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Costing of HIV/AIDS services at a tertiary level hospital in Gauteng Province

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COSTING OF HIV/AIDS SERVICES AT A TERTIARY LEVEL HOSPITAL IN GAUTENG PROVINCE

Leena Susan Thomas

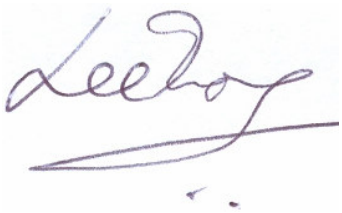
A research report submitted to the

Faculty of Health Sciences, University of Witwatersrand, South Africa in partial fulfilment of the requirements for the Masters in Medicine in the branch of Community Health

Johannesburg 2006

DECLARATION:

I, Leena Susan Thomas, declare that this research report is my own work. It is being submitted for the Masters in Medicine, Community Health. It has not been submitted before for any degree or examination.



_____

Leena Susan Thomas

6th day of September 2006

This report is dedicated to my family, Xavier, Ria, Jacob, Mum & Dad.

Presentations arising from this study: (Accepted for the following conference as Oral Presentation)

Thomas L S, Manning A, Naidoo S, Martinson N. *Costing of HIV/AIDS services in a tertiary level hospital in Gauteng province, South Africa.* Proceedings of the Third international PHASA conference. 2006 May 15-17; Johannesburg, South Africa.

ABSTRACT:

Introduction:

This study sought to determine the costs of providing health care to HIV/AIDS patients in a tertiary level hospital in Gauteng Province. The study also determined what the implications were for the hospital in terms of planning and resource allocation.

Methodology

Study design: Retrospective Record Review

Study Period: 03 May 2005 – 15 June 2005

Study setting: Chris Hani Baragwanath Hospital, Gauteng.

Study population: Medical & Pediatric inpatient discharges and deaths

Results:

1185 records reviewed (812 HIV positive)

HIV positive patients were staying longer than others and costing the hospital more as well. Those on ARV therapy cost the most.

Conclusion:

More resources were being spent on HIV/AIDS patients. Increased lengths of stay and expenditure on drugs and investigations were the reasons for higher costs compared to HIV negative inpatients. Identifying ways of reducing admission and other costs must be seen as strategies in reducing the financial burden of HIV/AIDS to the facility.

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Nomenclature:

AFB	Acid Fast Bacillus
AIDS	Acquired immunodeficiency syndrome
ANOVA	Analysis of variance
ARV	Anti retro viral therapy
CD4 count	Count of Helper T cells
CHB	Chris Hani Baragwanath Hospital
CT	Computed tomography
CXR	Chest X-ray
Direct costs	*That which can be directly linked to a service or patient e.g. Drugs, investigations, staff time etc*
Echo	Echocardiogram
EEG	Electroencephalogram
EMG	Electromyogram
FBC	Full blood count
FNAC	Fine needle aspiration cytology
HAART	Highly Active Anti-retroviral treatment
HAST	HIV/AIDS, Sexually transmitted infections & TB
HIV	Human immunodeficiency virus
HIV Wasting disease:	severe & chronic wasting, malnutrition
Indirect costs	*That which cannot be specifically linked to a service or patient e.g. building maintenance, laundry, kitchen expenses etc*

INH	Isoniazid
IV	Intravenous
Level 1	*Step-down ward offering short stays for medical conditions*.
LFT	Liver Function test
LOS	Length of stay
MRI	Magnetic resonance imaging
N	Number of patients
PCP	Pneumocystis carinii Pneumonia
PCR test	Polymerase chain reaction test
PDE	Patient Day Equivalent
PMTCT	Prevention of Mother to Child Transmission
PTB	Pulmonary tuberculosis
RTI	Respiratory tract infection
RVD	Retroviral disease (HIV)
Tertiary care	*Services offered in an academic health facility with Medical specialists*
TB	Tuberculosis
TB Bactec	TB Culture & sensitivity test
U&E	Urea & electrolytes
USS	Ultrasound scan

CHAPTER 1

1.0 INTRODUCTION

1.1 Background and rationale:

According to the Burden of Disease study done in 2000, deaths caused by HIV/AIDS accounted for 30% of all deaths in South Africa[1], and with prevalence rates of approximately 11.4%, over five million South Africans are estimated to be living with the infection.[2] Morbidity is high, and with public hospitals seeing nearly half all admissions in their medical wards as HIV related[3], a significant portion of hospital resources is being spent on HIV/AIDS. By initiating the roll out of anti-retroviral therapy, the national government has prioritized the epidemic, budgeting R300 million for 2004/5, R600 million in 2005/6, and a billion rand in the 2006/7 financial years.[4] However, there is no system in place in public hospitals to cost the health care provided to HIV/AIDS patients.

