mostly women, children and younger people could not decide for themselves and older persons, men, community leaders and traditional healers were the ones with the authority to decide.(69,89,94,95) One hospital-based study reported that 65,8% of admitted patients (or their caregivers) reported that others took the decision for them to go to the hospital.(98)

- **Healthcare seeking**

- A. Availability and accommodation**

A total of 48 studies of which 4 hypertension studies reported on the constructs of availability and accommodation. 29 of these were reporting on geographic location as a FoB. A large majority of these studies found that living at an increased distance of a health facility decreased access and utilization of healthcare.(43,51,53,60,86,101,111) While some reported no effect(97,104,107), none reported the reverse effect.

In Kenyan studies on maternal healthcare it was found that the odds of facility delivery were 4 times higher if women lived less than 2km away from a health facility compared to the women living more than 5 km from a facility.(71) This is relevant as a study based on the 2008/2009 DHS found 88% all women lived within a 5 km radius of a health facility.(57) A Ugandan study reported 92% of health facilities delivered HTNC.(84) However if taken into account that lower level facilities more often provided inadequate care(108), geographic distance to adequate care may still be high.

Lack of accommodation and facilitating swift care was frequently mentioned. Most importantly long waiting times in health facilities were reported by HCW and patients as a reason not to attend care (43,51,53,74,111) or self-medicate(91). In one study 85% of patients reported to avoid seeking healthcare because of long waiting times.(111) Other barriers mentioned were high frequency of visits causing fatigue and complex procedures of healthcare causing patients to be intimidated.(64) Financial accommodation was mentioned as a facilitator for pregnant mothers to go to a TBA. As payment methods were more flexible (in kind or delayed payments), women decided to use a TBA instead of formal health services.(51,54) No examples were found whereby this was utilized in formal healthcare.

Diverting of healthcare seeking behaviour towards TBA's or self-medication was also observed when healthcare was not available due to restricted opening hours.(62,69) Lack of 24-hour care and unfavourable opening hours was also reported as a problem in HIV care(60,74) and maternal care.(108,110) A study on capacity of health facilities to provide routine emergency childbirth care showed only 83% had 24-hour services.(108) Although few studies reported on appointment mechanisms, this seems to play a major role in long waiting times. One study showed that a designated time appointment system could lead to a reduction of waiting times by almost 70%.(112) Another Kenyan study found that lack of organisation of care caused critically ill patients to wait for a long time in emergency care.(90)

- B. Ability to reach**

39 studies were reporting on constructs of the ability to reach. Living environment was mentioned most frequent, whereby a number of studies found decreased AtC in rural environment compared to urban environments.(57,77,113) Economic differences between areas were shown to play a role in AtC, as one study showed women from impoverished areas received significantly lower quality care compared to women from wealthier areas.(109) Safety issues related to the environment as well as bad quality roads were mentioned by patients as a barrier.(62,69,78,110). Living in an institution was also mentioned as a reason not to have AtC.(64)

There were big differences reported in utilisation of healthcare based on geographic area.(58,102) In Nairobi county 40% of women had adequate maternal healthcare services compared to only 8% in the north-eastern province.(77)

Lack of availability of (affordable) transport required people to walk big distances(53,60) or not to attend healthcare(50–52,62,78). While availability of transport was associated with increased access.(90) Long travelling times caused people to fail to access care whereby an inverse relation was reported whereby increasing travelling times led to decreased access.(111)

Impact of mobility on AtC varied significantly per population and condition. Pregnant women reported decreased mobility at the end of pregnancy as a barrier, causing them to deliver at home(51,69,110) but also in elderly decreased mobility caused them to have decreased AtC.(81) In another study among a nomadic tribe it was found that increased mobility of the tribe decreased AtC,(89) while increased mobility of a non-nomadic population was found to be associated with increased AtC.(115) Moving away of patients was mentioned to be the reason in 14-25% of patients lost to follow-up.(56,85,99)

Lack of social support was mentioned by several studies as a FoB. People mentioned not to disclose their HIV status out of fear of losing relationships.(60,85) In both HIV and hypertension care patients reported not to attend healthcare because of lack of social support.(43,44,69,89) Lack of support by employers was found to be a barrier in HIV care.(63) In another study it was found that social support was not important in decisions by caregivers of children.(62) Social support was found to be essential in one study on emergency care whereby the majority of road traffic accident victims were brought to the hospital by unknown people.(90)

- **Healthcare reaching**

- A. Affordability**

43 studies (7 hypertension studies) reported on aspects of affordability, of which 32 studies reported on aspects relating to direct costs. Virtually all these studies reported that financial thresholds could function as a barrier for accessing care. In one study only 12% of pregnant women considered healthcare to be affordable.(102) Vice versa it was found that decreasing financial barriers through free services or a voucher scheme increased access.(27,107,117) Indirect costs were identified as a barrier whereby transportation costs was mentioned most frequently(43,51,52,84,85) but also unofficial payment was mentioned.(87) Opportunity costs were mentioned by several studies,(43,51,52,60) mainly reported as work commitments and not loss of income.(56) There was no difference observed between studies reporting on hypertension and other studies.

Few studies quantified the impact of healthcare costs, nor were estimates made of the ratio between direct costs, indirect costs and opportunity costs. Only one study from 2013 calculated that transportation costs accounted for 23,89% of health related costs (healthcare + transportation).(114) One study on tuberculosis made an estimate of the opportunity costs, but these estimates were not representative for patients of hypertension because it presumed loss of work during the treatment period.(100)

B. Ability to pay

35 studies were identified that reported on the ability to pay. Most of these (24 studies) reported on assets or socio-economic status (SES). The findings were consistently showing that a job or income, high SES or more assets and being insured increased access and utilisation of healthcare. While unemployment, lower wealth and no insurance were associated with lower utilisation of health services and decreased access.(114) No studies were identified that showed the opposite effect. Lack of social capital or was never mentioned as a barrier, but one study reported patients exploiting their social capital for their health expenditures.(88)

The significant influence of wealth on AtC was seen in one study whereby the unadjusted odds ratio of facility delivery was 18.3 for the wealthiest quintile compared to the poorest quintile. Adjusted for confounders this was still 5.62.(57) Another Kenyan study showed that the wealthiest quintiles profit most from government healthcare benefits while the poorest have greater healthcare needs.(20)

A study on healthcare payments based on the 2013 Kenya Household Expenditure and Utilization Survey, found the incidence of catastrophic health expenditure (defined as out-of-pocket health costs > 40% of annual non-food expenditure) to be 6.58% if direct costs and transportation costs were combined. There was significant inequity between richest and poorest quintiles, whereby 2.40% of the highest socio-economic quintile incurred catastrophic healthcare costs and 15.68% of the population in the poorest quintile. Catastrophic health expenditure also varied between counties, whereby Turkana county had the highest (30.91%) and Nakuru county the lowest (2.59%) incidence which may be influenced by difference in poverty levels. In 2013 an estimated 619,541 people were pushed into poverty because of health expenditures.(114) These calculations did not take into account unofficial payments, other indirect costs and opportunity costs. The MoH estimated in 2009 that 16% of the sick did not seek care for financial reasons, while 38% had to sell their assets or borrow in order to finance their medical bills.(125)

- **Healthcare utilisation; primary and secondary access**

A. Appropriateness

There were 38 studies (8 hypertension studies) identified reporting about aspects of appropriateness. Most reported on technical and interpersonal quality, whereby lack of qualified staff, good equipment and medication were most prevalent.

