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Short communication

Prevalence of HIV and Disease Outcomes on the Medical and Surgical Wards at Kamuzu Central Hospital, Lilongwe, Malawi

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Abstract: Introduction: The World Health Organization (WHO) recommends HIV Counseling and Testing (HCT) in a range of clinical settings. We describe the characteristics of patients diagnosed with HIV on the medical and surgical wards at a tertiary care hospital in Malawi.

Methods: Under the universal opt-out HCT protocol we characterized the number of new HIV/AIDS infections and associated clinical features among hospitalized surgical and medical patients diagnosed during the course of admission.

Results: All 2985 and 3959 medical and surgical patients, respectively, admitted between April 2012 and January 2013 were screened for HCT. 62% and 89% of medical and surgical patients, respectively, had an unknown status on admission and qualified for testing. Of the patients with an unknown status, a new HIV diagnosis was made in 20% and 7% of medical and surgical patients, respectively. Of the newly diagnosed patients with a CD4 count recorded, 91% and 67% of medical and surgical patients, respectively, had a count less than 350, qualifying for ART by Malawi ART guidelines. Newly HIV-diagnosed medical and surgical patients had an inpatient mortality of 20% and 2%, respectively.

Discussion: While newly diagnosed HIV-positive medical patients had high inpatient mortality and higher rates of WHO stage 3 or 4 conditions, surgical patients presented with less advanced HIV, though still meeting ART initiation guidelines. The medical inpatient wards are an obvious choice for implementing voluntary counseling and testing (VCT), but surgical patients present with less advanced disease and starting treatment in this group could result in more years of life gained.

Key words: HIV counseling and testing, inpatient, surgery, medicine, sub-Saharan Africa

INTRODUCTION

HIV and AIDS more heavily affect Sub-Saharan Africa than any other region of the world, with an estimated 22.9 million people living with HIV in the region [1]. In 2010 around 1.9 million people became infected with HIV and 1.2 million people died from AIDS in sub-Saharan Africa. Achieving universal access to treatment, prevention and care is predicated upon attaining universal knowledge of HIV status [1]. In Malawi, 11% of the general adult population has HIV, and higher rates are observed among high-risk populations, including 71% of sex workers [2]. Despite this high prevalence, 27% of women and 48% of men in Malawi have never been tested for HIV [3]. HIV counseling and testing (HCT) is recognized as a pivotal entry point for the prevention, treatment and care of HIV. The goal of HCT is to promote self-awareness of HIV status [4]. HCT alone has been shown to decrease high-risk behaviors [5], and earlier diagnosis is associated with a longer life expectancy [6].

The Malawi Ministry of Health (MOH) guidelines in 2011 state that HTC should be offered to all patients with an

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unknown or undocumented status presenting to a health care facility for any reason [7], and several studies have shown increased identification of HIV-positive patients through the HTC implemented in various settings [8–11]. Though the majority of sub-Saharan African countries have developed similar policies, few have been able to fully implement HTC in all settings, and most previous research has been in antenatal clinics [12, 13]. In a study from Malawi, HIV-infected patients comprise 28% of medical inpatients [14], and in a study from South Africa, 33% of surgical patients offered HTC tested positive [8]. A decade ago, 91% of medical and 56% of surgical patients tested positive in Blantyre, Malawi [15]. Medical patients tested under universal opt-out protocols were found to have advanced disease by World Health Organization (WHO) staging criteria in 70% of cases [9], while a similar study of surgical patients showed that only 24% had advanced disease [10].

Comparisons of current WHO staging criteria and CD4 counts between medical and surgical patients have not been delineated, and while universal HCT in all health-care settings is recommended, it is not routine in many parts of sub-Saharan Africa [13]. Few previous studies have focused on surgical patients [10, 11], and only one study from a decade ago compares medical and surgical patients [15]. Therefore, we sought to determine the number of new HIV infections diagnosed under the universal opt-out HTC protocol at Kamuzu Central Hospital (KCH) in medical and surgical patients. We also sought to describe associated clinical and demographic characteristics. We examined CD4 counts, discharge diagnosis, and outcome to determine differences between HIV-positive medical and surgical inpatients.

