# BURDEN AND COST OF INPATIENT CARE FOR HIV-POSITIVE PAEDIATRIC PATIENTS — STATUS IN THE CAPE TOWN METROPOLE DURING THE SECOND WEEK OF MARCH 1999

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*Objective.* To determine the burden of the HIV epidemic on paediatric inpatient facilities in the teaching hospitals of the Cape metropole and tributaries to these hospitals.

*Setting.* Second- and third-level hospitals.

*Method.* During the second week of March 1999 a multicentre collaborative census was performed of all paediatric beds in the teaching hospitals of Cape Town and all facilities draining to and from them.

*Results.* One hundred and six HIV-infected patients were identified from a total of 1 264 beds. Thirty-nine children were in second-level beds or in a long-term residential facility. Fifty-six children were in second-level beds designated for acute care, and occupied 12% of all such beds. Ten children were in beds designated for the care of tuberculosis. Thirty-two (56%) of the acute admissions were for gastro-enteritis, and 13 (23%) were for pneumonia. In 10 children (18% of all admissions) recognised complications of HIV infection were direct causes of admission. For 29 children (35% of all admissions) the current admission was the first; the remainder had had a mean of 2.4 previous admissions. Fourteen children (25%) had received oxygen, and 26 (46%) had received intravenous therapy. Mean lifetime hospitalisation cost per infected child was calculated to be R19 712. The projected cost of a local initiative to reduce mother-to-child transmission is between R8 326 and R10 806 per vertical infection prevented.

*Conclusion.* The inpatient burden of HIV-infected children in Cape Town reflects an early stage of the epidemic. Compared with projected lifetime hospitalisation cost for infected children, an intervention to reduce vertical transmission cost would be cost effective.

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Health strategies aimed at containing the human immunodeficiency virus (HIV) epidemic include the use of zidovudine (AZT) in the peripartum period to reduce the rate of vertical infection of newborn infants.[1-3] This is a costly intervention (Khayelitsha Mother to Child Transmission Prevention Protocol, Provincial Administration of the Western Cape, 1999) and there is an argument that money spent on peripartum use of AZT[4] could be used more efficiently in education and prevention of adult disease. Aside from the practical[5] and ethical criticisms raised against this view, there is a counter-argument that peripartum AZT is in itself a cost-effective measure in terms of the disease it prevents.[5,6] This argument may be supported or refuted by current data describing the volume of paediatric inpatients with HIV infection and the intensity of their treatment.

The prevalence of HIV infection in the Western Cape province of South Africa lags behind that of the rest of the country[7,8] and sub-Saharan Africa. Nevertheless, there is a significant rate of infection among women attending antenatal clinics in this region (Provincial Administration of the Western Cape — annual antenatal survey results, March 1999). Despite a plateau in the overall rate in this population in the last 2 years, it is expected that a rising rate of infection among women of childbearing age will result in a rise in rates of infection among children and children hospitalised for HIV-related or unrelated disease. This increasing number of HIV-infected patients is expected to create an increased demand for paediatric beds, already a scarce resource in the Western Cape metropole (D Power: Head, Department of Paediatrics and Child Health, University of Cape Town — personal communication, 1999). The evolving crisis demands a plan of action for the prevention of HIV infection in children and a plan for the provision of health care for children already infected.

A regional census of known HIV-positive paediatric inpatients was performed to provide data for calculation of current inpatient costs and information for the pro-active planning of inpatient care for HIV-infected children in the Western Cape metropole.

## AIM

The aims of the study were to collect data on all known HIV-positive patients occupying paediatric beds in the teaching

hospitals of the Western Cape and tributary facilities to these hospitals, and to estimate the cost of their inpatient care.

## METHOD

The census surveyed all paediatric beds in the following institutions: Groote Schuur Hospital (including the Princess Alice Wing), Red Cross War Memorial Children's Hospital and Tygerberg Hospital, which are the tertiary teaching hospitals; Conradie, Eben Dönges (Worcester), False Bay, Hottentot's Holland, Karl Bremer, Paarl, Somerset, Stellenbosch, and Victoria hospitals, which are regional (second-level) facilities with paediatric beds; Maitland Cottage Hospital (for paediatric orthopaedics); Brooklyn Chest Hospital and Brewelskloof Hospital, which are hospitals for tuberculosis (TB); Sarah Fox Home, which is a convalescent facility; and Nazareth House and Saint Joseph's Home, Montana, which are residential homes for chronically ill children. Neonatal beds were not included in the census.

A census team consisting of paediatricians and a social scientist surveyed all paediatric beds (medical and surgical) during the second week of March 1999. Where HIV/AIDS had been considered in the diagnosis, patients were identified to the team by ward staff. The basis for diagnosis for HIV infection was determined by examination of the bed notes. Diagnostic status was graded as confirmed (polymerase chain reaction (PCR) positive, or seropositive over 18 months of age), probable (seropositive under 18 months of age with physical signs), or suspected (physical signs and serological result pending).

Information was recorded describing patient demographic details, date and duration of admission, reason for admission, additional diagnosis, nutritional status, current TB status, use of oxygen or intravenous therapy, highest level of care during current admission and maternal health status. Data were recorded on a uniform data collection sheet and entered into an Epi-Info database.