In the hypertension studies stock out of medication was mentioned most. All hypertension studies reporting on this topic mentioned this as a problem.(44,84,91) A Kenyan study quantifying availability showed that availability of anti-hypertensive drugs were usually below 50%(113) which is comparable to a study from Uganda(84). Availability was especially low in public health facilities, lower level facilities and rural facilities.(113) Also lack of essential equipment was mentioned(43,46,84) and lack of trained staff.(44,84) One Ugandan quantitative study found that 92.9% of health facilities reported to manage hypertension. 98.1% of all HCW indicated that they were in need of additional training for hypertension management.(84)

With regard to adequacy there were contrasting statements, one Kenyan hospital-based study reported that adherence to national hypertension guidelines was high(46) but two other studies reported lack of guidelines and lack of specialized treatment.(44,84)

The findings of these hypertension studies are in line with other areas in the Kenyan healthcare system. Both in maternal care and malaria care it was found that patients were receiving care according to the MoH guidelines in less than 50% of cases.(77,80,102,108) In addition to that, studies reported lack of staff, lack of equipment, lack of training, stock out of drugs and lack of guidelines to form barriers for accessing care.(60,66,69,90,103,110) Although two maternal care studies were identified whereby patients reported satisfaction about quality and availability of care(62,65), available evidence clearly indicates that appropriateness of the HS in Kenya is low.

B. Ability to engage

17 studies of which 8 hypertension studies were reporting on aspects of the ability to engage. The topics discussed were heterogeneous, whereby 12 studies reported about adherence or loss to follow-up. Adherence rates varied from 78.3% (in-hospital)(47) to 3.4% (out-patient)(30) in HTNC and as high as 89%(82) in HIV care. Although another HIV-study showed loss to follow-up to be 37.8%.(126) Both patients(60,62,65,104) and HCW(46,84) reported that motivational and supportive counselling and patient education are important facilitators for utilization of healthcare by patients. Peer support or caregiver support were perceived to be important facilitators as well.(44,63) No studies were identified that quantified the relative impact of these factors.

• Healthcare consequences; economic, satisfaction and health

Only 17 studies reported on aspects of healthcare consequences of which 6 hypertension studies. The main focus was on health (13 studies) whereby lack of symptoms and experiencing side-effects were reasons to stop treatment.(65,92,122,127) Interestingly good results on treatment was reported by patients in HIV care both as reason for continuation(104) and non-adherence.(63) Women who did not experience negative health-consequences in previous pregnancies were more likely not to use skilled health attendants.(66) Expected improved economic outcomes with treatment was mentioned by one study as a reason for participants to attend healthcare.(65)

Satisfaction was reported by 4 studies to be a FoB. Satisfaction was found to be only 55% in malaria treatment(87), while almost 60% rated quality of care as poor-fair in emergency trauma care.(88) One study reported that people preferred to go to traditional healers with their children because they experienced more spiritual and social satisfaction there.(53) Three studies found it to be a barrier for AtC.(87,95,127)

• Factors identified but not addressed in the framework

There were several FaB which were identified, but did not fit the constructs. These were noted separately after which these were organised into the new constructs below.

Emotional factors

With regard to emotions it was found that fear was a reason for people to avoid healthcare. This fear could be non-related to disease, whereby one study found that elderly might feel burdensome to their family(43) and another study found fear of travelling because of safety issues as a barrier.(56) Dislike of the health facility was also mentioned as a barrier to attend healthcare.(55) More often it was disease related whereby fear of lifelong treatment, fear of side effects, fear of caesarean section were reasons not to attend healthcare.(43,50,51,53–55) However, one hypertension study reported fear of economic and health related consequences to be a facilitator to seek healthcare.(43) Other emotions were not mentioned as a FoB.

Behavioural factors

There were 10 studies identified that reported on behavioural aspects, which could be subdivided into FaB linked to individual behaviour and FaB linked to properties of the HS.

- ***Individual behaviour***

The studies reporting on individual behaviour as a barrier reported several mechanisms. Two studies reported lack of interest and motivation as reasons not to attend care.(44,55) Two other studies reported patients would go into denial as a coping strategy, thereby avoiding healthcare.(43,55) Forgetfulness was mentioned as a reason not to adhere to therapy in both HIV and hypertension study.(44,56) Although not clearly stated as a reason there were some indications that a habit of attending formal health services in the past led to increased facility delivery.(57–59)

- ***Behaviour influencing factors of the health system***

In a number of studies properties of the HS and organisational aspects were mentioned as facilitators and barriers. Positive incentives like free food with HIV program(44,55,60), free testing for HIV and other conditions(51,62,65), free bed nets and medication(51,63) were mentioned as facilitators for patients to seek healthcare. One study even reported patients went to different facilities to benefit from all incentives.(64) Stopping a positive incentive was also mentioned as a reason to stop treatment.(64) In one study women reported to attend antenatal care because they expected to receive better and faster care during delivery.(62) In addition to that there were several studies mentioning fear of testing for HIV in maternal care as a negative incentives, causing people not to attend healthcare.(54,61,62)

Experience

Closely linked to behaviour, there were 7 studies reported on experience of patients as a FoB to attend healthcare. Personal experience of knowing someone else with the specified condition was mentioned as a reason to attend healthcare in one HIV and one hypertension study. (52,70) While in maternal care it was found that previous experience of uncomplicated delivery and higher order pregnancies resulted in delayed healthcare seeking and home delivery.(58,66,67,69) One study reported that past experience with poor quality services caused patients to fail to appreciate the severity of disease as a barrier.(68) It seems that experience influences the attributed risk to a condition, which may cause someone to seek or avoid healthcare.

Education level, language and literacy

13 studies were identified that mentioned education level as FoB. An increased education level was found to be associated to increased linking to healthcare(52,59,73), increased healthcare utilisation (57,71,72,75–77,79) and lead to higher adherence levels.(74) Also the education level of the partner was shown to have an impact on healthcare utilisation.(75) Most studies showed an incremental effect of education, whereby higher education levels resulted in higher attendance levels.(57,76) One study even reported an adjusted odds ratio of 8.657 (CI 1.445-51.85) of using a skilled birth attendant during delivery between the non-educated and the highest educated.(76) No studies were found to report increased education levels as a barrier. Language and low literacy levels were reported as barriers by only two studies.(42,78)

Household composition and family size

There were several studies reporting on family composition and family size. Having a larger family was associated with decreased utilisation of healthcare.(57,73,80) Also families whereby the

husband had multiple wives or was not monogamous were found to have a decreased utilisation of healthcare.(57,68) AtC was found to be higher for children when the father was alive and when pregnant women were with the father of the unborn child.(58,73) However, when the head of the household was the husband it was found that adherence was lower compared to when any other family member was the head of the household.(80) Presence of an elderly person, a person with a chronic ailment or a large family size were also found to be associated with increased odds of catastrophic health expenditure.(114)

Age

There were 10 studies that reported age to be associated with increased or decreased AtC. Four studies found that a more advanced age was associated with increased healthcare utilisation(27,72–74), but others reported decreased linking(83), decreased utilisation of healthcare (59,75,81) and decreased adherence(82) with increasing age. One study found lower utilisation of healthcare in both younger and older age groups.(67)

Disease related factors

Another category which was not included in the Lévesque model were FaB related to the disease, which was mentioned by 16 studies. One of the observations frequently mentioned was that people with non-severe disease or low risk conditions were less likely to initiate treatment, causing patients not to start or delay treatment(44,52,54,62,63,66,72,73,84,87) or cause non- adherence.(85) In two HIV studies it was reported that patients with more advanced disease were less likely to adhere to therapy. (56,74)

The nature of disease was another reason why people did not attend healthcare. For example pregnant women who could not access care in time because of abrupt onset of labour(57) or lack of symptoms in hypertensive patients causing patients not to recognise disease.(44)

Competing interests

In 9 studies they reported on competing interest of the patient which caused them to prevent or delay seeking healthcare. One study mentioned commitment to work(56), three studies mentioned social/family responsibilities(55,56,63) and three studies mentioned the need to take care of primary needs as a barrier to access care.(60,63,69) In a study on hypertension participants reported that leaving activities and work to attend HTNC was disadvantageous as they preferred to focus time and money on primary needs which were more urgent.(43)

In addition to that several studies mentioned co-morbidity as a barrier to accessing care, which were interpreted as health related competing interest. Conditions mentioned as barriers were depression(60), alcoholism(44,74), pregnancy(55) and mental instability.(56) On the other hand tobacco use and alcohol consumption were associated with increased linking to healthcare following screening for hypertension.(52)

Organisation of the health system

In addition to accommodation of health facilities it was found that complexity of the HS as a whole also influences AtC. Availability of alternatives to formal health services were found to cause patients to seek healthcare elsewhere. For example drugs bought at local shops accounted for 30,5% of all malaria drugs purchased.(80) Also delays in services was found to differ dependent on which type of facility was used. More delay was found in public and faith-based hospitals.(88)

Discussion

A significant amount of evidence was identified through the literature search, with a wide range of articles from different areas and different conditions. Therefore we could get a broad and deep insight into AtC in Kenya. A significant proportion was hospital based, which may play a significant role as the population-based STEPwise survey reported medication use of only 22% in the preceding two weeks(16), several hospital based studies reported medication use of >50%.(47)

11 of 86 included studies(13%) were relating to HTNC in Kenya. Of these only 3 reported on more than three FoB, and 2 of these were from the same study site. Therefore it can be concluded that the level of evidence on the FaB for AtHTNC in Kenya is low.

