Costs of hospital care for HIV-positive and HIV-negative patients at Kenyatta National Hospital, Nairobi, Kenya

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Objective To record the costs of hospital care for HIV-positive and -negative patients in Nairobi, and identify costs paid by patients per admission.

Design Cost data were collected on inpatients enrolled in a linked clinical study using standardized costing methods.

Setting: Kenyatta National Hospital, Nairobi's main district hospital.

Patients Consecutive adult medical admissions to one ward over 14 weeks who consented to enrolment; tertiary referrals were excluded.

Main outcome measure Average length of stay and cost per patient admission.

Results The hospital costs of 398 patients (163 HIV positive; 33 with clinical AIDS) were analysed. The mean length of stay was 9.3 days and the mean cost per patient admission was US$163. There was no significant difference in costs or mean lengths of stay between HIV-positive and -negative groups, nor were the costs and lengths of stay for clinical AIDS patients significantly different to those for HIV-positive patients without AIDS. The patient charges paid to the hospital per admission, recorded for 344 patients, were on average US$61; and did not differ by HIV status.

Conclusion The similar cost patterns for inpatient care irrespective of HIV status or clinical AIDS probably reflects the limited provision of care beyond basic clinical services. Length of stay rather than differing treatment regimes thus appears to be the main cost driver. Private costs of medical care were high and were likely to pressurize households. When resources are limited, the introduction of new, more costly therapies needs careful planning. The study provides cost information for planning care services in resource-poor settings.

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Introduction

The number of people living with HIV/AIDS in sub-Saharan Africa in 2000 was estimated to be over 25.3 million [1], representing over two-thirds of all reported individuals infected worldwide. The burden of care on the health sector stemming from this epidemic is still rising [2], and inpatient prevalence rates measured in several major government hospitals around Africa vary from approximately 40% in Nairobi, Kenya [3] to 70% in Bujumbura, Burundi [4]. Clinical care for HIV/AIDS in developing countries consists, at best, of the basic management of bacterial, mycobacterial and opportunistic infections [5,6]. Testing facilities are not widespread and there is minimal access to primary disease prophylaxis, or to antiretroviral treatment. It has been predicted that the HIV-induced increase in demand for 'no frills' basic care alone will have a major impact on the ability of resource-poor countries to provide adequate healthcare using systems already over-stretched before the era of HIV [7]. Healthcare costs in Kenya, where prevalence was estimated to be 13.9% in

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2000 [1] were predicted to reach 3.7 billion KSh (US$68 million) by 2010 [8]. These studies predicted a heightening of the overcrowding problem in the hospital, increased demands on medical staff as the patient mix became more seriously ill, further strains on other hospital and healthcare resources, and a widening of the gap between available drug supplies and demand [7,8].

Existing models of the provision of care for people living with HIV/AIDS are often described as a continuum of care across which a patient moves according to their healthcare seeking behaviour [9]. Providers across this continuum include individuals in the home, primary healthcare centres, centres for the management of tuberculosis or sexually transmitted diseases as well as hospital-based curative services. Although alternative models of care are being developed [10], there are very limited data on the costs of HIV/AIDS hospital care in developing countries [11]. We therefore assessed the economic burden of HIV/AIDS on medical services at Kenyatta National Hospital (KNH), Nairobi, Kenya.

Materials and methods

Background

We studied adult patients admitted to KNH in 1997 and enrolled in a clinical study [3,6]. Until late 1997, KNH served as the main district hospital for Nairobi as well as a teaching hospital and the national referral centre for Kenya. It has a total bed capacity of 1520 beds. There are seven medical wards at the hospital, each with it's own medical team. Inpatient admissions are authorized by casualty doctors who filter all emergency patients. Admissions are organized in a 7 day roster, such that consecutive admissions in a 24 h period are admitted to a single ward.