Information on the daily cost of beds was obtained from the administration departments of second- and third-level hospitals and convalescent/residential care institutions included in the study. Costs were calculated on the basis of this information.

No identifying details were included in the analysis. Approval of the study was received from all institutions included in the study. The Research Ethics Committee of the University of Cape Town and the Ethics Committee of the Faculty of Medicine of the University of Stellenbosch approved the protocol.

## RESULTS

At the time of census there were 106 HIV-infected patients (of all diagnostic categories used in this census) in 1 264 beds, or 8.3% of total beds. Fifty-seven (54%) of the patients occupied 'acute' beds, 4 (4%) were in convalescent care, 10 (9%) were in TB institutions and 35 (33%) were in long-term residential care (Table I). Ninety-eight per cent of children in acute beds were in general paediatric beds, and 1 was in intensive care. No children were in designated sub-specialist (tertiary) beds. The burden was unevenly spread. In some hospitals 1 in every 5 general beds was occupied by an HIV-infected child. All children in 'residential' accommodation were living in Nazareth House. All the children in convalescent beds were in the Sarah Fox Home.

**Table I. Bed use by HIV-infected children**

| Type of bed | Total beds | HIV-positive patients | Percentage of category |
|---|---|---|---|
| Acute, tertiary | 351 | 1 | 0.3 |
| Acute, second level | 482 | 56 | 12 |
| Orthopaedic (long-term) | 85 | 0 | 0 |
| Tuberculosis | 96 | 10 | 10 |
| Convalescent | 60 | 4 | 7 |
| Residential | 190 | 35 | 18 |
| Total | 1 264 | 106 | 8.3 |

The diagnosis of HIV infection in acute admissions was clinical (pending confirmatory serology) in 11 patients (19%), based on clinical signs and positive enzyme-linked immunosorbent assay (ELISA) serology in 38 (67%), and based on detection of human immunodeficiency viral DNA by PCR in 8 (14%). During the current admission 14 (25%) of the HIV-infected children received oxygen and 26 (46%) received intravenous fluid or drugs. Most children (more then 78%) in acute beds had been admitted for the management of pneumonia or diarrhoeal disease (Table II).

**Table II. Reasons for admission to 'acute' beds**

| Diagnosis | Number | Percentage |
|---|---|---|
| Diarrhoeal disease | 32 | 56 |
| Pneumonia | 13 | 23 |
| *Pneumocystis* pneumonia | 2 | 3.5 |
| Tuberculosis | 2 | 3.5 |
| Other | 8 | 14 |

'Other' reasons for admission included *Haemophilus influenzae* meningitis, pyelonephritis (2 cases), abscess, kwashiorkor, auto-immune haemolysis, cardiac failure (cor pulmonale secondary to lymphoid interstitial pneumonitis) and a drug reaction. Forty-two per cent of acute admissions had complications of their HIV infections or disease thought to

relate directly to the underlying condition. In 10 (18%) of the children conditions complicating their HIV infection were direct reasons for admission. Five patients had lymphoid interstitial pneumonitis (LIP), 2 had *Pneumocystis* pneumonia (PCP), 2 had *Cryptosporidium* diarrhoea, 1 had auto-immune haemolytic anaemia and 1 had an erythema multiforme drug reaction (presumably related to PCP prophylaxis). In addition to these problems, 8 children had severe oral thrush and 1 had severe *Candida* napkin dermatitis as diagnoses additional to some other reason for acute admission. Six children had chronic suppurative otitis.

Twenty-two children (21% of the total), 12 in 'acute' beds and 10 in convalescent care, were receiving treatment for pulmonary TB. The 'acute' admissions were for miliary TB and tuberculous meningitis.

Eighty-one per cent of HIV-positive children in acute beds had some form of malnutrition. Six children (10%) had kwashiorkor, 14 (25%) were marasmic and 26 (46%) were underweight for age. By comparison, 25 (53%) of 39 children in convalescent or residential care had features of malnutrition. One child in the Sarah Fox Home had features of kwashiorkor. Twenty-two (63%) of the 35 children in Nazareth House had a normal weight for their age.

Children in acute beds were between 1 and 74 months old. The median age was 13 months and the mean age was 18 months. Forty-five per cent of children were under 1 year old. Children in residential or convalescent beds were between 5 and 131 months old, with a median age of 39 months and a mean age of 42 months. The duration of stay in acute beds ranged between 1 and 41 days (one outlier had been in hospital for 217 days), with a median stay of 6 and a mean stay of 11 days. Duration of stay in convalescent/residential beds ranged between 29 and 2 323 days, with a mean duration of 486 days.

The current hospital admission was the first for 20 (35%) of the children in acute beds. The remaining children in the acute group had had between 1 and 7 (a mean of 2.4) previous admissions.