1. Evaluation and redesigning the framework

The framework by Lévesque was useful to structure findings from the studies identified by our search strategy. However, not all FaB identified could be classified into the constructs. First, there was significant overlap in categories for some FaB identified, which made it difficult to classify findings. This may be attributable to the fact that none of the identified studies were conducted with the framework by Lévesque and many studies used different models or no model at all.

Therefore there was considerable heterogeneity in the way FaB were reported. For example studies reported on the influence of travelling time(86) which in fact is a composite measure of distance, living environment and availability of transport. In addition to that FaB were identified that did not fit any construct. These were organised in the new constructs described in the results section.

On using the model for structuring and analysing data it became clear that it was not possible to quantify the possible effects on AtHTNC of AHOHM. The main challenge was that it was not possible to quantify AtC, nor to make clear what the relative impact of individual FaB was. To some extent this is caused by lack of standardised reporting of results, which is a barrier for systematic analysis. But we also considered the structure of the model to be unsuitable for our research question.

This seems to be the result of the definition of AtC used by Lévesque, which puts the possibility of a patient central in defining AtC. We feel this is inadequate for our purpose because it is difficult to measure possibilities, which makes it difficult to apply and use this model in practice. Secondly it puts the responsibility of accessing care at the level of the patient. To some extent this is justifiable, but it fails to address the responsibility of the HS to adjust services and working methods to the population it serves.

Definition of access to care by Lévesque

“the possibility to identify healthcare needs, to seek healthcare services, to reach the healthcare resources, to obtain or use health care services, and to actually be offered services appropriate to the needs for care.”

We therefore propose to use a different approach whereby AtC is defined as: The ability of the HS to identify healthcare needs (monitoring and research), to identify patients (screening), to motivate and enable patients to enrol in care (linking), to provide adequate and appropriate treatment and follow-up (healthcare utilisation) in order to get improved health outcomes.

This definition is a combination of the “cascade of care” and the AtC model by Lévesque. This HS perspective on AtC can be seen as the opposite side of the same coin of the model by Lévesque. By

combining the AtC model and the cascade of care, AtC becomes a quantifiable performance indicator for the HS to address the needs of the population.

In the next chapter we describe the challenges experienced in using the Lévesque model in more depth, which will then be used for designing a new AtC model.

Challenges experienced with the Lévesque model

In applying the model it became clear that it did not include aspects which seem essential for understanding why people may or may not access care nor was the structure of the model suitable for quantification of AtC. In order to understand what the impact of any intervention may be, quantification is essential. Below follows a point wise summary of the problems identified.

- Because of a lack of quantitative endpoints and intermediate performance indicators the model does not allow for quantification of AtC or the relative impact of individual factors. If quantification is not possible, it is not possible to quantify changes over time nor to measure impact of programs. Lack of possibilities to measure the impact of individual factors on the whole process, makes it difficult to prioritize which FoB should be targeted.
- Although the original paper states that the model is relating to one episode of care it does not make clear that AtC may differ per condition/disease. Disease and disease management related factors have a significant influence on AtC.
- The framework is presented as a linear process whereby each construct has a fixed place in the process, but several factors may have an impact throughout the process. Failure to appreciate this, may cause public health professionals to underestimate their effect.
- There is no distinction made in process related FaB and FaB which are unrelated to the process of accessing/providing care. This distinction may be important in analysing underlying problems and in developing interventions.
- Several FaB were not included in the model, especially FaB which seem unrelated to the process of accessing care. Therefore the framework does hardly take into account the outer setting. This is essential for understanding why people access care or not.
- The framework does not include any factor relating to behaviour or emotional factors. As decision taking is not just a rational weighing of pros and cons, emotional and behavioural factors may significantly influence AtC.

Main critiques on the Framework:

- It is not possible to quantify access to care nor the relative importance of individual factors
- There is no distinction between diseases/conditions
- The process and its constructs are presented as a sequential and linear process
- The outer setting and its influence on AtH are not taken into account
- Important factors relating to the disease, the population and the health system were not included
- Emotional and behavioural aspects were not included

Designing a new framework

In order to address the issues raised in the previous section, we developed a new framework. The aim was to develop a holistic framework that can be used as a tool for public health purposes, that allows for quantification of AtC and enables the user to prioritize identified FaB. It could also help to adjust interventions to the needs of the population and to identify gaps in the knowledge about AtC.

In addition to that the framework could be used as a new standard for future studies in the field of AtC to improve comparability and communication over this topic.

Compared to the Lévesque model the model is altered at the following points;

- Performance of the HS according to the steps of the cascade of care model was put central in the process of accessing care to create quantifiable (intermediate) outcomes.
- A distinction is made between process related factors and process unrelated factors. Factors which are process-related apply only to that episode of a specified disease in a specified population. In general these are the factors which can be influenced most easily by policy makers and HCW. Factors unrelated to the process can be seen as constant factors which can relate to the disease, the population or the HS. Many of these factors are likely to apply to a multitude of diseases.
- Introduction of an action step between the process-steps leaves room for behavioural and emotional aspects. This recurrent step emphasizes that AtC is more than just a sum of barriers and facilitators, but a complex interaction of emotional and behavioural responses to the HS and population factors.
- New FaB which were identified in the data analysis were included in the new Framework.

Using this framework does not warrant an easy and clear answer to our research question but it is likely to give a more comprehensive understanding of why people do or do not access care. The new framework is presented in figure 6. The model includes most important factors identified by our study, but it is not intended to be exhaustive. Other factors may apply in different settings.

The FaB which are not directly related to the process of accessing care are organized and clarified with an example in table 2. In table 3 questions are formulated that show how the process-specific part of the model could be applied to HTNC.

In the next chapter we will analyse the results through the new model. For the purpose of this thesis we will apply it to Kenya as a whole. However, as considerable heterogeneity in AtC exists even within relatively small geographic areas(16,28,79,128), we feel the model is most suitable to apply in smaller geographical areas. We think a suitable size to apply the model could be county level.