Cost-sharing in KNH consists of nominal fee rates for services in the form of an outpatient and inpatient treatment fee, a dispensing fee depending on the drug prescribed, and investigation fees. The fees aim to achieve a degree of cost-recovery, and are set according to a combination of direct costs of supplies and patients' perceived willingness and ability to pay. Only the investigation fee is set at the level of the direct cost of supplies. Special subsidies previously granted to HIV-positive patients were withdrawn in 1996. Patients have three alternatives with which to cover their costs: first, direct payment of the user-fee; second, through membership of the National Health Insurance Fund (NHIF) (a national insurance fund that subsidizes the medical costs for formal sector employees); and, third, for the those considered unable to pay by a hospital social worker, the fee may be partly or fully waived.

Data collection procedure

Cost data were compiled for a subset of patients enrolled in the cross-sectional observational clinical study on completion of the clinical data collection [3,6]. In the clinical study, consecutive acute medical admissions in 15 sequential 24 h on-take periods to one of seven medical teams were reviewed. If informed consent was given, patients were enrolled during admission. Tertiary referrals or patients transferred into the ward post-admission were excluded. These exclusion criteria meant the study population was representative of secondary care users only, the most common type of hospital user across sub-Saharan Africa. For the study, a project-salaried HIV/AIDS counsellor was provided for the ward. However, normal practice in the hospital at that time was for nurses to carry out HIV/AIDS counselling on the wards, as part of their routine duties.The patient support centre, which was under development at the time of the study, now provides further support for HIV services in the hospital and may have an impact on the costs of admissions. Patients were otherwise managed in a routine fashion and followed until death or discharge.

The sample size was based on convenience and aimed to be similar to previous studies of HIV impact at KNH [12,13]. Data sources for the economic analysis included the clinical study records, cashier records, staff rosters, hospital expenditure records, laboratory and radiology examination records, suppliers price lists and interviews with key staff.

Clinical data, records of treatment and investigations, lengths of stay and patient expenses were collected as far as possible for all admissions who consented to enrol. Patients were classified according to HIV status and the WHO clinical case definition for AIDS [14]. They were further classified at discharge by the project physician into single diagnostic categories, according to the diagnosis identified as the main reason for the current admission. For example, a diabetes diagnosis signified admission as a result of a diabetes-related complication. This oversimplifies co-morbidity but was felt to be the most practical approach to summarizing the case mix. Details of the clinical study methods are described elsewhere [3,6].

Description of costing methodology

The costing took the perspective of the hospital and the patients. The average length of stay and average cost were calculated for each of the patient categories. Hospital costs were classified according to medical and ward staff costs, pharmaceuticals, investigations and non-curative care (overhead) costs. This latter category included the costs of laundry, catering, building maintenance, utilities, cleaning, transport and capital assets. The average cost for each patient was then calculated using the following formula:

$$C = (L[NC + S]) + (I) + (D)$$

where for each patient,

C = total hospital cost
L = length of stay
NC = non-curative care cost per day
S = ward staff cost per day
I = investigation cost
D = drug cost

Non-curative care costs per patient day were allocated to the patient using a standard step-down approach [15]. Shared costs were allocated to the wards and other departments on the basis of floor space in the hospital. A cost per patient day was then calculated on the basis of daily bed returns on the ward. The annualized cost of capital assets was valued as 10% of recurrent costs, a low side estimate based on a review of hospital costs in developing countries [16]. Medical and ward staff costs were calculated using staff rosters and the university and hospital salary sheets. Ward staff costs excluded the cost of the counsellor employed for the purpose of the study as it was felt that this did not reflect current hospital practice. Investigations were recorded for each patient and were costed using a standard ingredients approach to costing in consultation with laboratory staff and records. Staff training costs were not included in the cost analysis.

Pharmaceutical utilization was identified using patient prescription sheets. Drug costs were obtained from the hospital pharmacy suppliers' price lists. The cost of drugs prescribed to maintain long-term chronically ill patients after discharge were not included. For example, the cost of the long-term prescription of insulin for a patient with diabetes was excluded. Those drugs acquired by the patients or their families outside the hospital because of shortages or exclusion from the essential drugs list, as well as tuberculosis drugs financed by the National TB Programme were not counted as hospital costs but were analysed separately. Finally, the personal costs to patients of an inpatient episode was analysed using a sub-set of patients. Patients were selected if their cashier records were available. Patient costs were calculated as the sum of all fees paid to the hospital, plus any costs incurred for prescribed drugs purchased outside the hospital.

