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AN ASSESSMENT OF FACILITY-BASED CARE OF DIABETES, HYPERTENSION, AND HEART FAILURE ACROSS WESTERN KENYA

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ABSTRACT

Background: Low- and middle- income countries account for three-fourths of the global non- communicable disease related mortality. In response to the increasing number of non- communicable disease diagnoses in Kenya, the government released a national strategy for non- communicable disease in 2015. The purpose of this study was to assess facility-based care of diabetes, hypertension, and heart failure across western Kenya.

Methods: A 71-question cross-sectional survey was administered among facility-based healthcare workers in Siaya County, western Kenya, between October 2015 and January 2016. All Level 4 and 5 facilities, as well as a cohort of lower-level facilities were surveyed.

Results: Of the 21 health facilities surveyed, six (31.6%) had specific non-communicable disease clinics. Eleven of the 21 (52.4%) facilities had glucometers, and providers indicated that even these glucometers were often not functional. Three of the 21 facilities (14.3%) had a diabetic registry, one a functioning electrocardiogram machine, and one other a congestive heart failure registry.

Conclusions: Facilities at every level were lacking equipment and medications expected by the Kenya's Essential Package of Health Services. Improvement for follow up and referral services could be achieved through the development of comprehensive non-communicable disease registries.

INTRODUCTION

Non-communicable diseases (NCDs) are a growing cause of morbidity and mortality globally with the most rapid rise across low- and middle-income countries [1]. In 2012, 68% of all deaths worldwide were due to NCDs [1]. Low- and middle-income countries account for three-fourths of the global NCD-related mortality and a further disproportionately high percentage of overall premature deaths [1]. The most common NCDs are diabetes, cancer, hypertension, and heart failure.

The prevalence of NCDs among the Kenyan population is high. However, due to poor screening and a largely rural population, the proportion of patients in treatment is extremely low [1,2]. Three to 6% of the population has diabetes and, while one in three face severe limitations in access to care, as many as 50% are undiagnosed [2,3,4]. Population estimates of hypertension vary from 25 to 50% [1,3]. While heart failure accounts for 9-15% of hospital admissions across all sub-Saharan Africa, 50% of overall hospital admissions in Kenya are NCD-related [4,5].

In response to the World Health Organization citing lack of registration systems to monitor patients, weak health infrastructures, and inadequate funding as primary barriers to the prevention and control of NCDs, the Kenya government in 2015 released a national strategy for NCDs [1]. Although the Kenya NCD national strategy includes sections on community awareness, preventative health, health systems strengthening, and chronic care management, an optimal national and regional model for NCD management in Kenya has not yet been defined [6].

Several NCD care-models implemented in rural Africa to date have been described as promising [7,8,9]. These models are principally based on nursing-centered screening, diagnosis, and treatment as well as innovative use of existing infrastructures originally designed for long-term care of HIV and tuberculosis patients [7,8,9].

The purpose of this study was to survey facility services directed at care for patients with diabetes, hypertension, and heart failure in western Kenya. The goal of this work was for identified gaps to inform future intervention strategies.

METHODS

A 71-question NCD-focused assessment tool, designed to support semi-structured key-informant interviews, was developed by the study authors, then tested, improved and validated through mock interviews with local Kenyan clinicians. The assessment tool focused on six domains of inquiry: facility demographics, personnel, supplies and laboratory, medications, diagnosis and management of NCDs, and referral services. Specific questions were designed to probe provider knowledge and capabilities, the burden of NCD management in relation to the overall workload, recommendations for continuing education, and referral services.

The NCD management capabilities assessment was conducted between October 1, 2015 and January 31, 2016 in Siaya County, Western Kenya. All Level 4 and 5 facilities (e.g., regional and district hospitals) as well as a selection of lower-level facilities chosen via convenience sampling, stratified by facility level (e.g., dispensaries, health centers, and health clinics), were assessed. Enrollment was continued until thematic saturation was achieved.

Key informants were identified based on availability at time of interview and were restricted to a clinician involved in NCD care. One healthcare provider at each facility was asked to participate. Verbal consent was obtained prior to interview initiation. Depending on availability, interviews were conducted by a field research team comprised of one of three US physicians (PT, SV, HZ). The research team additionally toured the facilities and inspected medications and equipment.