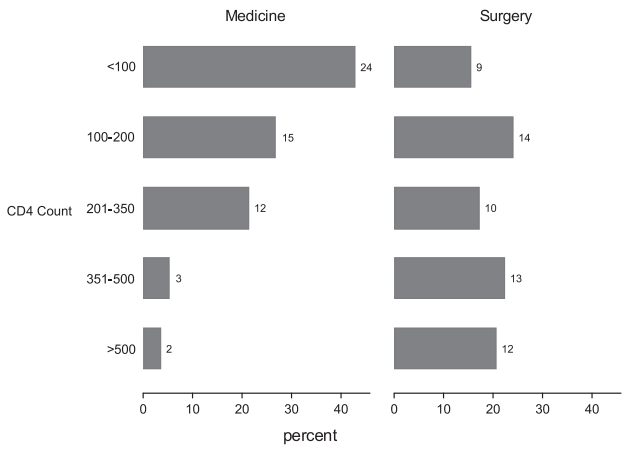

Fig. 1. CD4 counts in medicine and surgery patients with a new HIV diagnosis at KCH

METHODS

Study setting and population

KCH is a 750-bed tertiary care hospital in Lilongwe, Malawi with a catchment population of over 5 million people in the central region of the country. Since November 2011, the standard procedure for HIV testing on the KCH medicine and surgical wards includes counselor initiated, universal opt-out HIV testing as has been described previously [11]. At admission, HIV counselors approach all newly admitted patients and evaluate for evidence of previous HIV testing. All patients with no documented HIV test results or documented negative test dated older than three months are offered and receive HIV counseling and testing unless they explicitly refuse. HIV testing results are recorded according to required MOH guidelines and shared with treating clinicians through documentation in the patient file.

The study population consisted of adult medical and surgical inpatients that were eligible for HCT. We included all adult medical and surgical inpatients screened for HIV counseling and testing and described characteristics of those newly diagnosed with HIV during hospitalization at KCH from April 2012 to January 2013 in this analysis.

Study Design

This is a retrospective observational study of prospectively collected data. Demographics, clinical characteristics, admitting and discharge diagnoses, HIV status and test results, and inpatient mortality are abstracted from medical and surgical patient charts and entered into an Access database.

We first describe the HIV status, age, sex, and admission diagnosis distribution of all persons presenting for care. For the main analyses, we included patients who had unknown HIV status on admission or a negative test dated older than three months, who tested positive. Per protocol at KCH, a CD4 count and WHO staging is performed for all adult patients newly diagnosed with HIV.

Data Analysis

Demographics and clinical characteristics of the general medical and surgical populations were compared. Newly diagnosed HIV-positive medical and surgical patients were compared with respect to CD4 count, discharge diagnosis, and inpatient mortality. For newly diagnosed HIV-positive patients without recorded WHO staging on the intake forms, WHO 3 or 4 criteria was abstracted from the discharge diagnosis. Surgical diagnoses coded in our database and meeting these criteria included osteomyelitis, septic joint, Kaposi sarcoma, pyomyositis, extra-pulmonary

TB, and empyema. Medical diagnoses coded in our database and meeting these criteria included chronic (> 1 month) gastroenteritis, Kaposi sarcoma, meningitis, oral or esophageal candidiasis, pneumonia, and pulmonary or extra-pulmonary tuberculosis.

Categorical variables were compared between settings using Person's chi-square test, and continuous variables were analyzed using the *t*-test. Odds ratios and 95% confidence intervals comparing medical and surgical patients for inpatient mortality, discharge diagnosis meeting WHO 3 or 4 criteria, discharge diagnosis of infection, and CD4 counts less than 350 were calculated using logistic regression. Adjusted odds ratios were controlled for age and sex, unless otherwise specified. Data were analyzed using Stata 12.

Both the National Health Science Research Council of Malawi and the University of North Carolina Internal Review Board approved this study.