All costs were converted to constant year 2000 US dollars using the International Financial Statistics 1997 [17] and the average US inflation rate [18]. Statistical analysis was carried out using non-parametric methods (Mann–Whitney U test) using Epi Info 2000.

Results

Patient sample

Of 523 admissions to the medical ward over the 14 weeks of the clinical study, 518 (99%) were enrolled. Cost data collection commenced on completion of the clinical data collection. In total, 398 (76%) patients had complete prescription and cashier records required for the cost analysis, and were therefore included in the economic analysis. A subset of 334 (64%) patients was used to analyse patient costs. HIV prevalence (41%) in the cost data sample was similar to the prevalence in the complete clinical sample. Tuberculosis was the most prevalent diagnosis overall (Table 1) and was more prevalent in the HIV-positive group than for HIV-negative patients. Malaria and diabetes were more common in the HIV-negative than the HIV-positive group. However, analysis of the clinical sample showed that overall the most common diagnoses were shared by both groups, and this is explored in more detail elsewhere [3].

Hospital costs

The total cost of the sample was US$65 004 and represented 3683 patient days. Non-curative costs made

Table 1. The seven most prevalent diagnostic categories[a] on discharge.

	HIV negative		HIV positive		All patients
	(N)	(%)	(N)	(%)	(N)
Tuberculosis	21	9	45	28	66
Acute pneumonia	21	9	28	17	49
Acute gastroenteritis	18	8	16	10	34
Malaria	26	11	4	2	30
Non-tuberculous meningitis	12	5	11	7	23
Diabetes	16	7	1	1	17
Clinical enteric illness	10	4	6	4	16
Other	111	47	52	32	163
Total	235		163	41	398

[a]Patients were classified into single diagnosis categories. These diagnoses were the main cause of admission identified at discharge by a senior physican.

up the greatest share (35%), with a similar cost share attributable to ward staff (32%). Investigations were 21% and pharmaceuticals 11% of total costs. For the sample, 42% of patient days and 42% of costs were associated with HIV-positive patients. The breakdown of costs was not affected by HIV status (Table 2).

Overall, the mean length of stay during the study period was 9.3 days (median 6 days) and the mean cost per patient admission was US$163. Between the HIV-positive and HIV-negative groups, there was no significant difference in cost ($P = 0.162$) or mean length of stay ($P = 0.182$) (Table 2); the mean costs per patient to the hospital were US$161 and US$166, respectively. This lack of difference is further confirmed by the similar interquartile ranges of the total cost per patient of the two groups.

When analysed by the seven most common diagnoses, length of stay did not vary markedly. Patients with tuberculosis and meningitis stayed marginally longer in hospital compared with all other major diagnoses, with a median length of stay of 8 days (Table 3). The remaining major diagnoses resulted in median lengths of stay of between 4 and 7 days. Within diagnostic groups, differences were observed between HIV-positive and -negative patients. Although the means were not statistically significant, Table 4 shows that the median length of stay for HIV-positive patients was one day longer than for the HIV-negative group. For acute pneumonia, clinical enteric illness and malaria the median length of stay was one day longer for the HIV-positive than for the HIV-negative group. The apparent extended length of stay for the HIV-negative gastroenteritis group was the result of two cases with unusually long stays of 24 and 31 days.

Table 2. Total and average cost and length of stay by HIV status.