Quantitative data were analyzed with standard descriptive and frequency analyses using Microsoft Excel 2007 (Seattle, Washington, USA). Qualitative thematic analysis was conducted on the open-response data using NVivo 10 software (QSR International, Victoria, Australia). Two physician researchers (PT, HZ) independently coded the survey transcripts and reconciled any differences in their coded themes.

This study was approved by the institutional review board of Partners HealthCare (Massachusetts General Hospital, Boston, MA, USA) and the ethical review committee of Maseno University School of Medicine (Maseno, Kenya).

RESULTS

A key informant at each of 21 health facilities in Siaya County, western Kenya was surveyed between October 1, 2015 and January 31, 2016. The facilities included dispensaries/health clinics, health centers, primary hospitals, and secondary hospitals as designated by the Kenya Essential Package for Health (KEPH) (Table 1). The 21 key informants included one medical officer (4.8 %), 11 clinical officers (52.4 %), and nine nurses (42.9%).

Table 1

Health facilities surveyed in Siaya County, Kenya; October 2015 – January 2016

Type of health facility	Number
Dispensary/health clinics (Level 2)	8
Health Centers (Level 3)	6
Primary hospitals (Level 4)	6
Secondary hospitals (Level 5)	1

Level 2 and 3 facilities:

Staffing: Fourteen key informants were queried about the cadre level that diagnosed and managed NCDs at their facilities. One (7.1%) reported that a medical officer and 13 (92.9%) a clinical officer and/or a nurse managed NCDs at their facility. Two (14.3%) reported a laboratory technician on staff. None of these informants described availability of a pharmacist. Two of the 14 (14.3%) reported that their facilities did have inpatient beds yet none of the 14 facilities had dedicated NCD clinics.

Equipment and Medication: Thirteen of the 14 (92.9%) Level 2 and 3 facilities possessed a functioning blood pressure cuff, six (42.9%) a glucometer, and 13 (92.9%) a scale. Five (35.7%) of the facilities stocked medication to treat high blood pressure, two (14.3%) a hypoglycemic agent for diabetics, and five (35.7%) furosemide for treatment of heart failure and high blood pressure. Nine of the 14 informants (64.3%) reported that equipment was often non-functional, and medications were consistently out of stock (Table 2).

Table 2
Functioning supplies and equipment at health facilities in Siaya, Kenya (number of facilities)

		Level 2 n=8 (%)	Level 3 n=6 (%)	Level 4 n=6 (%)	Level 5 n=1 (%)	Total n=21 (%)
General						
	Gloves	6 (75)	5 (83.3)	6 (100)	1 (100)	18 (85.7)
	Adult Scale	7 (87.5)	6 (100)	6 (100)	1 (100)	20 (95.2)
	Manual blood pressure cuff	6 (75)	5 (83.3)	5 (83.3)	1 (100)	17 (81)
	Digital blood pressure cuff	6 (75)	4 (66.7)	5 (83.3)	1 (100)	16 (76.2)
Laboratory/Diagnostics						
	ECG	0 (0)	0 (0)	1 (16.7)	0 (0)	1 (4.8)
	X-ray	0 (0)	0 (0)	2 (33.3)	1 (100)	3 (14.3)
	Ultrasound	0 (0)	0 (0)	3 (50)	0 (100)	3 (14.3)
	Ophthalmoscope	1 (12.5)	0 (0)	2 (33.3)	1 (100)	4 (19)
	Glucometer	3 (37.5)	3 (50)	4 (66.7)	1 (100)	11 (52.4)
	Urinalysis	3 (37.5)	3 (50)	6 (100)	1 (100)	13 (61.9)
	BUN/Creatinine	2 (25)	1 (16.7)	3 (50)	1 (100)	7 (33.3)
	Lipid profile	0 (0)	0 (0)	1 (16.7)	0 (0)	1 (4.8)
Medications						
	Thiazide	1 (12.5)	2 (33.3)	6 (100)	0 (0)	9 (42.9)
	ACE inhibitor	2 (25)	2 (33.3)	4 (66.7)	1 (100)	9 (42.9)
	Calcium Channel Blocker	1 (12.5)	3 (50)	3 (50)	1 (100)	8 (38.1)
	Beta Blocker	1 (12.5)	2 (33.3)	3 (50)	0 (0)	6 (28.6)
	Metformin	2 (25)	0 (0)	4 (66.7)	1 (100)	7 (33.3)
	Sulfonylureas	1 (12.5)	0 (0)	4 (66.7)	0 (0)	5 (23.8)
	Insulin	1 (12.5)	0 (0)	4 (66.7)	1 (100)	6 (28.6)
	Loop diuretic	2 (25)	3 (50)	3 (50)	1 (100)	9 (42.9)