RESULTS

Patient Population

During the study period 6944 patients were screened for HCT, including 2985 medical patients and 3959 surgical patients. Medical patients were on average 2 years older than surgical patients, and females comprised a greater portion of medical patients (Table 1).

The most common diagnoses among surgical patients were trauma (n = 1476, 37%), while the most common diagnoses among medical patients were pneumonia (n = 448, 16%), malaria (n = 382, 13%), and anemia (n = 381, 13%) (Table 2).

HIV Counseling and Testing

Of the 2985 medical and 3959 surgical patients screened for HCT, 1857 (62%) medical patients and 3506 (89%) surgical patients had an unknown HIV status or negative test dated older than three months on admission and

Table 1. Characteristics of medical and surgical patients at KCH

Characteristic	Medicine (n = 2985) n (%) or mean (SD)	Surgery (n = 3959) n (%) or mean (SD)	p value
Demographics			
Age	39.7 (16.6)	37.6 (19.3)	< 0.001
18–25 years	590 (20%)	1,093 (28%)	
26–35 years	831 (29%)	935 (24%)	
36–50 years	814 (28%)	876 (23%)	
51–65 years	389 (13%)	586 (15%)	
65+ years	281 (10%)	372 (10%)	
Sex			
Male	1653 (56%)	2711 (69%)	< 0.001
Female	1325 (44%)	1653 (31%)	
Hospital Course			
Admitting Diagnosis			
Infection	1189 (41%)	537 (14%)	< 0.001
Non infection	1664 (59%)	3410 (86%)	
Outcome			
Discharge	2199 (75%)	3135 (89%)	< 0.001
Death	674 (22%)	111 (3%)	
Abscond	62 (2%)	286 (8%)	
HIV Counseling and Testing Results			
HIV status			
Known positive	933 (31%)	230 (6%)	< 0.001
Known negative	195 (7%)	223 (6%)	
Tested positive	224 (8%)	159 (4%)	
Tested negative	915 (31%)	2107 (53%)	
Unknown/not tested	718 (24%)	1240 (31%)	

* Outcome data are missing for 60 medical patients and 407 surgical patients, therefore percentages are based on totals excluding missing patients.

Table 2. Discharge diagnosis and outcome among all patients and newly diagnosed HIV+ patients on the surgical and medical wards at KCH

	All Surgical patients (N = 3959)		Newly diagnosed HIV + surgical patients (N = 159)	
	Total n (%)	Mortality n (%)	Total n (%)	Mortality n (%)
Trauma	1476 (37%)	45 (3%)	58 (38%)	1 (2%)
Bowel Obstruction	266 (7%)	15 (6%)	15 (10%)	0 —
Skin/soft tissue infection	225 (6%)	2 (1%)	12 (8%)	0 —
Cancer	188 (5%)	7 (4%)	1 (1%)	0 —
UGI Bleeding	143 (4%)	8 (6%)	5 (3%)	0 —
Sub-acute abdominal pain	132 (3%)	4 (3%)	4 (3%)	0 —
Total	3959 —	111 (3%)	159 —	4 (3%)
	All medical patients (N = 2985)		Newly diagnosed HIV+ medical patients (N = 224)	
	Total n (%)	Mortality n (%)	Total n (%)	Mortality n (%)
Pneumonia	448 (16%)	113 (25%)	59 (28%)	10 (17%)
Malaria	382 (13%)	46 (12%)	40 (19%)	8 (20%)
Anemia	381 (13%)	99 (26%)	18 (9%)	5 (28%)
Acute gastroenteritis	257 (9%)	30 (12%)	26 (12%)	3 (12%)
CHF	227 (8%)	62 (27%)	6 (3%)	2 (33%)
Meningitis	135 (5%)	45 (33%)	19 (9%)	8 (42%)
Total	2985 —	674 (23%)	224 —	44 (20%)

* Diagnosis is not specified in 14 surgical patients (including 4 surgical patients with new HIV diagnosis, and in 133 medical patients (including 15 medical patients with new HIV diagnosis). Missing data are excluded when calculating percentages. Additionally, 596 surgical patients (including 19 surgical patients with a new HIV diagnosis) and 1138 medical patients (including 76 medical patients with a new HIV diagnosis) have more than one discharge diagnosis listed. Therefore, percentages of patients with each diagnosis do not add to 100%.

qualified for testing (Table 1). Of the 5363 patients with an unknown HIV status on admission, 1139 (61%) medical and 2266 (65%) surgical patients received HIV testing during their hospital admission. Nineteen (1%) medical patients and 59 (2%) surgical patients declined testing. Other patients died or were discharged before testing was offered, or the counselor was unable to locate the patient.