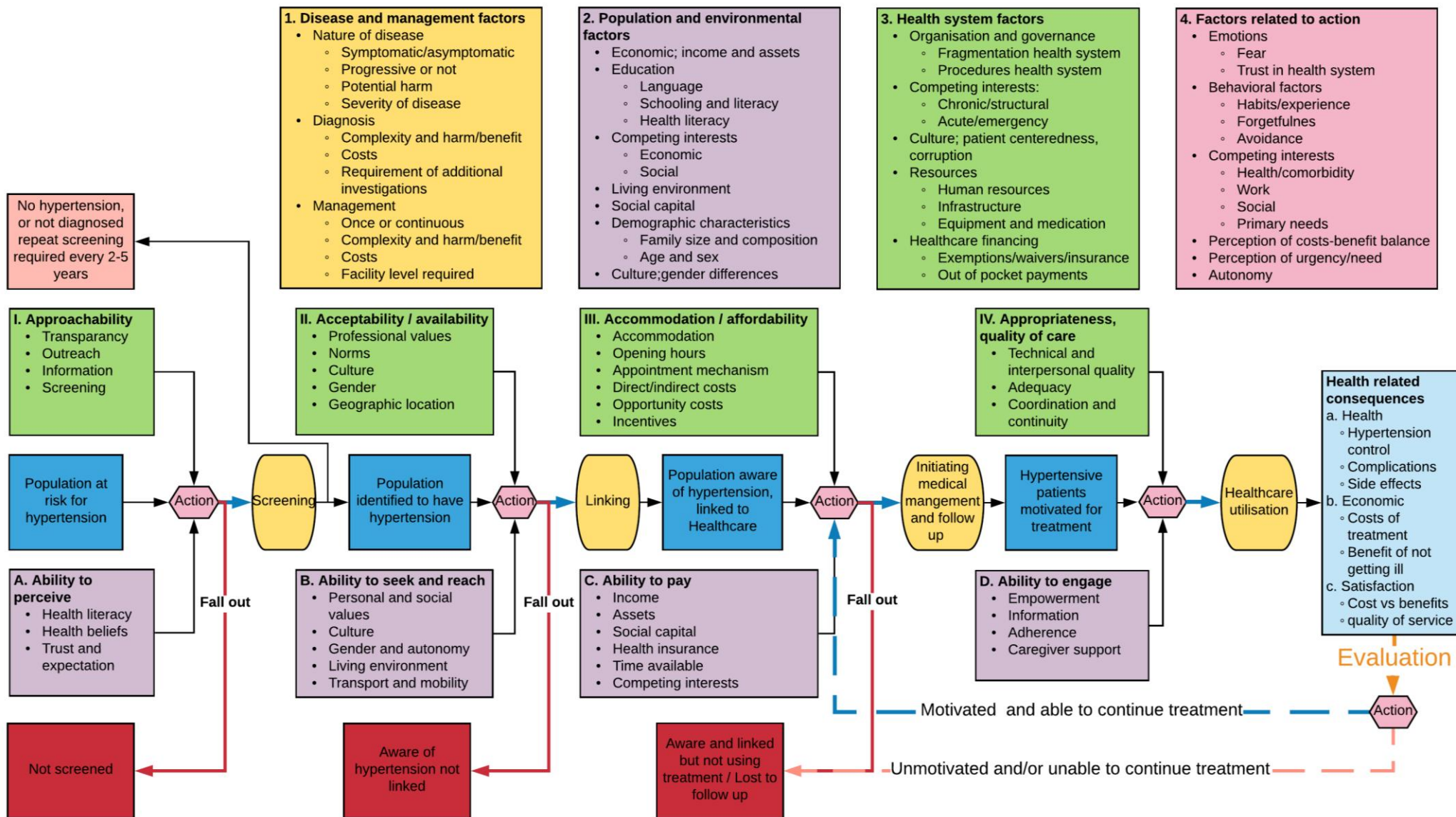


Figure 7; proposed new model for access to care applied to hypertension care.

- The model is a mix of the model by Lévesque and the cascade of care. The concept is that access to care differs per disease, so this model should be applied per disease/condition. From left to right the process goes through the steps of the cascade of care. This approach could enable the user to understand better which barriers and facilitators are most important.
- The textboxes numbered 1-3 above the flowchart represent barriers/facilitators which are not related to the process of accessing healthcare and may have an impact throughout the whole process. In general these factors cannot easily be influenced by policy makers or HCW's.
- New to both models is to include factors related to action (textbox 4). Factors related to action include emotion, behaviour and other factors which may influence choices and behaviour of patients, which in turn are influenced by population and health system factors. Action is recurrent at all steps of the process.

The model includes most important factors identified by our study, but it is not intended to be exhaustive. Other factors may apply in different settings.

Table 3; Facilitators and barriers not related to the process of accessing care		
Constructs	Possible influence/ example	
1. Disease and disease management related factors		
Nature of disease	Symptomatic/asymptomatic	Asymptomatic disease is more difficult to find
	Progressive or non-progressive	People may be less inclined to get treatment for non-progressive disease
	Potential harm	If the potential harm is high people are more inclined to seek healthcare
	Severity of disease	People may be less inclined to seek care for early stages of disease or disease with non-severe complaints
Diagnosis	Complexity and potential harm/benefit of diagnostics	Point of care tests provide easy diagnosis and less side-effects compared to eg MRI based testing
	Costs	The costs of a diagnosis can be a major barrier
	Requirements of additional investigation	If additional testing (eg viral load in HIV) is needed costs go up, and access may go down
	Level of facility and healthcare staff required for diagnosis	Specialist care is less available and is more dispersed
Management	Once or continuous	Chronic treatment is an important barrier for continuous access
	Complexity and potential harm/benefit of treatment	If a treatment regimen is easy it will be more easily available side effects may be lower and adherence is likely to rise
	Costs	If the essential costs for treatment are high access goes down
	Level of facility and healthcare staff required for management	Specialist care is available less and is more dispersed
2. Population factors		
Economic	Income	Income affects access to all diseases and is mostly unrelated to the process
	Assets(socio-economic status)	The access to economic assets affects access to all diseases and is mostly unrelated to the process
Education	Languages	Language barriers may negatively influence communication
	Schooling and literacy	Increased education levels have shown to be an important facilitator for accessing care, understanding written information is needed to understand hospital and disease specific information
	Health literacy	Understanding of the health system is needed to engage with it
Competing interests	Economic	Farming activities during the rainy season prevent populations from seeking care
	Social	A burial or marriage might require someone to stay at home in spite of a need for care
Living environment	Rural/Urban	Populations in urban environments generally have better access to care than people from rural environments
	Safety	People living in a conflict area are less able to travel from safety perspective
Social capital		Populations with disrupted social systems (e.g. refugees) may have more problems to obtain sufficient resources to access care
Demographic characteristics	Household size and composition	Bigger households in general had less access to care than small households
	Age and sex	Women have more contact with health facilities because of reproductive health issues
Cultural factors	Gender/religion	Male patients are reported to delay care seeking because they perceive the need to appear strong
3. Factors related to the health system		
Organisation and governance of the health system	Fragmentation of the health system	Fragmentation of the health systems makes it difficult for a lay person to understand where they should go in case of health problems
	Procedures within the health system	If procedures to get care are complex with multiple appointments and registrations needed, access go down
Competing interests of the health system	Chronic/structural	The double burden of disease causes many health facilities to be overburdened
	Acute/emergency	An epidemic may cause the health system to be overloaded and may cause malfunctioning
Culture	Patient centeredness	A negative or judgemental culture in the health system may discourage patients to seek care
	Corruption	HCW asking for bribes limit access to care
Resources	Human resources	If the number and/or quality of the training of HCW is low this has a negative influence on access to care
	Infrastructure	A low number or quality of health facilities in relation to the geographic area increases travelling times and reduces access to care
	Equipment and medication	Unavailable or interrupted supply of medication and/or equipment at health facilities increases costs and the need for travelling which reduces access to care
Financing	Exemptions/waivers	Many countries apply exemptions for specific diseases or age groups to decrease financial barriers
	Insurance	Availability of insurance decreases costs and provides protection against catastrophic health expenditure
	Out of pocket payments	Administration costs and other costs unrelated to disease may form barriers for multiple conditions
	Private facility financing/incentives	Payments for visits by patients may form a financial incentive for private providers to let patients come frequently thereby increasing costs to patients unnecessarily
4. Factors related to action		
Emotion	Fear	Fear of high costs, fear of diagnosis, fear of using medication all form barriers to access care
	Trust in health system	Lack of trust in the health system may cause someone not to access care or not continue with treatment
Behavioural factors	Habits and experience	People who have a tradition of seeking care at a traditional healer are less inclined to seek care at other facilities
	Forgetfulness	People do not adhere to treatment out of forgetfulness
	Avoidance	People may avoid to seek care as a coping mechanism
Competing interests	Health/comorbidity	Depression in HIV infected people was found to decrease adherence
	Work	People report obligations at work as a reason not to attend care
	Social	The responsibility for children is reported by women as a reason not to attend care
	Primary needs	The need to take care of food and shelter is a reason not to attend care
Perception of cost-benefit balance		If a person perceives the advantages to be low or disadvantages to be high they are less inclined to utilize the health system
Perception of urgency/need for action		If someone feels a health problem is not urgent he/she may delay or refrain from seeking care
Autonomy		Lack of autonomy may form an important barrier to seek care