	Drugs (US$)	Investigations (US$)	Ward staff (US$)	Non-curative (US$)	Total (US$)	Length of stay (Days)
All patients (n = 398)						
Total	7417.68	13 894.15	21 039.93	22 652.12	65 003.88	3683.00
Average	18.64	34.91	52.86	56.91	163.33	9.25
Median	3.36	29.71	34.20	36.82	114.53	6.00
IQR (lower)	1.29	16.39	17.10	18.41	65.23	3.00
IQR (upper)	11.09	48.20	62.70	67.51	187.35	11.00
HIV negative (n = 235)						
Total	4946.42	7419.03	12 295.62	13 237.77	37 898.84	2151.00
Average	21.05	31.57	52.32	56.33	161.27	9.15
Median	3.29	25.46	34.20	36.82	108.64	6.00
IQR (lower)	1.25	15.11	17.10	18.41	60.09	3.00
IQR (upper)	14.71	43.33	62.70	67.51	190.84	11.00
HIV positive (n = 163)						
Total	2471.26	6475.12	8744.31	9414.34	27 105.04	1532.00
Average	15.16	39.72	53.65	57.76	166.29	9.40
Median	3.46	35.94	39.90	42.96	130.85	7.00
IQR (lower)	1.42	19.64	22.80	24.55	75.35	4.00
IQR (upper)	9.47	52.02	62.70	67.51	186.12	11.00
P value	0.743	0.341	0.254	0.254	0.162	0.182

IQR, Interquartile range.
Costs in US$ 2000.

Table 3. Median length of stay by HIV status and major diagnosis.

	Median length of stay per HIV+ patient in days (IQR)	Median length of stay per HIV− patient in days (IQR)	Median length of stay per patient in days (IQR)
Acute gastroenteritis, N = 34	3.5 (1.0–1.5)	4.5 (2.0–11.0)	4.0 (1.0–7.0)
Acute pneumonia, N = 49	6.0 (3.0–11.5)	4.0 (2.0–8.0)	6.0 (3.0–8.0)
Tuberculosis, N = 66	8.0 (5.0–14.0)	8.0 (4.0–11.0)	8.0 (5.0–13.0)
Clinical enteric illness, N = 16	10.5 (7.0–13.0)	6.5 (4.0–8.0)	7.0 (4.5–11.0)
Diabetes, N = 17	4.0 (4.0, 4.0)	4.0 (4.0)	4.0 (3.0–5.0)
Malaria, N = 30	4.0 (3.0–7.5)	3.0 (2.0–6.0)	3.0 (2.0–6.0)
Non-tuberculous meningitis, N = 23	7.0 (5.0–14.0)	9.0 (2.5–17.0)	8.0 (3.0–15.0)
Other, N = 163	7.0 (3.5–10.5)	7.0 (3.0–13.0)	7.0 (3.0–13.0)
Total, N = 398	7.0 (4.0–11.0)	6.0 (3.0–11.0)	6.0 (3.0–11.0)

IQR, Interquartile range.

Table 4. Total and average cost and length of stay for HIV-positive patients by clinical case definition of AIDS.

	Drugs (US$)	Investigations (US$)	Ward staff (US$)	Non-curative (US$)	Total (US$)	Length of stay (Days)
Clinically diagnosed with AIDS (n = 33)						
Total	288.38	1165.40	2000.82	2154.13	5608.73	350.00
Average	8.74	35.32	60.63	65.28	169.96	10.61
Median	2.02	32.05	39.90	42.96	121.23	7.00
IQR (lower)	0.79	20.57	11.40	12.27	61.38	2.00
IQR (upper)	5.39	49.04	68.40	73.65	187.43	12.00
Without clinical diagnosis of AIDS (n = 120)						
Total	2058.23	4816.37	5723.14	6161.67	18 759.41	1003.00
Average	17.15	40.14	47.69	51.35	156.33	8.36
Median	3.49	36.83	39.90	42.96	130.50	7.00
IQR (lower)	1.56	18.09	22.80	24.55	77.48	4.00
IQR (upper)	9.62	52.46	62.70	67.51	180.53	11.00
P value	0.2	0.7	0.8	0.8	0.9	0.8

IQR, Interquartile range.
Costs in US$ 2000.