Demographics of Newly Diagnosed HIV-positive Patients

A new diagnosis of HIV infection was made in 224 (20%) medical and 159 (7%) surgical patients who underwent testing. In total, 1157 (39%) medical and 389 (10%) surgical patients were HIV-positive, either diagnosed prior to admission or diagnosed through the HCT protocol. Of the total number of HIV-positive medical patients, 224 (19%) were newly diagnosed under the inpatient HCT protocol, whereas 81% had a prior diagnosis. Of all HIV-positive surgical patients, 159 (41%) were newly diagnosed under the inpatient HCT protocol, while 59% had an HIV diagnosis prior to admission. The mean age of the newly diagnosed medical and surgical patients was 36.7 and 34.5 years, respectively. The majority of newly diagnosed medical (54%) and surgical (65%) patients were male. Significantly more medical patients had WHO Stage 3 or 4 diseases recorded as discharge diagnoses in their charts at the time of admission (50% vs. 5%) (Table 3).

As with the background surgical inpatient population, the most common discharge diagnosis in surgical patients with a new HIV diagnosis was trauma (n = 58, 38%). Similar to the background medical patient population, the most common diagnoses in medical patients with a new HIV diagnosis were pneumonia (n = 59, 27%) and malaria (n = 40, 18%). (Table 2)

CD4 Count Analysis

Requests for CD4 counts were documented in all but four patients; however, only 25% (n = 56) and 36% (n = 58) of medical and surgical patients, respectively, had a CD4 count obtained and recorded in the patient chart (Table 4). Medical patients were less likely to have a CD4 count obtained and recorded (AOR 0.6, CI: 0.4–0.9). Patients with a

Table 3. Comparison of medicine to surgery patients with a new HIV diagnosis at KCH

Characteristic	Medicine (n = 224)	Surgery (n = 159)	p-value
Demographics			
Age in years			
Mean (std dv)	36.7 (12.8)	34.5 (11.9)	0.09
18–25 years	37 (17%)	34 (22%)	
26–35 years	92 (42%)	61 (39%)	
36–50 years	63 (29%)	49 (31%)	
51–65 years	18 (8%)	12 (8%)	
65+ years	10 (5%)	2 (1%)	
Sex			
Male	122 (54%)	103 (65%)	
Female	102 (46%)	56 (35%)	0.04
CD 4 Count and WHO Staging Criteria			
CD4 count obtained			
Yes	56 (25%)	58 (36%)	
No	168 (75%)	101 (64%)	0.02
CD4 count			
> 350	5 (9%)	25 (43%)	
< 350	51 (91%)	33 (67%)	< 0.001
< 200	39 (70%)	23 (40%)	0.001
Abstraction of WHO criteria			
WHO Stage 3 or 4	105 (50%)	8 (5%)	
Not WHO Stage 3 or 4	104 (50%)	146 (95%)	< 0.001
Hospital Course			
Admitting diagnosis			
Infection	167 (80%)	31 (19%)	
Non infection	42 (20%)	127 (81%)	< 0.001
Outcome			
Discharge	170 (78%)	134 (96%)	
Death	44 (20%)	3 (2%)	
Abscond	3 (2%)	2 (2%)	< 0.001

* Outcome data is missing for 7 surgical patients and 20 medical patients, therefore percentages are based on totals excluding missing patients.

discharge diagnosis meeting WHO stage 3 or 4 criteria were slightly, though not significantly less likely to have a CD4 count obtained and recorded (AOR: 0.7, CI: 0.4–1.1).