The Chris Hani Baragwanath Hospital (CHB) in Johannesburg, South Africa is one of the largest hospitals in the Southern Hemisphere with nearly three thousand beds. It is an academic and tertiary level hospital. The hospital's Department of Internal Medicine has 710 beds, whilst its' Pediatrics Department has 343 allocated beds *(from monthly hospital nursing statistics. Provided by Nursing Director, the late Mrs M Khumalo and staff, CHB).* What is the financial burden of HIV/AIDS in an institute of this size? The answer to this is crucial in that it affects budgeting and resource allocation.

Determining financial budgets for public health hospitals is a challenge considering that budget allocation in South African public health sector institutes has generally always been

a historical incrementalist budgeting process, whereby resources for a certain year are allocated based on the previous year's expenditure (usually adjusted for inflation). While most public sector hospitals in South Africa also generate some revenue through patient user fees, these amounts are insufficient to manage hospitals, and annual hospital budgets are allocated from the coffers of individual provinces.[5]

The historical budget allocation approach is quite rudimentary and assumes that health care provision does not change much over time. It does not adjust for changes in priority health problems or changes in population dynamics. On the other side of the spectrum lies zero-based budgeting, which is a more rational and comprehensive approach. This approach involves justifying the budget needs for any one year based on health services offered, health programs planned and other performance indicators. It does not rely on the previous year's budget. Zero-based budgeting entails more work for managers, but it allows them to plan for what they *are* doing and what they *want* to do in order to cater to their patients' needs.[6] This latter budgeting approach was being implemented in Chris Hani Baragwanath Hospital at the time of the study. Therefore, for the hospital managers concerned, this study was imperative to determine the financial burden of HIV/AIDS to the institute in order to plan for the provision of HIV/AIDS services at the facility.

1.2 Literature review:

Costing the impact, direct or indirect, of HIV/AIDS on the health sector in any country is not an easy task. With the issue of patient confidentiality being so important in HIV/AIDS, it is quite difficult to determine exact numbers of people affected. Since the infection is also related directly or otherwise to a myriad of other illnesses, the cost implications

become quite complex. Nevertheless, challenges aside, it still remains crucial for health managers, planners and policy makers alike, to be aware of how much it costs to manage HIV/AIDS. Hickey, in a paper published by the Institute of Democracy (Idasa) in South Africa in 2003 highlighted these issues and touched on recommendations such as improved information management, patient tracking systems, accurate budgeting and planning, capacity building and the like. The paper also noted that in 2000, 24% of all public hospital admissions in South Africa were due to AIDS-related illnesses.[7]

The impact of the provision of antiretroviral (ARV) therapy to HIV/AIDS patients in South Africa is expected to slow the progression of the disease, thus reducing hospitalization time and numbers of hospital visits. Since the budget for ARV therapy is allocated from a National ARV fund in South Africa, and not from individual hospital budgets, it is anticipated that adequate provision of ARV therapy, in the long run, will reduce the costs of management of HIV/AIDS in hospitals. Kitajima et al in Thailand attempted to estimate the cost savings of providing ARV therapy as opposed to the cost of not providing it in HIV/AIDS patients. The Highly Active Antiretroviral therapy (HAART) regimen used in Thailand at the time of the study was quite expensive, and so it was found that the cost of patients on HAART as opposed to those not on HAART was much higher. Thailand at the time had a universal health insurance scheme that excluded HAART from its benefits, but while there had been a demand to include it in the insurance package; the study found that a large budget would have been needed to provide the expensive HAART regime, at the time, to all the patients that needed it. The conclusion was that if low cost ARV therapy

could have been provided, the costs might have been lower, but probably still higher than that for those not on ARV therapy.[8]

Guinness et al from Kenya published a paper in 2002, which estimated the costs of hospital care for HIV positive patients compared to HIV negative patients. Research here showed that the costs of a specific illness-period of caring for a HIV positive patient and a HIV negative patient were quite similar. The reason for this was that due to limited resources, not much had been actively done for an HIV positive patient since drug therapy had not been an option at the time and diagnoses had been clinically determined. However, over a longer period, the study showed that costs for caring for a HIV positive patient would have been higher due to repeated hospital visits with more severe infections. The paper demonstrated the futility experienced by many health practitioners in under resourced areas that were unable do much for their HIV positive patients other than supportive treatment.[9]