There was no difference between the mean costs and lengths of stay of HIV-positive patients with clinical AIDS (n = 33; 25%) and those not diagnosed with AIDS (n = 120) (see Table 4). The mean and median costs were US$170 and US$121 for those with clinical AIDS and US$156 and US$131 for those without ($P = 0.9$). The mean lengths of stay for these two groups were 10.6 days (median 7) and 8.4 days (median 7), respectively ($P = 0.8$). The similar patterns observed in the comparisons of length of stay and costs arise from the fact that the per diem costs are driving the total inpatient episode cost.

Patient costs

From a sample of 344 patients, with cashier records, the mean charge per patient was found to be US$61 (median US$40). Of the 102 patients known to hold an NHIF card, only 29 were recorded as having made claims and having been reimbursed or partly reimbursed through the fund. Table 5 shows the mean and median hospital charge for patients who paid the fee, whose fees were waived and for those who had an NHIF card.

Table 5. Average patient expenditures per inpatient stay after reimbursements.

	Mean hospital charge per inpatient episode by method of financing (median)		
	(KSh)	(US$)	(N)
Self-financed	2404 (1763)	48 (35)	268
NHIF funded	4874 (2095)	98 (42)	17
NHIF plus self	4580 (3663)	92 (74)	12
Waived	6593 (5380)	132 (108)	19
Partly waived	11 059 (10 850)	222 (218)	9
Absconded	1993 (1993)	40 (40)	2
Other/not known	1486 (420)	30 (8)	17
Total	3012 (1993)	61 (40)	344

NHIF, National Health Insurance Fund.
Costs in US$ 2000.

In addition to the fees paid, pharmaceuticals were purchased outside the hospital by the patient or their carer, when prescribed drugs were not available within the hospital, at a mean cost to the patient of US$32 (median US$9). On average, patients thus paid a total of US$78 in direct medical expenses per episode of illness (median US$54). This did not differ by HIV status.

Discussion

Our study looked at the economic burden of HIV/AIDS in KNH in 1997. It found that 42% of costs on the medical ward were associated with HIV-positive inpatients. This impact on health services can only have served to compound the problems of the existing overcrowding in the medical ward, which reported a bed occupancy rate of 187% during the study year [3]. It also noted that illness episodes of HIV-positive patients were similar in cost to manage compared with HIV-negative patients, although the cost of care for an HIV-positive patient over their entire illness will be greater than for an HIV-negative individual, through repeat admissions and an increasing severity of illness.

These findings concur with those of an earlier study from Zaire (now the Democratic Republic of the Congo), which also found no significant difference in costs between HIV-positive and HIV-negative groups [19]. The Kenya results, however, differ from a recent Zimbabwean study [20], in which the direct cost of treatment and length of stay was greater for the HIV-

positive category in all but one 'central' level hospital. There are several possible explanations for these differences. First, in a situation with relatively limited diagnostic facilities, in which the identification of HIV infection is not actively pursued, and few therapeutic options exist, it is likely that there will be no noticeable difference in treatment between the two groups of patients. This is particularly the case if early more acute HIV-related problems predominate [21,22]. The similar cost patterns in the two patient groups in our study may reflect the reality of limited, non-specific basic services being provided to both groups of patients. This is in contrast to the situation in Zimbabwe, where, at the time of the study, the health system was relatively strong and a wide range of drugs and other supplies were readily available at public hospitals [20]. Second, the similar patterns of care reflect the similar clinical problems of early, non-AIDS HIV-positive patients and HIV-negative patients presenting for care to hospitals in Africa [3,13,22], when, or if, those patients with overt AIDS and the terminally ill may be self-selecting to stay at home. This latter argument is supported by the clinical data, which revealed similar presentations for the HIV-positive and HIV-negative patient groups, although with different frequency and an absolute and relative decline in the numbers of clinical AIDS cases since 1992 [3,6]. A further reason for similar or shorter lengths of stay and costs for HIV-positive patients could be the result of pressures to limit patient stays in an overcrowded hospital.