Table 4; Facilitators and barriers related to the process of accessing care applied to hypertension		
Constructs		Questions to ask
Population at risk for hypertension		
I. Approachability (health system)	Transparency	Is the hypertension program transparent about its organisation and costs?
	Outreach	Does the hypertension program go to communities for treatment and education?
A. Ability to perceive (population)	Information	Is there understandable information available for patients and relatives?
	Screening	Is there a screening program for hypertension?
	Health literacy	Do people understand what hypertension is, how it can be detected and why it is important.
	Health beliefs	What do people believe with respect to hypertension? What do they believe about its causes and possible treatments?
	Trust and expectation	Do people feel trust towards the health system to let them manage the hypertension? Do they expect to profit from treatment?
→Action→Screening→		
Population identified to have hypertension		
II. Acceptability and availability (health system)	Professional values	Do HCW involved in hypertension care take their responsibilities? Is there corruption?
	Norms	Are HCW involved with their job and are they present when they have to?
	Culture	Is there a warm and welcoming or a judgmental authoritative culture?
	Gender	Could gender in healthcare negatively influence linkage to hypertension treatment?
	Geographical location	Is good quality hypertension care provided at the lowest level near patients?
B. Ability to seek and reach (population)	Personal and social values	Do people feel it is important and socially wanted that they get treatment for hypertension?
	Culture	Is there a culture supportive for preventive medicine?
	Gender	Do men and women value a good health equally?
	Autonomy	Are patients with hypertension likely to make their own decisions regarding health or are they dependent on others?
	Living environment	Is the environment suitable and safe for travelling? Are there additional requirements for travelling?
	Transport and mobility	Is there transport available at the time needed? Are the patients able to travel?
→Action →Linking→		
Population aware of hypertension and linked to hypertension care		
III. Accommodation and affordability (health system)	Accommodation	Are there long waiting times for hypertension care, or is service fast and easy?
	Opening Hours	Do opening hours meet the requirements of hypertension patients?
	Appointment mechanism	Are there suitable appointment mechanisms to promote efficiency?
	Direct costs	Do the costs for attending the clinic and obtaining medication comply with the ability to pay of patients?
	Indirect costs	How often and how far do people have to travel to attend clinic? Can they come alone or do they need to bring someone?
	Opportunity costs	Do people lose income or food if they go to the clinic?
	Incentives	Are there incentives (positive or negative) that stimulate patients to attend care?
C. Ability to pay (population)	Income	Does someone have an income that can be used for hypertension care?
	Assets	Does the patient have assets to access hypertension care?
	Social capital	What social network does someone have and are they supportive to the patient to let him obtain hypertension care?
	Health insurance	Is hypertension care covered by the insurance? Are there additional requirements for that?
	Time available	How much time can someone dedicate to hypertension care?
	Competing interests	What other problems does someone have that need attention and funding?
→Action →initiation of medical management and follow-up→		
Hypertensive patients motivated for treatment		
IV. Appropriateness and quality of care (health system)	Technical and interpersonal quality	Is there sufficient staff, do they have right level of education and did they receive adequate training for hypertension care?
	Adequacy	Are HCW prescribing medication adequate and do they provide sufficient good quality information according to the needs of the patient?
	Coordination and continuity	Are there clear agreements on management, future meetings. Is medication available continuously according to the needs of patients?
D. Ability to engage (population)	Empowerment	Do patients get the opportunity to manage their own condition? Do they feel they can positively influence the management of their disease?
	Information	Do patients get the information they need in an understandable way?
	Adherence	Are patients able to adhere to treatment?
	Caregiver support	Does the patient have relatives to support them in management of the disease?
→Action →healthcare utilisation→		
Healthcare consequences (outcome measures)	Health impact	Hypertension control, incidence of CVD
	Economic consequences	Costs of treatment versus decreased loss of income due to better control of hypertension and reduced incidence of CVD
	Satisfaction with healthcare	Peoples experience with quality of healthcare and the health system

2. Applying the new model

In this next section we will analyse what is the current situation regarding the FaB for AtHTNC which are not related to the process of providing healthcare following the new model. The process related FaB and the potential influence of AHOHM will be discussed in the next chapter. As it is not possible to be exhaustive in this analysis the aim is to emphasize the findings which seem most relevant in relation to AtHTNC.

A. Facilitators and barriers unrelated to the process

1. Disease and management factors

Hypertension is a highly prevalent chronic, mostly asymptomatic pre-condition that increases the chance of CVD. It requires lifelong treatment, usually with multiple drugs. The diagnosis and treatment of uncomplicated hypertension are relatively easy and can be provided by lower cadre HCW's.(129) More complicated cases and diagnosis and management of CVD usually require care from higher cadres.(130,131) Costs for simple treatment may be low as generic drugs are widely available. However, costs rise quickly as people frequently need multiple drugs and often have comorbidity like diabetes and CVD.(16,28,132) If cardiovascular complications arise the healthcare costs rise steeply.(132)

From a patients perspective the asymptomatic nature, chronic treatment and the accumulative costs of hypertension management are significant barriers for AtHTNC. From a HS perspective important barriers are the high number of patients and the requirement for specialist care for a significant proportion of the population with hypertension. Based on an estimated prevalence of hypertension of 23.8%, there are 5.5 million people in Kenya living with hypertension. Of these only 3.4% have adequate control and only 6.2% of Kenyans aged 40-69 with a CVD-risk of $\geq 30\%$ receive treatment.(16) These figures are both exemplary for the massive need for treatment and the challenge to adequately address these issues in an overburdened and understaffed HS.

2. Population and environmental factors

There are a multitude of factors relating to the environment and the population that contribute to a decreased access to care. Most investigated is the influence of wealth and income on AtC. The majority of studies confirmed that lack of income or low assets formed a significant barrier for access to care. As unemployment in Kenya is estimated(2016) to be 40% and 43.3% of the population is living below the poverty line(11) it should be no surprise that access to care is low. This is also seen from the high incidence of catastrophic health expenditure.(114) Compared to other diseases, lack of resources may be even more important in HTNC. Given its asymptomatic nature and a poor knowledge regarding the relevance of hypertension in relation to CVD(52,92), it may be difficult to convince patients to allocate scarce resources to HTNC.

Education levels were shown in multiple studies to affect AtC, whereby a consistent finding was that higher degrees of education led to increased AtC. Language barriers and illiteracy may have similar effects, although only two studies reported on this.(42,78) A possible explanation is that higher education levels improve health literacy. This may enable patients to better understand disease related information and navigate more easily through HS procedures and therefore leads to increased utilization power. As over 80% of the Kenyan population did not complete secondary education this is an important finding. People with low education and low literacy levels may require

a different approach in order to reach them and provide appropriate management. The impact may be even higher in HTNC in comparison to other conditions. Because of the indirect relation between hypertension and CVD and treatments which can be quite complex, a considerable level of understanding and insight is required.

Competing interests like social and economic responsibilities or prioritizing primary needs like food and shelter seem to have a significant influence on AtC. This is closely related to poverty. It is understandable that people with low resources will neglect the distant threat of hypertension in the face of immediate threats like hunger or lack of safety. Also in relation to health it was mentioned by several studies that comorbidity was a competing interest that might result in reduced treatment levels.(44,56,60,74) This may be of significant influence in AtHTNC as hypertension is more prevalent in the elderly who frequently have comorbidity. Highly prevalent diseases like HIV, chronic pulmonary disease, common ailments and malignancies may lead to lower prioritization or negligence of hypertension. Conditions that increase the risk for CVD like obesity, diabetes and harmful alcohol use are also highly prevalent.(16,28)

Another factor which is relevant in the light of the population and environment are the vast differences between different geographic areas in Kenya. There are major differences between the different regions and counties in Kenya with regard to population density, rural versus urban living, economic properties, cultural practices, education levels and all kind of other parameters.(3,4) Apart from the fact that each of these variables may form a FoB, the variation in itself poses a significant challenge in finding health solutions that can easily be adjusted to the needs and characteristics of the population. To address this heterogeneity adequately it is important to monitor differences and make sure the HS is responsive to those differences.

