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Mortality and Recovery After Stroke in The Gambia

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Background and Purpose—There are no previously published studies of the long-term outcome of stroke in sub-Saharan Africa. Our goal was to determine the case fatality, time to and cause of death, and recovery in a hospital cohort of stroke patients in The Gambia.

Methods—For 1 year beginning April 1, 1990, any patient presenting to the Royal Victoria Hospital (Banjul) with a diagnosis of stroke or having a stroke as an inpatient was recruited. After a standardized assessment, patients were followed up at 1 month, 6 months, and 3 to 4 years to assess recovery or, for those who died, record the date and likely cause of death.

Results—Mean age of the 106 patients (70 men) was 58 years (range, 20 to 93 years). By 1 and 6 months, 29 (27%) and 47 (44%), respectively, had died, with only 27 (25%) surviving to final follow-up (4 patients not traced). Death occurred in hospital in 43 patients (57%). Cause of death was the initial stroke in 46 (61%), further stroke in 5 (7%), infection in 9 (12%), miscellaneous in 8 (11%) (only 1 vascular), and unknown in 7 (9%). On Cox regression analysis, incontinence in the first 24 hours, sensory inattention, and impaired gag reflex on admission were significant predictors of mortality. Predictors of recovery were similar to those of developed countries.

Conclusions—Despite the young mean age, there was a high case fatality rate. The main cause of death was the stroke itself, and ischemic heart disease was very rare. (*Stroke*. 2003;34:1604-1609.)

Key Words: Africa south of the Sahara ■ fatal outcome ■ recovery of function ■ stroke

Sub-Saharan Africa (SSA) is a vast area with a huge diversity of cultures, ethnicity, and medical resources that needs to be considered when comparisons between regions are made. However, even for the whole SSA, data relating to stroke are very limited. Recent verbal autopsy data demonstrated that the age-adjusted stroke mortality rates in Tanzania are high.[1] For the age group of 15 to 64 years, age-adjusted stroke mortality rates in all 3 Adult Morbidity and Mortality Project areas for the years 1992 to 1995 were significantly higher than the age-adjusted rates for England and Wales for 1993. One might expect the prevalence of stroke-related disability to be correspondingly high, but when this was measured in 1 of the Adult Morbidity and Mortality Project areas, the age-specific rates were lower than in studies from developed countries.[2]

These findings suggest that case fatality in SSA is higher than in developed countries, but the published evidence for this is very limited and based almost entirely on in-hospital mortality figures. In a hospital-based study of 116 patients in Pretoria,[3] 1-month mortality was 33.6%, but there were no details on follow-up methods, no indication of whether deaths outside hospital were recorded, and no long-term follow-up. There are similar problems with other studies that report case fatality rates. There has been no detailed published study of the cause of death of stroke patients in SSA.

Most of the few studies examining recovery after stroke in SSA have been retrospective and are therefore hampered by missing and variable quality of data. In a prospective study of 318 patients in the Ibadan Stroke Register,[4] 207 were alive at 3 weeks, but at 3 months, only 76 (24%) were alive, and at 12 months, only 36 (11%) patients could be traced. The main conclusion from these data is that it is very hard to follow up patients after discharge from hospital in Africa. No previously published study has included long-term community follow-up or classified recovery from stroke in a detailed manner. Therefore, data on recovery after stroke in SSA are very limited.

We report here on a prospective hospital-based study in The Gambia with rigorous community follow-up for up to 4 years to investigate the long-term recovery from stroke and to determine case fatality, time to death, and likely cause of death.

Methods

Research Design

The Gambia straddles the Gambia river and is 322 km long by an average of 35 km wide. In the population census just before the

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study, only 6% of the population was >60 years of age, but only 5% of older people actually had a birth certificate. Of the 1 million population, 95% were Muslim, and 54% lived in rural areas. Banjul, the capital, is situated at the mouth of the Gambia river. The Royal Victoria Hospital in Banjul has 300 beds and is the main referral hospital for the country. The medical unit has 1 male ward and 1 female ward, each with 30 beds, and has ≈2000 admissions per year. The inpatient fee can be waived if the family cannot afford it. At the time of the study, there was no CT scanner in the country.

For 1 year beginning April 1, 1990, any patient presenting to the Royal Victoria Hospital with a diagnosis of stroke or having a stroke as an inpatient was recruited to the study. Stroke was defined according to the World Health Organization definition,[5] and both recurrent and first-ever strokes were included, but patients with a history and cerebrospinal fluid findings suggestive of subarachnoid hemorrhage were excluded.