The mean CD4 counts in newly diagnosed medical and surgical HIV-positive patients were 168 and 331 cells/μL, respectively. The CD4 count did not differ significantly between male and female patients (p = 0.4) or between patients who were admitted for management of an infectious versus non-infectious complaint (p = 0.1). However, there was a statistically significant difference in the mean CD4 count among patients with an admission diagnosis that met WHO stage 3 or 4 disease and those without, 137 and 301 cells/μL, respectively (p = 0.001).

HIV Staging and ART Eligibility

WHO stage 3 or 4 disease or CD4 count less than 350 cells/μL are the eligibility criteria for starting antiretroviral treatment in Malawi. Of the 114 newly positive patients with a CD4 count, 51 (91%) of medical and 33 (57%) of surgical patients were found to be less than 350 cells/μL. Of all newly diagnosed patients, 132 (61%) medical and 40 (25%) surgical patients met criteria for ART initiation, either by CD4 count or WHO stage 3 or 4 disease by discharge diagnosis. Of the 132 medical and 40 surgical patients eligible for ART, CD4 count less than 350 cells/μL was the determining criterion for 20 (15%) medical patients and 33 (83%) surgical patients who did not have a discharge diagnosis meeting WHO 3 or 4 criteria.

Table 4. Comparison of outcomes, CD4 counts, and diagnoses between medicine and surgery patients with a new HIV diagnosis at KCH

	Crude OR	CI	Adjusted OR*	CI
Outcome				
Survived	1		1	
Died	7.41	2.86–19.14	7.21	2.77–18.78
CD4 Count				
CD4 not obtained	1		1	
CD4 obtained	0.58	0.37–0.90	0.59	0.38–0.93
CD4 > 350	1		1	
CD4 < 350	7.27	2.69–22.20	7.80	2.60–23.44
CD4 > 200	1		1	
CD4 < 200	3.49	1.61–7.58	3.25	1.45–7.28
Admitting Diagnosis				
Non-infectious	1		1	
Infection	13.97	8.43–23.16	14.93	8.83–25.23
Not meeting WHO stage 3 or 4 criteria	1		1	
WHO state 3 or 4 criteria	18.43	8.60–39.46	19.01	8.80–41.07

* Adjusted for age and sex

Mortality Analysis

Newly diagnosed HIV-positive medical patients also had a higher in-hospital mortality than newly diagnosed HIV-positive surgical patients (Table 3). Among the 44 medical patients with a new HIV diagnosis who died on admission, meningitis, pneumonia, presumed sepsis, and malaria were the most common diagnoses. Three surgical patients died, one who was admitted for trauma and two with unrecorded or undetermined admitting diagnoses. Eight patients with a recorded CD4 count died during admission, including seven medical patients and one surgical patient, all of whom had a count less than 350 cells/μL and seven of whom had a count less than 200 cells/μL. Patients with a final diagnosis meeting criteria for WHO stage 3 or 4 diagnosis were significantly more likely to die on admission (AOR 3.4, CI: 1.8–6.4). Outcome data were missing for 7 medical and 20 surgical patients with a new HIV diagnosis.

DISCUSSION

In our study, surgical patients with a new HIV diagnosis had less advanced disease by CD4 count, and less inpatient mortality, than medical patients. The majority of medical and surgical inpatients with a new HIV diagnosis qualified for ART by Malawi MOH guidelines, and surgical patients were more likely to qualify based on CD4 count rather than having a discharge diagnosis meeting WHO 3 or 4 criteria.

The discharge diagnoses for newly identified HIV-positive patients in the surgical and medical wards were similar to the discharge diagnoses in the background populations on these wards respectively, with a few exceptions. A greater percentage of newly diagnosed HIV-positive patients had meningitis compared with all medical inpatients, and fewer newly diagnosed HIV-positive medical patients had congestive heart failure compared with all surgical inpatients. Additionally, fewer surgical patients with a new HIV diagnosis had cancer than the background surgical inpatient population. This is likely a reflection of age, as newly diagnosed HIV medical and surgical patients were generally younger than the general inpatient population.