3. Health system factors

The complexity of the HS could be an important barrier for AtC. Many studies described that patients utilize different providers in different order, dependent on their resources, the nature of the disease and the quality of services.(28,44,91,94,96) It is likely that lay-people cannot differentiate well enough what is the best place to get healthcare in a complex health system. The HS of Kenya is fragmented.(125) Apart from the different levels of public health facilities, private for-profit and private non-for-profit providers, there are many unregulated, unofficial providers and traditional providers who all play a role in the HS.(80) These parallel HS are usually not described in relation to AtC(31,133) but they may have an effect on quality of care.(80) No studies were identified that quantified the influence of fragmentation on AtC.

The health system has to deal with the double burden of disease and gets more patients and diseases than can be treated.(16) Therefore decisions have to be made where and how to utilize scarce resources. The persistent high mortality and morbidity from diseases like malaria, HIV, pneumonia and maternal and paediatric mortality are a competing interest for NCD's like hypertension. It is questionable if it is possible to allocate more resources to HTNC in the face of so many acutely threatening diseases. Mobilizing resources for vertical programs may have a disruptive impact on the HS as a whole(134) so it should be handled with caution.

The culture in the HS was found to have a profound influence on AtC in Kenya. Almost universally studies reported absenteeism, poor attitudes of HCW's and patients not to feel comfortable. In some studies this was reported as a reason for patients not to attend or stop treatment. Also corruption was cited frequently.(43,44,51,60,85,90) Apart from that it creates financial barrier, the injustice may also form a cultural barrier.

There are many areas in which the Kenyan HS is short of important resources. The available human resources in public healthcare are 70% below what is needed.(21) This was also reflected by our results, whereby lack of (qualified) staff and understaffing were frequently mentioned. The same counts for availability of equipment.(43,46,84) The occurrence of stock-outs of essential medicine was reported in a wide range of studies for various conditions.(44,77,80,84,91,102,108) The occurrence of stock-outs over a wide range of drugs indicates that the supply chain for medication is inadequate. The effect of intermittent availability of drugs in a disease like hypertension is potentially high as the creation of habits is important for adherence.(130) Stock-outs increase costs of healthcare for patients as medicine prices are significantly higher at private than public facilities.(132,135)

The financing of the HS is another major barrier for patients to access healthcare. In Kenya there are few financial risk protection mechanisms and out of pocket payments are high.(14,24) This was reflected in a high number of studies reporting that patients considered healthcare to be expensive. This contributes to a high incidence of catastrophic health expenditure and therefore decreased access to healthcare.(114,125)

B. Process related facilitators and barriers and the potential impact of AHOHM

This section will discuss how the health system interacts with the population in the process-steps of HTNC and how this interaction might be influenced through AHOHM. If available evidence will be provided to support claims about the potential influence of AHOHM.

- ***Approachability in relation to the ability to perceive***

With regard to transparency and provision of information the HS seems to be performing low. The little evidence found indicated that prices and procedures within the HS were not clear. However, new initiatives are taking place in the form of the "Pima pressure campaign" to raise awareness and provide screening.(19) As the campaign is multimedia based and mostly centred in urban areas the impact in rural areas might be low.

With regard to health literacy it was found that knowledge regarding hypertension was low.(43,44,47,91,92) Even in patients who were motivated enough to take treatment, the link between hypertension and CVD was not known whereby the majority reported that there was no link or were uncertain about it.(47) Although in general patients seem to prefer biomedical medicine, a sceptical attitude towards the effectiveness of hypertension treatment was observed.(43,44) A facilitator seems to be that fear of consequences of HTN is mentioned as a reason for treatment.(43)

The combination of a HS which previously did little regarding awareness about and screening for hypertension and a population that seems to have little knowledge about hypertension and is sceptical about the effectiveness of treatment, are significant barriers for increasing AtHTNC. This may explain why only 44% of the population ever had their BP measured.(16) As the current set-up

of AHOHM is that it is only provided with a clinic based intervention, it is unlikely that the application will influence the above mentioned factors.

- **Acceptability and availability in relation to the ability to seek and reach**

Professional values, norms and culture of the HS seem to play a significant role for the acceptability of HTNC. Poor staff attitudes, fear of getting reprimanded by staff, corruption and absenteeism were mentioned in hypertension studies as reasons not to attend HTNC.(43,44) Although this was not different from the rest of the HS, these factors may be especially relevant in HTNC as a good relation is needed to convince patients of the need for treatment and stimulate adherence.(130)

With regard to social values and cultural aspects of the population there were few FaB that were specific for HTNC. Specific populations may experience barriers however. Elderly were reported to avoid healthcare out of fear to be burdensome to their families. With regard to gender it was found that men did not seek AtHTNC until disease was severe. Women were reported to lack autonomy to seek AtHTNC.(43) Despite this, women were found to be on treatment twice more often, most likely as a result of more intensive contacts related to reproductive health.(16)

The geographic location of facilities providing HTNC may have a significant impact on AtHTNC. From the 2010 health system assessment it appeared that respectively 50% and 70% of the population live within an hour walking distance of a public health facility or a private health facility and 80% lives within an hour of a retail outlet. In rural areas this was less.(125) Although officially all health facilities should provide HTNC, actual availability may be low as essential resources and staff were reported not to be available or of low quality.(43,44,84) A 2011 report found that availability of NCD-services in facilities below hospital level was 36% or less.(22) As transportation and living environments are frequently mentioned barriers(50–52,62,78) and only one third of the households have a means of transport(3) geographical distance and availability are likely to be important barriers for AtHTNC.

Linkage to hypertension care seems low as only 22,3% of patients aware of hypertension were using medication in the STEPwise survey.(16) Although this may also be explained by non-adherence, not being linked is likely to play a significant role as in a slum-based study 90% of patients were LTFU following screening.(30) The influence of AHOHM at this part is likely to be limited. As linking to HTNC still has to take place, people will not yet have access to the intervention.

- **Accommodation and affordability in relation to the ability to pay**

Lack of accommodation and appointment mechanisms resulting in long waiting times and unfavourable opening hours are frequently mentioned throughout the HS including HTNC.(43,51,53,74,111) Although a 2014 study reported waiting times to be less than an hour for the majority of patients visiting a public or private facility.(22) It is not clear how this is in HTNC. Long waiting times combined with long travelling times result in high indirect costs and opportunity costs which potentially are significant barriers.

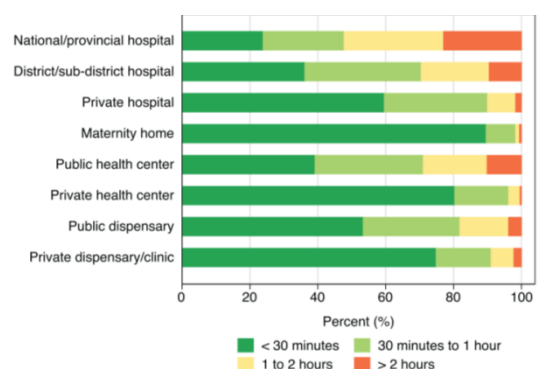


Figure 8 reported waiting times in various facilities. Figure adapted from IHME 2014 report

In a recent analysis it was found that transport cost account for 24% of patients’ health expenditure. The opportunity costs from lost economic productivity due to clinic visits are unclear, but work commitments together with social responsibilities were reported to be a barrier.(43,51,52,60) As hypertension treatment requires recurrent visits and patients usually come frequently especially at the start of treatment, indirect costs and opportunity costs will be significant barriers for AtHTNC.