The patients were seen as soon as possible after admission, usually within 24 hours, almost all within 48 hours. Details were collected on demography, medical history, and potential risk factors. If the exact age of the patient was not known, it was calculated by estimating their age at the time of significant events in Gambian history such as Gambian Independence in 1965 or World War II. Date, mode of onset, and progression, if any, of the stroke were also detailed. The patients underwent a full general and neurological examination, and blood samples were tested with the Venereal Disease Research Laboratory (VDRL) test (all confirmed by the Treponema Pallidum Hemagglutination test). Blood pressure was recorded in patients recumbent on admission, during the first week, at 7 days after stroke (when possible), and at all subsequent follow-up visits. During their hospital stay, patients received standard care, but resources meant that there was a lack of intensive monitoring and therapy input.

Patients were followed up at home (or in hospital if still an inpatient) at 1 month, 6 months, and between 3 and 4 years to assess neurological recovery and disability, including Barthel Index score. Without addresses or telephone numbers for most patients, a careful description of the geographical location of their home and names of close relatives were recorded at hospital discharge. Patients were classified as having good (Barthel score ≥15) or poor (Barthel score <15) recovery. Stroke recurrence and details of antihypertensive treatment, aspirin, and other treatment were recorded. If patients died, details on timing and likely cause of death were recorded after questioning of relatives, friends, and significant others if necessary.

Statistical analysis was carried out with an SPSS statistical package. Dichotomous variables were cross-tabulated and statistically assessed for association with the χ^2 test. Fisher's 2-tailed exact test was used when any of the expected values in the table fell to <5. Results for prognostic indicators are shown for those admitted to hospital within 1 week of stroke. Kaplan-Meier survival curves were calculated with the STATA statistical package, and curves were compared by use of the log-rank test. Data were analyzed with a backward stepwise Cox regression with a significance level of 0.1 for removing candidate variables.

Results

Of the 109 patients originally admitted to the study, 3 were subsequently excluded. Two of these showed progressive deterioration and had other signs and symptoms suggestive of cerebral malignancy; the other had a recurring Todd's paresis after seizures. For the remaining 106 patients (70 men; 66%), the mean±SD age at stroke was 58±16 years, and the median age was 60 years (range, 20 to 93 years) for the group as a whole. For men, the mean age was 58.5±17 years, and the median was 59.5 years (range, 20 to 93 years). For women, the mean±SD age was 58±16, and the median was 62.5 years (range, 21 to 80 years). Seventy were from rural and 36 were from urban areas; 95 were Muslims and 11 were Christians.

History was obtained solely from the 14 patients, from the patient and caregiver or other informant in 59 cases, and solely from relatives and/or friends in 33 cases. Ten were inpatients at the time of stroke, whereas 80 (56 men) were admitted within 1 week, with a mean time to admission for this group of 29 hours (median, 8 hours). Sixteen patients (8 men) took >1 week and 8 (6 men) took >1 month to be admitted.

At the time of stroke, 24 (23%) lost consciousness, 40 (38%) complained of a headache, and 9 (8%) had vomiting. Ten patients (9%) gave a history of previous stroke (8 on the same side), 0 indicated previous transient ischemic attack, 3 had known diabetes, 1 was taking regular aspirin, and 3 were pregnant (12, 23, and 32 weeks' gestation); only 10 had ever consumed alcohol. There was no history of hypertension in 78 patients (74%), of whom 62 (58%) had never had their blood pressure measured. Of the 15 receiving antihypertensive treatment, 6 had had treatment for <1 year. Fifty-three patients had a stroke involving the right carotid territory; 53 had a stroke involving the left carotid territory. On the Bamford classification, there were 54 total anterior circulation strokes, 33 partial anterior circulation strokes, and 19 lacunar strokes. The stroke patients made up 5% of adult hospital medical admissions and, with a mean duration of stay of 19 days (median, 14 days; range, 1 to 142 days), accounted for 10% of medical bed days occupied.