Early HIV diagnosis provides an opportunity to improve the health of not only the individual patient, but also the population as a whole. HCT alone reduces high-risk behaviors [5], and anti-retroviral therapy (ART) reduces transmission of HIV [16]. Starting ART before the CD4 count falls below 200 cells/μL results in nearly double the years of life gained from treatment than implementing ART at CD4 counts below 200 cells/μL [17], and starting ART before the CD4 count falls below 350 cells/μL results in further decreases in mortality and incident tuberculosis than starting at a threshold of 200 cells/μL [18]. However, advanced presentation at the time of diagnosis is common [19], obviating these benefits.

Though the Malawi Ministry of Health recommends HCT be offered to a patient presenting to a health care facility for any reason [Malawi guidelines], nearly half of men and a quarter of women in Malawi have never been tested for HIV [2]. In our study, medical patients with a new HIV diagnosis had lower CD4 counts, more advanced HIV, and

higher inpatient mortality than surgical patients, consistent with previous studies [13]. Although fewer surgical patients tested positive, HTC in the surgical population presents a unique opportunity to identify patients with less advanced HIV who can expect more years of life gained from ART than patients with more advanced HIV. While few patients in our study declined testing, more than half of newly diagnosed HIV-positive patients presented with advanced HIV by WHO 3 or 4 criteria and CD4 count, and were likely symptomatic. Whether these patients declined previous testing or lacked access to testing before admission is an important area for future research to optimize delivery of HTC services.

According to Malawi MOH guidelines for 2011, both clinical and laboratory guidelines can be used to determine ART eligibility. All newly diagnosed HIV-positive patients with WHO stage 3 or 4 disease qualify for ART and do not require a CD4 count for ART initiation, while patients with WHO stage 1 or 2 disease require a CD4 count to determine eligibility. In our population, surgical patients with a new HIV diagnosis infrequently met WHO stage 3 or 4 criteria by discharge diagnosis, and the vast majority of surgical patients eligible for ART met eligibility because of a CD4 count less than 350 cells/μL. In contrast, half of newly diagnosed medical patients met WHO 3 or 4 criteria by discharge diagnosis, and few patients met ART eligibility based on CD4 count alone. Surgical patients were more likely to have a CD4 count obtained and recorded in the medical chart, which is consistent with the recommendation that CD4 counts be obtained in WHO stage 1 and 2 patients but not in WHO stage 3 or 4 patients.

Though CD4 counts are more likely to determine ART initiation in surgical patients, CD4 counts are more likely to determine clinical management of the acute diagnosis in medical patients. Therefore, obtaining a CD4 count can be important for clinical decision-making in both groups, but obtaining and recording a CD4 count remained a challenge in both medical and surgical wards. Challenges include the availability of personnel, blood collection tubes and needles, and an operational CD4 count machine with rapid turnaround time and communication of the results. Point-of-care testing for CD4 counts has been shown to be accurate [20] and to reduce loss to follow-up [21, 22] in patients with newly diagnosed HIV and could result in better clinical management of these patients.

This study is limited by the incomplete record of WHO staging and CD4 counts. We attempted to abstract those diagnoses which met criteria for stage 3 or 4 disease, but incidental candidiasis or Kaposi sarcoma may not be recorded, and WHO stage could therefore be underestimated. Additionally, more than a third of patients who qualified for HCT and did not decline testing were not tested. Patients were often discharged or died before testing, or were lost on the wards.

In our setting, HCT identified more new HIV infections in medical patients, who typically presented with advanced disease. However, the majority of both medical and surgical patients met criteria for ART initiation by CD4 count, though surgical patients were much less likely to have a diagnosis meeting criteria for WHO stage 3 or 4 disease. Improved CD4 count implementation could identify particularly more surgical patients who qualify for ART. Though the medical inpatient wards are an obvious choice for implementing VCT, surgical patients present with less advanced disease, and starting treatment in this group could result in more years of life gained.

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