Note: Availability of the medical supplies and was determined by their availability at a facility on the day of visit

Knowledge and Training: When the 14 key informants from the Level 2 and 3 facilities were asked about guidelines and/or clinical pathways regarding hypertension, diabetes, and congestive heart failure diagnosis and management, three (21.4%) stated that Ministry of Health (MOH) guidelines were being utilized. All 14 informants described that blood pressure cuffs were used to diagnose hypertension, six (42.8%) that

glucometers were used to diagnose and manage diabetes, and two (14.3%) were able to articulate symptoms consistent with congestive heart failure.

Two of the 14 informants (14.3%) reported having had education specifically focused on NCDs. All 14 expressed a desire for continued medical education focused on NCDs, while seven (50.0%) requested additional training

on heart failure, and six (42.8%) on diabetes management.

Informants were asked if their facility conducted performance evaluations for medical staff. Seven of the 14 informants (50%) reported having performance evaluations of which five (5/7, 71.4%) used chart reviews, one (1/7, 14.3%) used skills evaluations, and one (1/7, 14.3%) used patient feedback.

Chronic Disease Management and Referrals: When asked about hypertension management, nine of the 14 (64.3%) Level 2 and 3 facility informants said that hypertension was managed at their facility by initiating medications and lifestyle modifications, and five (35.7%) reported that patients were referred immediately upon diagnosis. Of the nine facilities that managed hypertension initially, all nine referred cases of complicated or uncontrolled hypertension. Seven of the 14 informants (50%) stated that follow-up for hypertension occurred at their facilities.

Six of the 14 informants (42.9%) stated that diabetic screening was available at their facility, and four (28.6%) of the six were able to initiate hypoglycemic agents. Ten informants (71.4%) stated that they referred patients to higher-level facilities immediately after diagnosis of diabetes. When asked if a facility had a follow-up system for patients with diabetes, one informant (7.1%) described a specific facility diabetic registry and five (35.7%) follow-up appointment capabilities. Follow-up laboratory testing at these five facilities included random blood sugars (4/5, 80.0%) and urine dipsticks (4/5, 80.0%). Four of the five facilities (80%) performed diabetic foot examinations.

One of the 14 key informants (7.1%) stated that congestive heart failure was diagnosed and managed at their facility. Thirteen (92.9%)

described that patients were referred immediately upon diagnosis or suspicion to either a sub-district or district hospital. None of the 14 Level 2 and 3 facilities had congestive heart failure registries or a method of tracking patient weights. One (7.1%) informant reported that they managed follow-up in patients diagnosed with congestive heart failure.

When asked how well their Level 2 or 3 facility managed hypertension, one out of 14 (7.1%) responded, 'excellent,' one (7.1%) 'very good,' two (14.3%) 'satisfactory,' three (21.4%) 'poorly,' four (28.6%) 'unacceptable,' and one (7.1%) informant left the question blank. When asked the same question regarding diabetes, one out of 14 (7.1%) responded, 'very good,' three (21.4%) 'satisfactory,' three (21.4%) 'poor,' four (28.9%) 'unacceptable,' and one (7.1%) informant left the question blank. In response to congestive heart failure management, two (14.3%) responded, 'satisfactory,' four (28.9%) 'poor,' five (35.7%) 'unacceptable,' and one (7.1%) informant left the question blank.

Level 4 and 5 facilities

Staffing: Four of the seven key respondents (57.1%) from Level 4 and 5 facilities reported that a medical officer was on staff to manage NCDs, and all seven facilities had a clinical officer and nurse additionally available to assist with NCD care. Three (42.9%) stated that a consultant doctor was available for complicated medical cases. Five (71.4%) described availability of a facility-based laboratory technician and five (71.4%) also reported availability of a pharmacist. All seven facilities had inpatient capacity, and six (85.7%) scheduled outpatient NCD clinics.