Follow-Up

By 6 months and the final follow-up, 3 and 4 patients (all men), respectively, had been lost to follow-up. By 1 and 6 months, 29 (27%) and 47 (44%), respectively, had died. At the final follow-up (at least 3 years), 27 patients (16 men) were alive, and 75 were known to have died. The mean age at stroke for those who died was 61 years (median, 60 years; range, 24 to 90 years). Of these, 37 (26 men) died in hospital during their original admission. A 77-year-old man with an in-hospital stroke after a fractured neck of femur died after 142 days. Excluding this man, mean time from stroke to death for this group was 18 days (median, 7.5 days; range, 1 to 81 days), and mean duration of admission was 9 days (median, 5 days; range, 1 to 66 days). For the 38 who died after initial discharge from hospital, 6 (2 men) died in hospital on a subsequent admission, and 32 (22 men) died at home. Mean time to death was 538 days (median, 504 days; range, 35 to 1300).

Table 1 shows causes of death in relation to place of death for all patients. The other causes of death included hypertensive encephalopathy, septicemia, and congestive heart failure. The 7 with unknown cause were all men with limited recovery (1-month Barthel scores <10) who died at home after >3 months, so it is likely that they died from causes related to their original stroke. Of the 10 patients (7 men) who had previously had a stroke, 1 was lost to follow-up, and 4 were alive at 6 months, but only 1 was still alive at final follow-up. Interestingly, only 1 died of another stroke.

Tables 2 and 3 show the prognostic indicators for case fatality at 1 month and 3 to 4 years, respectively, and Table 4 gives the prognostic indicators for stroke recovery at 1 month (missing data on 4) for those patients admitted to

TABLE 1.   Cause of Death in Relation to Place of Death

Place of Death	n	Initial Stroke, n	Another Stroke, n	Infections, n	Other Causes, n	Unknown, n
All	50 (40)	32 (26)	3 (3)	5 (4)	3 (2)	7 (5)
Hospital readmission	3 (3)	0	2 (2)	1 (1)	0	0
Home	22 (18)	7 (7)	1 (1)	4 (3)	3 (2)	7 (5)
Original hospital admission	25 (19)	25 (19)	0	0	0	0

Values in parentheses are for those admitted within 1 wk of stroke.

hospital within 1 week of stroke. Data are missing for receptive and expressive dysphasia, dysarthria, visual field defect, and facial palsy for 1 patient who died shortly after admission. Age; sex; area of abode; marital status; history of previous stroke, angina, hypertension, smoking, alcohol use, or snoring; time of day of stroke; atrial fibrillation on examination; and positive VDRL all had no significant effect on mortality or recovery.

For the backward stepwise Cox regression, initial candidate variables included that were excluded with regression modeling were sex; area of abode; history of hypertension, snoring, and cigarette or pipe smoking; whether the stroke occurred during the day or night or during sleep; impaired consciousness after stroke; atrial fibrillation; carotid territory distribution; dysarthria; expressive dysphasia; swallowing problems; facial palsy; or visual field deficit. Table 5 shows the final model.

In relation to Kaplan-Meier survival curves, impaired consciousness level on admission, urinary incontinence in the first 24 hours, any swallowing problems during admission, expressive dysphasia, any visual field deficit, and sensory inattention all had a major impact on mortality, particularly

early. Those ≥65 of age tended to do worse from the outset (see the Figure).

At 1 month, there was full recovery in 9 patients (8.5% of total), whereas 9 had no recovery of movement at all. Of the 51 (29 men) assessed (5 [4 men] could not be followed up) at 6 months, 17 (33%) were on antihypertensive medication, 9 (18%) had made a full recovery, and 17 (33%) were left with a severe impairment (unable to lift affected limbs against gravity). Of the 27 (25%) still alive at final follow-up, 3 had had another stroke, 4 were regularly taking aspirin, and 12 were under regular follow-up for hypertension, of whom only 4 were satisfactorily controlled and 3 had completely defaulted from treatment. Seventeen (65%) patients had a maximum Barthel score of 20, of whom 8 (31%) had made a complete recovery.