The approximate cost of hospital care for these children may be calculated from the daily bed cost in each hospital. At Groote Schuur Hospital this is R280 per day in the paediatric ward (management accounting programme, MAP office, Groote Schuur Hospital, 1999). This includes costs such as personnel (including the salaries of all medical, nursing, domestic and administrative staff), drugs and other consumables, but excludes capital investment. Bed costs at other hospitals range between R500 and R652, reflecting an average cost for all beds and all levels of care and are not specific for paediatric beds. Based on the Groote Schuur cost estimate, the annualised cost of paediatric beds for a constant number of 57 HIV-positive inpatients would be R5 825 400. It costs R85 a day to accommodate a child at Nazareth House.

Data on maternal health were missing in almost one-third of patient records (Table III).

**Table III. Maternal health status**

| | Acute beds | | Convalescent beds | |
|---|---|---|---|---|
| Maternal health status | *N* | % | *N* | % |
| Well | 39 | 68 | 17 | 36 |
| Symptomatic | 2 | 3 | 0 | |
| Deceased | 2 | 3 | 11 | 23 |
| Unknown | 14 | 25 | 19 | 41 |

## DISCUSSION

The proportion of hospitalised children who are HIV-positive in the Western Cape region is comparable to figures from the Ivory Coast derived in 1991 - 1992,[9] but far lower than the 28% seropositivity rate reported from Lusaka in 1991.[10] Despite a rapid increase in the number of HIV-positive patients admitted annually,[11] the region is in an early stage of the epidemic. Medical staff in the hospitals surveyed in this census do not routinely screen patients for HIV status, but restrict screening serological tests to patients with clinical signs. It is therefore probable that the number of HIV-positive children we report represents an under-count. Appropriate intervention has the potential to restrict paediatric disease.

Nearly 80% of admissions were for diarrhoeal disease (56%) or pneumonia (23%). The preponderance of diarrhoeal disease accords with the summer epidemic of gastro-enteritis in the region. This pattern is similar to that reported from other non-malaria areas[12] and to the African experience, if malaria is excluded.[9,10] These children were hospitalised for intravenous fluid and oxygen therapy and required second-level beds in regional and tertiary facilities.

Although nearly half the HIV-positive census cohort had disease that could be related to underlying immunodeficiency, this was reason for admission in only a minority of cases. TB had been diagnosed in 20% of the cohort, who were still on treatment. This is a higher prevalence rate than previously found in hospitalised children in this region and is probably evidence of the effect of immunodeficiency on susceptibility to TB.

More than 80% of the children in acute beds were malnourished. Specific diagnoses occurred with the same frequency as in previous reports.[9-11] Children in convalescent care were better nourished. The contrast between domestic poverty of hospital patients and the excellent care at Nazareth House may account for some of the difference, but the mean age difference between the groups also suggests that the latter are in a better prognostic group in terms of their HIV infection.

Nazareth House was the only residential facility for HIV-positive orphans and destitute children at the time of the census. This is a matter of concern, because the Home is perpetually full and turned away more than 30 requests for placement in the 12 months preceding the census (J Payne, social worker, Nazareth House — personal communication, 1999). The home-based care initiative in the Western Cape should begin to meet the need for orphan care.

The poor quality of the maternal health record is problematic. From the available data it would appear that at this stage in the HIV epidemic the majority of mothers of children admitted with acute problems remain well and are able to look after their children themselves.

The cost of the programme for the prevention of mother-to-child transmission (MTCT) of HIV infection in the Khayelitsha region of Cape Town has been calculated at between R624 520 and R810 520 per annum, based on a rate of 5 000 births each year. The cost includes serological screening for infection, treatment for an expected 10% of infected women according to the Thai regimen[3] and PCP prophylaxis, follow-up serotesting at 15 months of age and formula milk feeds up to age 6 months for infants at risk. Based on a vertical transmission rate of 30%[12] and an effective 50% protection rate,[3] the cost per infant protected from infection lies between R8 326 and R10 806. The estimated lifetime hospitalisation cost for an infant diagnosed at 13 months (the median age for acute admissions in our census), surviving for 32 months from the time of diagnosis,[13] and requiring 2.4 admissions per annum[14] for a mean 11 days per admission (the mean duration of admission for this census), would be R19 712 (based on the Groote Schuur Hospital paediatric bed cost of R280 per day).

## Conclusion

The Western Cape region of South Africa is in a relatively early stage of the HIV epidemic, yet a significant proportion of children admitted to acute beds are HIV-positive. Second-level beds carry the major burden of hospital care. Diarrhoeal disease and pneumonia are the most frequent clinical problems. Patients are likely to be malnourished, to have multiple medical problems and are at increased risk for TB and multiple admissions every year. If the vertical transmission of HIV infection from mother to child is not addressed in this region (and countrywide), then the gains in health reflected by a fall in under-5 mortality rates for the region will be reversed. Health services will have to face a considerable increase in demand from ill and dying children.[15]

Data from this inpatient census suggest that an intervention such as the Thai regimen[3] for HIV-infected women will be cost effective in the Western Cape region of South Africa. We calculate the lifetime cost of hospital care for an HIV-infected child to be almost twice that of protecting an infant from infection through the prevention of MTCT.

There should be active planning for the care of future orphans, an inevitable consequence of interventions reducing vertical transmission.

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