Cost analyses of inpatient care for HIV-associated disease, based on empirical data, in Africa in the past decade are rare. Previous studies have used clinical suspicion to identify HIV-positive cases [19,23]. One study noted that home-based care in Zimbabwe was more costly on average than inpatient care [20,24]. Other studies have used modelling approaches to estimating the costs of AIDS to the health sector [25]. These assume a more western spectrum of opportunistic infection; and critically the availability and provision of drugs to treat these opportunistic infections. Although these models are useful in providing indications of future demand and costs, they do not explore the issue of gaps in service provision that need to be addressed to facilitate the delivery of specific AIDS care.

The cost of caring for people with HIV is not limited to hospital costs; patients themselves and their relatives bear some portion of the treatment costs, a home care burden, loss of earnings and productivity. There are also costs to outpatient follow-up services and onward referral to other services such as the tuberculosis programme, primary healthcare clinics and community care projects, which should be included when looking at total care costs for people living with HIV/AIDS. In particular, our study shows that patients are in fact bearing a large portion of the cost burden. The average charge to a patient for an inpatient stay was US$61, equivalent to 16% of the GNP per capita for Kenya [26]. In addition to this hospital charge, however, it was found that pharmaceuticals prescribed by hospital staff were often not available at KNH, and patients were required to purchase them elsewhere, thus increasing the average patient cost to US$78. These patient costs cover only one illness episode, therefore as the disease progresses and further treatment is required, the patient expenditures can only be expected to increase. Healthcare costs have been shown to have a significant impact on household expenditures and savings [27,28], and as they rise they could restrict access to health services. Insurance funds are used globally to protect households against such expenditure shocks. However, of the 102 members of the NHIF, less than a third were claiming reimbursements from the fund. It is possible that there is some degree of under-estimation, perhaps related to gaps in the record-keeping or delays in the making of claims. However, if there is this under-utilization of the NHIF, its impact on the utilization of health services and cost-recovery needs to be explored further. To facilitate access to health services, the planning of care strategies and the introduction of new therapies should consider not only their affordability from the provider's perspective, but also the patients' ability to pay and the nature of existing payment systems.

The analysis of costs presented here has a number of limitations. The economic component was retrospective. As a result, some patient expenditure records were no longer traceable, resulting in an incomplete sample although no obvious bias had led to this. It was not possible to carry out a time and motion study to ascertain if staff time varied for the patient categories. The sample size is small and may be the reason for the lack of significance in the differences between the two patient groups. As well as these data collection problems, the estimation of investigation costs was constrained by delays in reporting. As it was not clear whether the investigations had been completed from the patient records, the number and type of investigations were based on requested tests rather than test reports. For the sake of clarity, a single diagnosis was used for classifying patients into diagnosis groups. When there was co-morbidity, the patient was classified under the diagnosis considered to be the main cause of admission. Using this approach, there is the possibility that the cost related to a particular diagnosis also includes significant costs related to a secondary diagnosis. Cost-effectiveness comparisons between the HIV-positive and HIV-negative groups, as well as with other modes of care, are also not feasible as it was not possible to obtain an appropriate indicator of the quality of care. Finally, siting the study in a teaching hospital may have biased cost upwards, thus in spite of

the restriction of the patient sample to non-tertiary referral cases, the generalizability of the results to district hospitals must be made with caution.

Along with the longitudinal clinical study series [3,6], this analysis of the costs of HIV-associated care at KNH paints an important picture of the economic impact of HIV on hospitals and the patient costs of care. It provides baseline information to compare the costs and affordability of other care strategies and can assist with planning the care of a future caseload. However, further work on the costs of addressing gaps in service provision, alternative models of care and a greater understanding of the health-seeking behaviour of HIV-positive patients is required to understand the full amount of resources required at a national level to provide adequate care as prevalence increases. The study raises questions about the efficient hospital management of patients with HIV in the African setting, and demonstrates that little specialist care is currently available for these patients. In spite of this gap in service provision and the stabilization in the numbers of AIDS cases seeking acute care seen at KNH [3], there are persistent costs associated with the management of HIV-positive patients. Understanding the nature of the costs of care, whether at the hospital level or in the community, whether falling on the government or patients themselves, is essential to plan for the provision of care that is both adequate and affordable.

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