Discussion

This is the first published stroke study for SSA that provides comprehensive data on long-term community follow-up and provides the most comprehensive assessment of recovery to date. Considering the difficulties (most dwellings had no street name or number, post [ZIP] codes were nonexistent,

TABLE 2.   Prognostic Indicators for Mortality at 1 Month in Patients Admitted to Hospital Within 1 Week of Stroke

Variable	Dead (n=28), n (%)	Alive (n=62), n (%)	Statistical Significance*
Epileptic seizure at time of stroke	6 (21)	2 (3)	0.010†
Loss of consciousness at stroke	15 (54)	7 (11)	<0.0001
Impaired consciousness at admission	19 (68)	16 (26)	0.00015
Impaired gag reflex on admission	22 (79)	10 (16)	<0.0001
Swallowing problems on admission	24 (86)	12 (19)	<0.0001
Receptive dysphasia	22 (81)	16 (26)	<0.0001
Expressive dysphasia	23 (85)	31 (50)	0.0018
Dysarthria	25 (93)	44 (71)	0.025
Visual field deficit	22 (81)	26 (42)	0.00058
Facial palsy	15 (55)	24 (39)	0.14
Sensory inattention	23 (82)	19 (31)	<0.0001
Right carotid territory	14 (50)	31 (50)	1.00
Incontinence in first 24 h	28 (100)	34 (55)	<0.0001
Urinary catheter	9 (32)	12 (19)	0.18
Chest infection	11 (39)	6 (10)	0.00089

n=90.
*χ^2 test.
†Fisher's 2-tailed exact test.

TABLE 3.   Prognostic Indicators for Mortality at Final Follow-Up in Patients Admitted to Hospital Within 1 Week of Stroke

Variable	Dead (n=61), n (%)	Alive (n=25), n (%)	Statistical Significance*
Epileptic seizure at time of stroke	7 (11)	1 (4)	0.43†
Loss of consciousness at stroke	20 (33)	2 (8)	0.017
Impaired consciousness at admission	29 (48)	5 (20)	0.018
Impaired gag reflex on admission	18 (30)	4 (16)	0.0092
Swallowing problems on admission	30 (49)	5 (20)	0.012
Receptive dysphasia	32 (53)	4 (16)	0.0015
Expressive dysphasia	41 (68)	10 (40)	0.015
Dysarthria	50 (83)	16 (64)	0.051
Visual field deficit	41 (68)	6 (24)	0.00018
Facial palsy	28 (47)	10 (40)	0.57
Sensory inattention	38 (62)	4 (16)	0.00010
Right carotid territory	31 (51)	13 (52)	0.92
Incontinence in first 24 h	51 (84)	9 (36)	<0.0001
Urinary catheter	16 (26)	4 (16)	0.31
Chest infection	15 (25)	2 (8)	0.13†

n=86.
*χ^2 test.
†Fisher's 2-tailed exact test.

and only 2 patients had a telephone), the successful follow-up rate (96%) is very high. Only 1 other study (retrospective) has reported prognostic indicators for mortality, and no study has reported prognostic indicators for recovery. This is also the first study to ascribe cause of death in stroke patients in SSA. The high case fatality rate supports our original contention that the lower prevalence of stroke-related disability in SSA is likely to be due in part to higher case fatality. At the 3- or 4-year follow-up, only 19 patients (18% of total) were alive and living with stroke-related disability in the community.

This cohort is not likely to be entirely representative of all strokes occurring in the community. Those making an early good recovery and those with severe stroke such as primary intracranial hemorrhage causing early death are less likely to have reached the hospital. We have also included recurrent (generally a worse prognosis) and first-ever strokes, although

TABLE 4.   Prognostic Indicators at 1 Month for Stroke Recovery—Poor (Barthel <15) Versus Good (Barthel ≥15)—in Patients Admitted Within 1 Week of Stroke

Variable	Poor (n=34), n (%)	Good (n=24), n (%)	Statistical Significance*
Epileptic seizure at time of stroke	0 (0)	2 (8)	0.17†
Loss of consciousness at stroke	4 (12)	3 (12)	1.00†
Impaired consciousness at stroke	12 (35)	2 (8)	0.018
Impaired gag reflex on admission	8 (24)	1 (4)	0.067†
Swallowing problems on admission	10 (29)	1 (4)	0.019†
Receptive dysphasia	12 (35)	3 (12)	0.051
Expressive dysphasia	22 (65)	8 (33)	0.019
Dysarthria	28 (82)	15 (63)	0.089
Visual field deficit	21 (62)	3 (12)	0.00018
Facial palsy	19 (56)	3 (12)	0.00080
Sensory inattention	14 (41)	3 (12)	0.018
Right carotid territory	17 (50)	11 (46)	0.75
Incontinence in first 24 h	27 (79)	5 (21)	<0.0001
Urinary catheter	11 (32)	1 (4)	0.0096†
Chest infection	4 (12)	2 (8)	1.00†

n=58.
*χ^2 test.
†Fisher's 2-tailed exact test.