Equipment and Medication: All seven facilities had working blood pressure cuffs and scales. Five of the seven (71.4%) had working glucometers and three (42.9%) functional

ophthalmoscopes. One of the seven facilities (14.7%) had an operational electrocardiogram machine, three (42.9%) x-ray capabilities, and four (57.1%) an operational ultrasound. One facility (14.3%) had lipid profile testing and four (57.1%) had renal function testing. All seven facilities stocked antihypertensive and hypoglycemic medications and four (57.1%) furosemide. Four of the seven informants (57.1%) stated that medication availability was unreliable and five (71.4%) stated that equipment was often not functional and supplies out of stock (Table 2).

Knowledge and Training: Three of the seven key informants (42.8%) reported that MOH guidelines were utilized for diagnosis and management of hypertension, diabetes, and congestive heart failure. All seven informants stated that blood pressure cuffs and glucometers were used to diagnose hypertension and diabetes, respectively. Three (42.8%) were able to describe symptoms consistent with congestive heart failure.

Three of the seven informants (42.9%) reported having previously had dedicated in-service medical education on NCDs. Four of the seven (57.1%) voiced a desire for further education on congestive heart failure and three (42.8%) wished for regular updates on NCD management. When asked about existing performance evaluations for medical staff at their facilities, three of the seven informants (42.9%) stated they had annual evaluations in the form of chart review (2/3, 66.7%) and patient feedback (1/3, 33.3%).

Chronic Disease Management and Referrals: All of the seven key informants from Level 4 and 5 facilities stated that they were able to diagnose, treat and follow patients with hypertension. Five of the seven informants (71.4%) stated that they referred patients with high blood pressure emergencies. All seven described that they diagnosed and treated

patients with diabetes. One (14.3%) reported a facility diabetic registry. Diabetic appointments at all seven facilities included assessment of random blood sugar (7/7, 100%), urine dipstick (4/7 (57.1%), feet (7/7, 100%), eyes (3/7, 42.9%), and blood tests for glucose, electrolytes and kidney function (2/7, 28.6%). All seven informants reported they admitted patients with diabetic ketoacidosis, and three (42.9%) of the facilities had a diabetic ketoacidosis protocol. Four of the seven informants (57.1%) stated that diabetic patients were referred to another facility for complications such as renal failure or foot infections.

Six of the seven key informants (85.7%) stated that congestive heart failure was diagnosed at their facility. One facility (14.3%) had a congestive heart failure registry, all seven facilities managed follow up care for these patients. One of the seven informants (14.3%) reported that they recorded patient's weights as part of chronic heart failure care. Six informants (85.7%) reported that all patients were referred for echocardiograms. One (14.3%) reported that informal echocardiograms were performed at their facility.

When asked how their facility managed hypertension, one out of seven (14.3%) reported 'excellent,' one (14.3%) 'very good,' and five (71.4%) 'satisfactory.' When asked the same question regarding diabetes, one out of seven (14.3%) reported 'very good' and six (85.7%) 'satisfactory.' In response to congestive heart failure management, one (14.3%) reported 'very good,' two (28.6%) 'satisfactory,' and four (57.1%) 'poor.' When asked how their facility managed hypertension, one out of seven (14.3%) reported 'excellent,' one (14.3%) 'very good,' and five (71.4%) 'satisfactory.' When asked the same question regarding diabetes, one out

of seven (14.3%) reported 'very good' and six (85.7%) 'satisfactory.' In response to congestive heart failure management, one (14.3%) reported 'very good,' two (28.6%) 'satisfactory,' and four (57.1%) 'poor.'

DISCUSSION

This study assessed district and sub-district hospitals as well as a stratified sample of health centers, dispensaries, and private facilities across Siaya County, western Kenya to evaluate NCD care. Most facilities had variable and often times poor capabilities of diagnosing and treating NCDs.

Although, by definition, Level 2 and Level 3 facilities in Kenya are not expected to provide comprehensive care for NCDs, they are vital entry points into the health system for a large proportion of the Kenyan population. Therefore, it was important to assess the capabilities of these facilities to perform basic screening for hypertension, diabetes, and heart failure, and manage follow-up care. According to Kenya's Essential Package of Health Services (KEPHS), Level 2 facilities must be able to screen for hypertension with blood pressure cuffs and test blood sugars with a glucometer, although they are not responsible for diabetic screening [12]. Level 3 facilities should be able to screen for diabetes and perform urinalyses [12]. We found that only 37.5% and 50% of the Level 2 and Level 3 facilities respectively had functional glucometers. While the Kenya Essential Medications List (KEML) codifies that Level 2 and 3 facilities are not expected to carry antihypertensive or hypoglycemic medications, we discovered that 12.5% of the Level 2 and 25% of the Level 3 facilities surveyed had either or both medications in stock.