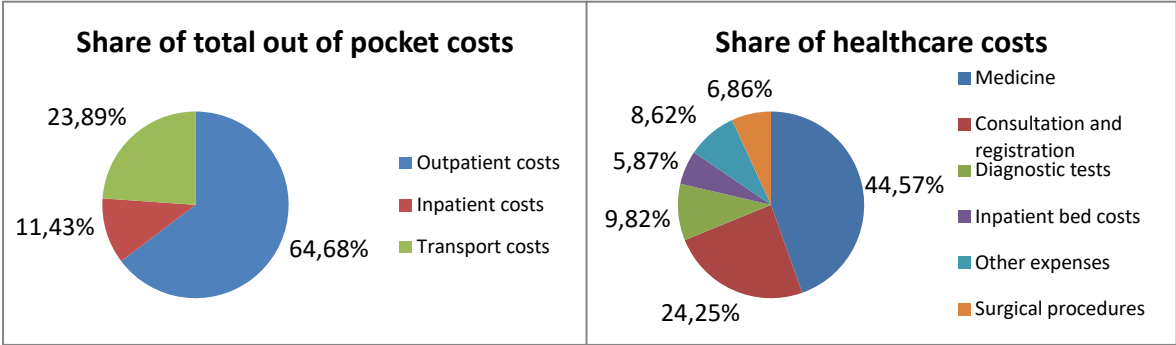


Figure 9 figure adapted from Barasa et al. 2017; specified healthcare costs and out of pocket costs in Kenya

Direct costs were mentioned by a majority of studies as a problem. A recent Kenyan study estimated costs of hypertension-treatment for patients attending the public healthcare to be \$76 per person per year.(132) This is similar to a slum-based study that calculated that from a provider perspective hypertension care could be provided at a cost of \$123 per person per year.(136) This does not yet include treatment costs of CVD or comorbidity.

Although 76\$ for a year may seem reasonable, affordability is low if looking at the 44,3% of population living below the poverty line. Even if the 2\$/day threshold for middle income(10) is taken, 76\$ is >10% of annual income. Additionally, costs for families may rise significantly in case of comorbidity, complications or unavailability of medication at the price of the public sector. Therefore direct costs, poverty, low income and unemployment are serious barriers for AtHTNC in Kenya.

The role of AHOHM in decreasing these barriers are not easy to predict. In its current set up it may reduce the number of required clinic-visits which may decrease opportunity-, transport- and direct costs. At the same time direct costs may rise because of the need to purchase a BP machine and to have a mobile device with internet. Although similar interventions were found to be cost-effective in western settings(137–139), this information is lacking in LMIC. In addition cost-effectiveness does not mean it will save sufficient costs or that it is affordable. One study reported that there will be significant additional costs per patient and the health system for this intervention even though it was cost-effective.(139) As the number of clinic visits by individuals remained the same in some studies(140) and it increased in others(139), it is not sure if a cost-reduction for individual patients can be achieved through AHOHM. For the health system costs may rise because of increasing numbers of patients.

- **Appropriateness and quality of care in relation to the ability to engage**

With regard to appropriateness and quality of HTNC there is evidence that HRH are too low(21), that staff is not trained up-to-standard(84) and that essential equipment is missing.(60,66,69,90,103,110) What is interesting, is that despite a severe shortage of HRH, there is under-utilization of staff. One study found that the number of clients per provider per day in primary healthcare was only 30%-50% of what is possible.(22) No explanation was given for this, but it could indicate that HRH currently are not the most important barrier for AtC. More research is needed to clarify this finding.

Quality of HTNC was reported by one study to be high, as 75% of prescriptions were in line with the Joint-National-Committee-7 or national guidelines.(46) Others reported that no guidelines were available and essential equipment was lacking.(44,84) Since 3 years there is a national guideline for management of hypertension in primary healthcare.(141) Although a guideline may have the potential to improve quality of care, it is questionable if this guideline has a positive effect regarding AtHTNC. The following aspects seem unfeasible from the perspective of the HS (capacity) and the population (affordability):

- All adults with hypertension(>140/90) are recommended to initiate treatment. No differentiation is made in CVD-risk based on age or other parameters.
- Extensive laboratory tests including glucose and an ECG are recommended each year.
- Referral is recommended for everybody with;
 - more than 2 anti-hypertensive drugs
 - Abnormal urine or blood investigations
 - HIV, diabetes or any CVD.(141)

As only 7% of district or sub-district hospitals have an ECG and 42% of health centres and dispensaries have glucometers(22) while 45% of hypertensive patients use ≥ 3 drugs(132) these guidelines will likely result in unnecessary treatment, unacceptable high costs, and overburdening of the HS.

It was found that stock-outs of medication are a serious and recurrent issue in the public health sector. Availability of medication at public health facilities is important, as prices for medication in private facilities are higher.(132,135) Stock outs of anti-hypertensive medications were frequently mentioned.(44,84,91) This is supported by several studies that showed availability of medication for hypertension was below 50%.(84,113)

With regard to the ability of patients to engage little information was found. Most studies described that patients and HCW considered information and empowerment through supportive counselling to be important.(60,62,65,104) However it was not quantified. Interestingly one study found that providers reported to need patient counselling and support systems.(46)

The impact of AHOM in this section may be significant as it addresses several FaB that seem important for management of hypertension. The patient interface could be a powerful tool to improve empowerment of patients, to provide understandable information and to stimulate adherence through behavioural messages and reminders. At the provider side it is likely to improve the availability and quality of blood pressure readings as home based measurements are more reliable than clinic based measurements.(142) It may also improve quality through improved adherence to guidelines, but caution should be paid as it could result in unwanted overuse of diagnostics, medications and referrals. Other important FaB like HRH and stock-outs of medication are not addressed.

Similar interventions have shown to be effective regarding clinical parameters in high-income-countries through behavioural change, patient education and increased involvement. However, results vary significantly per program and little information is available from LMIC. Most importantly, home-based monitoring alone is insufficient and supportive programs by HCW are still needed.(36,143)

Factors related to action and behaviour

The action step is a recurrent step within the process of accessing healthcare to reflect the non-rational and behavioural aspect of patients in the process of AtHTNC. Emotions like fear and (dis)trust play significant roles in the actions patients take. It may relate to the disease and its management(43,50,51,53–55), the HS(55), social aspects(43) or even the environment.(56) Behavioural aspects play an important role in utilizing healthcare. Patients were reported to avoid healthcare because of lack of motivation(44,55) but also as a coping strategy.(43,55) In an asymptomatic disease like hypertension this may offer an easy “solution” for some.

Because of the behavioural change aspects integrated in AHOHM(2) it may help to influence patient-behaviour. More research is needed for this.

Strengths and limitations

This study has several strengths and limitations. Firstly it provides a comprehensive view on a complex problem that interlinks with many aspects. Although the search strategy may not have been exhaustive, we were able to identify a wide range of literature from various sources. Furthermore articles from our search strategy were supplemented with articles and reports from grey literature to enhance comprehensiveness. However, there was overrepresentation of studies from certain research groups (e.g. 17 studies were from the AMPATH site). As these studies tended to come from areas with donor-funded programs the results may not be representative for the whole of Kenya. Also many studies were clinic-based instead of population-based, which may lead to a selection bias.

The selected literature and working methods may give a skewed image towards the barrier side, as many studies seemed to focus on barriers and not facilitators. Also study-sites tended to be concentrated on specific geographic areas and in specific diseases, which may limit external validity of our results.

Lastly, evidence was reviewed by a single junior researcher which may have made the findings more subjective. In part this was compensated through consultation of a senior researcher for advice about specific problems.

Conclusion

Hypertension and CVD are increasingly prevalent in Kenya. At the same time the impact of communicable diseases remains high. The double burden of disease is overburdening the HS which is fragmented and is lacking important resources and therefore fails to provide adequate AtC. AtHTNC is low as only 3.4% of the hypertensive population has adequate control with medication. This enormous treatment gap is exemplary for the massive need, but also for the challenge it forms for the overburdened HS to significantly improve AtHTNC.