Hansen, Chapman & Chitsike conducted a similar study in Zimbabwe in 2000, which highlighted a different scenario. This paper demonstrated that the cost of caring for a HIV positive patient was definitely higher, in fact twice as high, than caring for a HIV negative patient. The fact that at the time, Zimbabwe had a resource-strong health system which could have afforded to manage HIV/AIDS patients at a higher level, probably contributed to the increased costs. The areas of increased costs identified were mainly drug-related (though it was not clear if this had been ARV drugs or not), laboratory costs and radiology costs. Longer lengths of hospital admission had not translated into increased costs as the expenses for HIV positive patients were found to have been more during the initial two to

three days of admission, since most tests etc would have been done then, and after that care would have been supportive in nature.[10] A limitation to this Zimbabwean study was that the costs of admissions, in terms of staff, nutrition, facility maintenance etc, had not been determined.

A South African study by Shisana et al, to assess the impact of HIV/AIDS on the health sector across the country also highlighted a number of important points. Since South Africa is believed to have one of the highest numbers of HIV/AIDS cases in the world, it follows that the epidemic would have a significant impact on its health services and the society at large. The article looked at the impact of the epidemic on health workers, showing definite losses through staff illnesses, absenteeism and low staff morale. According to this study by Shisana et al, about 16% of health workers in both private and public health facilities, in four provinces, were HIV infected. The prevalence in the younger age groups (18-35 years) was higher, and the article inferred that without an intervention such as anti-retroviral drugs, South Africa could lose the identified infected health workers to AIDS over the next few years. Amongst the patients surveyed in public and private health facilities (clinics and hospitals) across four provinces, the prevalence rate was 28%. Prevalence rates in public hospital facilities alone were higher, at 46% (almost twice the prevalence determined in the Idasa study of 2000), and since these patients stayed in hospital longer (average 13.7 days across all types of hospitals), this meant increased costs to the hospitals concerned. According to the paper, it was also noted that HIV/AIDS patients were using the bulk of health facility resources, at the expense of non-HIV cases.[3]

Another similar South African study by Mathabathe & Kalete, not yet published, and commissioned in 2004 by the Gauteng Department of Health, gave a detailed account of how HIV/AIDS was affecting certain aspects of hospital services in the province. The article looked at impacts of the epidemic on admissions, both medical and pediatric; impacts on length of hospital stay; and impact on costs of caring for HIV/AIDS patients at eight hospitals in the province. Of relevance to the subject of this report, was the fact that Mathabathe et al determined a cost of care provided to adult HIV/AIDS patients at tertiary hospitals (R 1038.36), however the limitation was that this only included costs for drugs, laboratory and radiological investigations. Also interestingly, the average length of stay in tertiary hospitals (5.1 days) was cited to be shorter compared to other levels of care.[11]

Also of relevance to this study was a similar project conducted at Chris Hani Baragwanath hospital in 1996 that attempted to quantify costs of inpatient care of HIV infected patients. The paper by Karstaedt et al demonstrated the common conditions that HIV infected patients were being admitted for in the hospital, being mainly tuberculosis, acute pneumonias and gastroenteritis. The authors also used a similar methodology in determining costs, including the use of the bed-day cost (patient-day-equivalent cost), drug costs and investigation costs. More than 70% of the total cost of an admission was found to have been due to the bed-day cost. The average length of an admission was found to have been 9.8 days across all stages of HIV infection. The costs were calculated per patient per year, using the World Health organization staging for HIV/AIDS, and included all the recurrent admission costs for that year. The costs for Stage I patients were found to have been R910/year, R1277/year for Stage II, R2161/year for Stage III, and R6783/year for

Stage IV.[12] The differences with the current study (subject of this dissertation) were that in the Karstaedt et al study, records of only adult medical patients had been assessed for annual costs of all admissions per patient, and ARV therapy was not part of any treatment regimen at that time.

CHAPTER 2

2.0 MATERIALS & METHODS

2.1 Aim:

To estimate the total costs of caring for hospitalized patients with HIV/AIDS in the Medical and Pediatric wards of Chris Hani Baragwanath Hospital during the period May-June 2005.

Specific objectives:

- To determine direct costs such as lab investigations, procedure costs and pharmaceutical costs
- To determine a patient-day equivalent cost that covered overheads, staff salaries, consumables, and non-consumables
- To determine average lengths of stay of HIV positive and HIV negative patients
- To compare costs of care at Level 1 wards and Tertiary care wards
- To estimate the costs of providing care to HIV positive patients (not on ARV therapy) in comparison to HIV negative patients
- To compare costs of the HIV/AIDS patient (not on ARV therapy) to that of a patient on ARV therapy
- To estimate costs of HIV/AIDS cases as per discharge/death diagnosis
- To determine the proportion of the cost of care to HIV positive patients in relation to the total hospital budget for the period May-June 2005

2.2 Methodology:

Study Design: Record review of discharges and deaths of inpatients from the Internal Medicine and Pediatric departments over a period of six weeks.