TABLE 5. Final Model of Cox Regression Analysis for Risk Factors for Mortality by 3 to 4 Years in Patients Admitted Within 1 Week of Stroke

Variable	Relative Risk	Confidence Interval	*P*
Age ≥65 y	1.84	0.99–3.44	0.055
Impaired gag reflex on admission	2.08	1.10–3.95	0.024
Any sensory inattention	3.76	1.94–7.30	<0.0001
Incontinence within first 24 h	3.43	1.62–7.29	0.001

separate analyses showed no important differences. Interestingly, in a study from Copenhagen, although mortality for recurrent strokes was almost double that for first-ever strokes, neurological and functional outcomes and the speed of recovery in survivors were, in general, similar in the 2 groups.[6] Without CT scan results, we cannot reliably comment on the cause of the strokes.

Many of the prognostic indicator analyses are hampered by the small sample size, which is further restricted by the inclusion of only those patients admitted to hospital within a week of stroke. This was felt to be necessary in view of the considerable length of time some patients took to reach hospital. Most recovery after stroke occurs within the first few weeks, when case fatality is also high. Recovery was graded in terms of Barthel score. Because stairs are rare in The Gambia, we assessed the ability to walk up an incline as an alternative for stair climbing. The Barthel does not include analysis of speech problems; therefore, a patient can score a maximum of 20 while remaining totally aphasic.

We have shown the prognostic data for recovery at 1 month only, but the 6-month data showed similar results, and at final follow-up, the numbers are small. Incontinence within the first 24 hours, facial palsy, visual field deficit, sensory inattention, swallowing problems, expressive dysphasia, and use of urinary catheter were all predictive of a poorer outcome. The duration of admission is not dissimilar to that of developed countries, even though there is no institutional care available in The Gambia to which patients with significant residual disability can be discharged. At follow-up, few of those with hypertension had adequate blood pressure control, and very few were taking aspirin despite having no obvious contraindications. Three patients had a recurrent
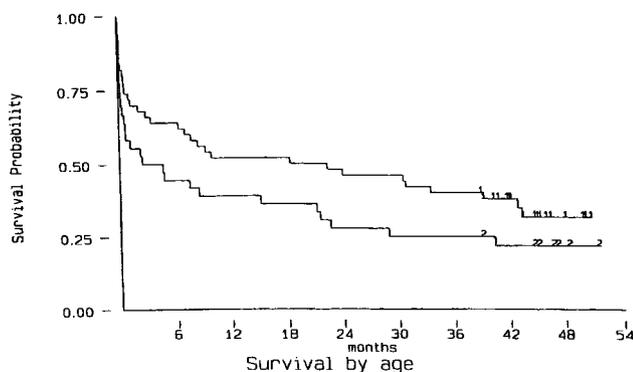
Kaplan-Meier survival curves for those admitted within 1 week of stroke for those ≥65 vs those <65 years of age.

stroke, whereas 3 (12%) of the survivors at final follow-up had had another stroke.

There were an equal number of left and right carotid distribution strokes, a finding similar to previous African studies. On the Bamford Classification (not previously reported in published African studies), there is a relative overrepresentation of total anterior circulation strokes and underrepresentation of partial anterior circulation strokes. This could be due to higher rates of hemorrhagic stroke. The lack of posterior circulation territory strokes may relate to case ascertainment, although these strokes do not appear to be common. Impaired consciousness after stroke was found in 36 patients, which is similar to the one third quoted by the Ibadan Stroke Registry in the 1970s.[4] This is not reported in detail in other African studies.

There are no reliable data for SSA with which to compare the case fatality prognostic indicators. Loss of consciousness at the time of the stroke and incontinence within the first 24 hours after stroke were significantly associated with increased mortality, an established finding from studies in developed countries.[7] Findings at the time of admission of impaired gag reflex, swallowing problems, impaired consciousness, sensory inattention, visual field defect, expressive and receptive dysphasia, and chest infection were all significantly associated with increased mortality. Most of these variables are signs of a severe stroke. Options for feeding patients with impaired swallow were very limited. On Cox regression analysis, sensory inattention and incontinence within the first 24 hours were both very significantly associated with increased mortality.