Through a literature search we found much evidence regarding AtC but evidence specific for AtHTNC is low. Overall evidence regarding the FaB for AtC is fragmented and not well structured across different studies. Through a revised framework (Figures 7 & 10) we analysed the results.

The interactions between the HS and the population are as diverse as complicated as is their influence on AtC. Most important barriers identified were poverty, low education levels, competing interest and low health literacy for the population. For the HS these were a fragmented health system with complicated procedures, overburdening of the HS, a poor attitude of HCW, lack of HRH, unqualified staff and a shortage of medication and equipment.

Barriers seem to cluster in poor, rural and low educated populations. Significant variations in living environments and socio-cultural aspects of different populations within Kenya make it difficult to generalize findings or to develop interventions that are fit for large areas or populations.

In order to address the rising need for AtHTNC a balanced and holistic approach is needed that addresses FaBs for AtHTNC, but acknowledges that there are a plethora of challenges for the Kenyan HS and society that cannot be addressed easily. An integrated approach with involvement of governments, civil society organisations and for-profit organisations is needed.

AHOHM may be a partial solution for this problem. It is likely to address several of the FaB for AtHTNC, but many systemic issues are not or cannot be

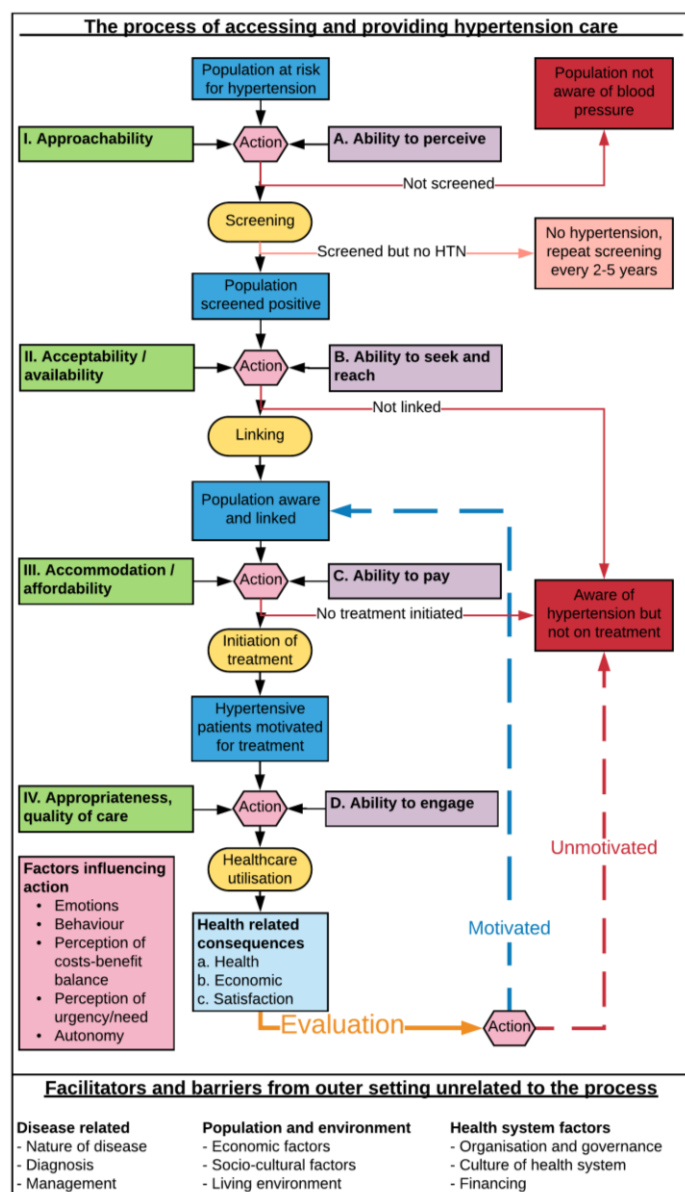


Figure 10 simplified version of revised framework

addressed through the proposed intervention. The main population where it is likely to have an effect are people motivated for treatment following linking to HTNC. As currently only 22.3% of people aware of hypertension (8% of people living with hypertension) are using treatment, this will likely limit its impact in increasing AtHTNC for the general population. In addition to that the same FaB that negatively influence AtHTNC (e.g. poverty or lack of resources in the HS) may also negatively influence the implementation of AHOHM.

The potential of AHOHM seems highest for patients already on treatment by improving quality of care and increased involvement of patients according to the CCM. Especially in the behavioural aspect following enrolment in treatment the intervention may have a positive effect. What the effect will be on health outcomes, visit-frequency, direct costs and indirect costs remains to be clarified as evidence is conflicting and little research is available from LMIC.

With regard to quality improvement some restraint is needed. If the decision support component will be based on the current national guideline for management of hypertension, it is likely to lead to an increased number of referrals and investigations. This may lead to unacceptable high costs for patients/society and overburdening of the HS. Although treatment of hypertension is cost-effective, this does not mean it is affordable by individuals or the state nor does it mean that it is the best way to use scarce resources.

Because of its linkage with other chronic conditions and risk factors for CVD an integrated approach for hypertension is needed. AHOHM in its current design is a vertical program, which may increase fragmentation and may not be a viable option on the long term. In the current setup the intervention does not address this challenge yet, but it could be a stepping stone to more automated and accessible chronic care.

To conclude the FaB for AtHTNC are diverse and lie for a significant part in domains which cannot or will not be influenced through AHOHM. For patients enrolled in care there may be significant advantages, but this still has to be clarified. Despite that the currently proposed intervention may have a limited influence on AtHTNC, it seems like a good start for improving AtHTNC. It seems to provide a good basis for a new approach from which additional functionalities can be added. To significantly improve AtHTNC collaboration with government and other local organisations is needed.

Recommendations

It becomes clear from our analysis that there is no single cause or solution to the problem of low AtC. To acknowledge this is essential to develop structural solutions and should be at the core of future plans to address this problem.

Internal recommendations

The following recommendations can be made to AHTI, the developer of AHOHM

- Low (health) literacy and education may have a significant effect on utilization power and can limit the understanding of both medical information and information regarding the intervention. Therefore it is recommended to develop visual information (and possibly audio recordings in different languages) to enhance involvement of patients
- There are vast differences in FaB between different regions and populations. Therefore the intervention should be adaptable and collection of data regarding FaB should be integrated in the intervention to allow for adaptation to different contexts
- Because important barriers like poverty, and lack of resources in the HS are not addressed, it is essential to pick a well described and homogenous study-populations and (intermediate) outcome measures to be able to measure the effect of the intervention.
- In order to reach more people it should be considered to expand the functions of the intervention to more domains of AtHTNC, especially with regard to awareness, screening and linking. It seems community health workers might contribute to this.
- The intervention in its current form is a vertical program which may lead to increased fragmentation. A plan should be made to prevent fragmentation and to enhance collaboration with public health sector and other stakeholders in primary care and anticipate on future integration into the HS.

External recommendations

The following recommendations can be made to the GoK

- The health system is fragmented. An integrated response is needed to strengthen the health system with a focus on decreasing fragmentation. Therefore we advise the GoK to collaborate with private for-profit and civil state organisations in programs for CVD.
- Despite a big shortage of HRH there are indications that utilization of HRH is low. In addition patients widely report absenteeism, bad attitudes and inappropriate behaviour. We recommend to investigate this further and develop plans to increase efficiency and acceptability of care by HRH.
- Financial barriers are an important barrier for AtHTNC. Therefore it should be investigated if the GoK can financially support hypertension programs. One way of support could be through sponsored medication programs to decrease medicine-prices and increase availability of medication.
- Current guidelines for management of hypertension in primary healthcare seem unrealistic from cost and capacity perspective. Therefore we suggest to review the guideline to differentiate between low, medium and high CVD-risk and to re-evaluate indications for referral, ECG and laboratory investigations.

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