Study setting: Medical and Pediatric wards, Chris Hani Baragwanath Hospital, Johannesburg

Study population: all inpatients seen in the Medical and Pediatric departments at the hospital

Study period: Six weeks (03 May – 15 June 2005)

Sampling:

Of the 8722 admissions seen at the hospital (in Medicine & Pediatrics) during the months of May and June 2006, 4020 records of discharges and deaths from the two concerned departments were directed to the principal investigator's office over the six weeks of the study. From these records, 812 HIV positive records were determined to be 'complete', and all of them were reviewed. The 'complete' records of non-HIV patients were sampled through systematic random sampling (every fifth record was selected), and resulted in 373 such records being reviewed for the study. Any incomplete record was excluded from the review. Eventually 2835 records were excluded for either 'being' incomplete, or unselected non-HIV records.

'Complete' records were defined as those with the following:

- Patient details,
- Doctors' notes
- Nursing notes
- Treatment details (drugs, dosages and days on treatment)

- Investigation details

If any of the above were missing, or if the information in the record could not provide the required data, the record was considered 'incomplete' and not included in the study.

In addition, HIV status was determined either by the clinician's discharge/death diagnosis and/or by the results of an HIV test in the patient file.

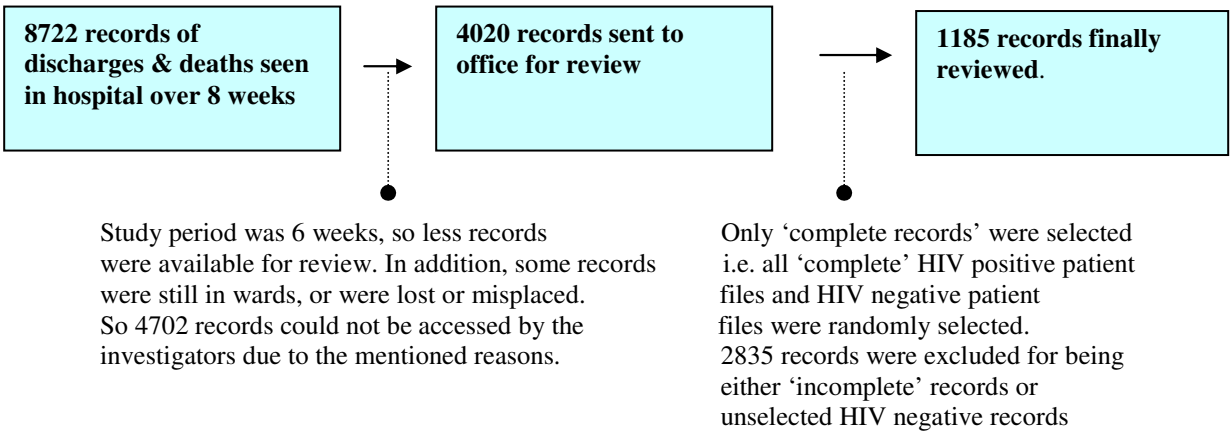


Figure 2.2.1: Record selection and flow

2.3 Ethical considerations:

All information was collected anonymously in the data collection sheet, and respected patient confidentiality. (See Appendix II)

Permission was obtained from the Human Research Ethics Committee (Medical) of the University of Witwatersrand (See Appendix III), as well as from the management of the hospital concerned. The Gauteng Health Department also approved the study.

2.4 Data Collection and Management:

The records from patients in the Medical and Pediatric departments, discharges and deaths, were collected each day by the area staff normally handling patient files, and directed to the office of the principal investigator. The files were then reviewed for HIV status, and utilization data extracted by the principal investigator and two researchers (retired nurses) on a data collection sheet. The costs of investigations, drugs, details on hospital expenses and the like were sourced from various departments and documents, as listed in Table 2.4.1.

Each item as indicated in the source document, be it drug or investigation, was specifically coded, the cost data calculated (see Appendix I) and then the relevant patient item entered onto the data collection sheet. The data collection tool/sheet (Appendix II), was developed by the data management team of the Perinatal HIV Research Unit (PHRU), who were also collaborators in this study. The patient details were linked to the data collection sheet with the hospital number only, and no patient names were entered in the data collection sheet. The records were reviewed from 03 May 2005 till 15 June 2005.

The data sheets were then entered into Datafax, an electronic character recognition system, used by the PHRU, and the data captured on their database.