Previous African Studies

In all the previously published stroke studies from SSA except the prevalence study from Tanzania,[2] the average age of the stroke patients was <60 years, usually between 55 and 60 years. Generally, up to twice as many men as women are represented in hospital studies, as in this present study. This may reflect the fact that women are less likely than men to go to hospital for cultural and financial reasons[8] rather than a difference in incidence. The most common cause of death in cohorts of stroke patients in Western countries is ischemic heart disease, but in earlier African stroke studies, as in this study, this was rare or nonexistent.

Very few prospective studies examining outcome have had the benefit of a CT scanner because there are few CT scanners in SSA. The figures from Pretoria[3] reflect the poorer prognosis in patients with cerebral hemorrhage, as has been found in studies in developed countries, but this is somewhat self-fulfilling because those who died before CT were predominantly classified as hemorrhagic. A 1-month mortality of 33% for 304 stroke patients was reported from Medunsa, South Africa,[9] but no breakdown into hemorrhage and infarction or follow-up details were given. In relation to studies without CT scanning, in a Harare incidence study, 96 (35%; 44 men) of the 273 patients (142 men) died within the first week, with a higher case fatality rate for women (40%) than men (31%).[10] A study from Accra[11] that examined stroke admissions over 3 time periods from the early 1960s to the early 1990s found a dramatic increase in both admissions and

case fatality in the early 1990s and a change in the sex ratio. In the 2 earlier periods, studied men generally outnumbered women by 2:1, but for 1990 to 1992, women outnumbered men. In the early 1990s, stroke was the leading cause of death in hospital in adults, accounting for 17.2% of deaths on the medical wards, with case fatality ranging from 41.9% to 50.3% over the time period. Although the most common age decade for admission with stroke was 50 to 59 years, the highest death rate was seen in the 60- to 69-year age group.

None of the above studies examined mortality in relation to time to admission to hospital. For various reasons, including distance from hospital, access to transport, ability to afford hospital fees, and local beliefs, it is likely that there is greater delay in patients reaching hospital in Africa (particularly from rural areas) than in developed countries. Many patients try "local treatment" before hospital admission, and some may not be admitted at all.

Worldwide Data

Worldwide, comparisons are generally based on first-in-a-lifetime stroke. Depending on the age structure and health status of the population studied, 1-month case fatality varies between 17% and 34%, with an average of ≈24%,[12] while 1-year case fatality is ≈42%.[13] In this study, mortality was 27% at 1 month and 44% at 6 months. Interestingly, in the United States in 1996, age-adjusted death rates for stroke per 100 000 were 39.2 for black women, 22.9 for white women, 50.9 for black men, and 26.3 for white men, with the higher rates for blacks particularly evident in the lower age groups.[14]

Until the present study, there have been no reliable data related to cause of death in stroke patients in SSA. In this study, the cause of death was the initial or subsequent stroke in two thirds, while other comorbidity was rare, so measures aimed at maximizing recovery from the stroke itself could have a significant impact on case fatality. In the Oxfordshire Community Stroke Project, half of all deaths within 30 days of stroke were due to the direct neurological sequelae of the stroke.[15] In the cerebral infarction group, half of all deaths were due to complications of immobility (eg, pneumonia, pulmonary embolism), and these were more likely to occur after the first week. Cardiovascular disease was the most common cause of death after the first year.[16]

The care of patients after stroke within the limited health budgets of most countries in SSA offers a major and increasing challenge. The higher case fatality rate in this study is likely to relate to a variety of factors such as limited facilities and staffing, including availability of physiotherapy and occupational therapy. With the evidence that is now available from developed countries on the benefit of stroke units in terms of both mortality and morbidity, suitable components that are locally available and feasible need to be introduced in SSA. For example, although it is unlikely that the therapy input that can be afforded in the West could be afforded in Africa, a few trained therapists could work with and train other staff, relatives, and caregivers to carry out therapy tasks. This would take advantage of one of the great strengths in many SSA communities, namely extended family

support. In addition, measures for secondary prevention were limited, particularly poor follow-up and treatment (including drug compliance) for hypertension. Compliance could be improved educating both patients and caregivers and improving the availability of locally affordable monitoring and treatment. The cost-effectiveness of hypertension treatment for primary prevention of stroke in Africa is much debated,[17] but there can be less doubt about the cost-effectiveness of secondary prevention. Similarly, other measures such as aspirin that are cheap and affordable should be maximized.

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