Because of the emergent findings from this study's assessment, the authors recommend that consideration be given to allow Level 2 and 3 facilities to serve as sites for screening for, and basic follow-up of diabetes. Since Level 2 facilities should all have glucometers, they could follow diabetic patients' blood sugars and facilitate referrals for patients with inadequate glucose-control. Level 3 facilities should be able to assess patients for possible renal disease and/or diabetic ketoacidosis and refer when necessary. An educational program to facilitate the implementation of these services may help to improve diabetic management at lower level facilities.

Level 4 and 5 facilities are designated as referral centers and thus are expected provide comprehensive NCD management capabilities. The findings from this assessment highlighted the lack of equipment and advanced laboratory services expected of level 4 and 5 facilities. The KEPHS states that Level 4 and 5 facilities should be able to provide lipid profile and renal function laboratory testing, as well as x-ray and ultrasound capabilities [12]. None of the Kenyan facility equipment guidelines address electrocardiographic capabilities. The study found that only one facility (14.3%) had lipid profile testing and four (57.1%) had renal function testing. Four facilities (57.1%) had an operational ultrasound and one facility had an electrocardiogram. Furthermore, the KEML expects Level 4 and 5 facilities to carry antihypertensive and diuretic medications [13]. We found that all of all seven facilities carried at least one antihypertensive and four (57.1%) had a diuretic available.

The authors recommend that consideration be given to improving the capabilities of Level 4 and 5 facilities to manage congestive heart failure. These facilities are referral centers for lower level facilities and should

have adequate equipment and supplies to effectively diagnose, treat, and follow patients with congestive heart failure. Our findings additionally support the development of a training program specifically targeting congestive heart failure management.

When investigating the way facilities tracked patients with hypertension, diabetes, and heart failure, few facilities were found to have a documentation method. Only 14.3% of the facilities surveyed had a diabetic registry, and 4.8% a congestive heart failure registry. Furthermore, all of the facilities surveyed referred patients to high levels of care at some point of diagnosis and management of hypertension, diabetes, and heart failure. Level 2 and 3 facilities referred patients with hypertension (5/14, 35.7%), diabetes (10/14, 71.4%), and heart failure (13/14, 92.9%) immediately upon diagnosis. Level 4 and 5 facilities referred patients with complications from hypertension (5/7, 71.4%) and diabetes (4/7, 57.1%), or for further imaging in patients with heart failure (6/7, 85.7%). The authors recommend that facilities develop comprehensive NCD registries that document NCD diagnoses, vital signs, laboratory tests, medications, and the facility to which they refer. Increased communication and knowledge sharing may also improve referral services and facility capabilities.

The survey assessment also found that performance evaluations for medical staff was limited. Only ten of the 21 facilities (47.6%) had methods of evaluation, seven (70%) of which used chart reviews. Incorporating quality assurance programs at all facility levels may increase the functions and delivery of care across the healthcare system.

This study was conducted among multiple levels of health facilities and a diverse group of health care providers. However, since the interviews were limited to only one county in

western Kenya the study may not be generalizable to other low-resource settings. There is a potential for social desirability bias in any survey or interview. We attempted to mitigate this possibility by, creating multiple questions on similar topics in order to triangulate towards "truth", and by utilizing interviewers that were not in positions of oversight. All participants were informed that survey responses would be held in strict confidence.

CONCLUSION

The capability of the Siaya County health system to screen, diagnose, and manage non-communicable diseases is limited. We recommend improved availability of medications, supplies, and equipment at all levels as well as the development of effective educational packages tailored to the level of expertise expected. Additionally, we recommend developing and implementing NCD facility registries in a standardized fashion across the entire health system. Lastly, improved communication and knowledge sharing, as well as the development of quality assurance programs, across the continuum of the health system, might improve overall care capabilities. Further research is needed on multiple levels to help identify optimal performing models of non-communicable diseases care.

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