Table 2.4.1: Sources of data

Sources of data for cost analysis:	**Data extracted from the sources**:
National Health Laboratory System.[1]	Costs of Laboratory investigations
Provincial Gazettes.[13]	Costs of Radiology & other investigations
• Pharmacy price lists.[14] • Price Lists from the procurement section for items such as intravenous fluids, drip sets and the like.[2]	Costs of drugs and other items
Patient records	- Diagnosis on discharge/death, CD4 count value per patient, investigation & treatment details etc - Lengths of Stay
• Financial expenditure sheets from the office of the Director of Finance at the institute.[3] • Hospital statistics department	Data of Hospital expenditure on staff, investigations, drugs, numbers of patients seen and the like to calculate the cost of a Patient Day Equivalent (PDE)

2.5 Calculation of Patient Day Equivalent Cost (PDE)[15]:

The PDE cost was the hospital cost of caring for an inpatient on a daily basis, and included the cost of personnel (doctors, nurses & other health workers), food, space, building maintenance and the like.

The formula used by provincial hospitals for calculating a PDE cost was:

$$PDE\ cost = \frac{Total\ Hospital\ expenditure^{*}}{(Total\ inpatient\ days + [0.5 \times Day\ patients] + [Total\ outpatient\ \&\ casualty\ headcount \times 0.33])}$$

Table 2.5.1: Data for PDE cost calculation for the study period (May-June 2005)

Average number of Inpatient days/month	65479
Average number of Day patients/month	2799
Average Total outpatient & Casualty headcount/month	82891
Average Total expenditure/month*	R57 377 467
Average PDE cost/month	R609

[1] Provided by Dr Mbele and staff, National Health Laboratory services, Chris Hani Baragwanath Hospital as communicated to Dr Manning, Clinical Director CHB (May 2005)
[2] Provided by Mr G Viviers, Deputy Director, Procurement, CHB (April 2005)
[3] Provided by Mr S Van Vuuren , Acting Director of Finance, and Mr P Nortje, Deputy Director of Finance, CHB (May 2005)
[*] In this study, the total hospital expenditure excluded all laboratory, procedure, blood bank and pharmacy costs. These excluded costs were calculated separately per individual patient in the study.

Therefore, the PDE cost calculated in this study was R609/day, according to the above formula.

The expense per patient, therefore, consisted mainly of three types of costs:

- Cost of drugs, intravenous (IV) fluids and other pharmaceuticals.
- Cost of laboratory investigations, radiological investigations and other procedures
- Cost of the length of stay (PDE cost in Rands x length of stay in days)

The above three categories of costs were added up to give a total cost per patient to the hospital[φ].

2.6 Statistical analysis

The data in the PHRU database was then exported to MS Excel, and analysis done using Epi Info Version 3.2 and SPSS software. The tests used to determine statistical significance were One-way ANOVA with post-test (Tukey) for more than three groups of data, and unpaired '*t*' test when two groups of data were compared. The main outcome measures were average length of stay per patient, average costs per patient for procedures and pharmacy services, and average total cost. Differences in values were considered statistically significant if the 'p' value was less than 0.05.

[φ] It must be noted that costs calculated from this study were different to what the hospital billed each patient, the assumption being that the hospital was not actually billing the true cost of patient care, since user fees are heavily subsidized. This study attempted to find out what those true costs were.

2.7 Pilot Study:

A Pilot study was conducted over a brief period i.e. a few days prior to the commencement date.

Issues identified during the pilot:

- Longer list of drugs and investigations had to be considered in terms of identifying costs
- Larger than predicted numbers of records were being seen every day, close to 100-150 records were being reviewed daily, so eventually all 'complete' HIV records collected during that period were reviewed, and the 'complete' non-HIV records had to be sampled (systematic random sampling). 'Incomplete' records were not reviewed.
- More than one researcher was needed (eventually 2 retired nurses were employed).
- Extra time for backlogs had to be factored in, due to the large numbers of records seen.
- The data sheet had to be changed three times to accommodate added data. (See final data collection sheet attached as Appendix II).

CHAPTER 3

3.0 RESULTS:

Over an eight-week period from the beginning of May until the end of June 2005, 8722 Medical and Pediatrics patients were processed as discharges or deaths from the Chris Hani Baragwanath Hospital *(Provided by Ms Joyce, CHB statistics department).* Of these, 4020 records were sent to the principal investigator's office during the six weeks of the study duration, and from these 1185 complete records were reviewed.

3.1 Characteristics of patients reviewed:

The following tables illustrate the demographic and other details of the patients reviewed. Table 3.1.1 below describes the numbers of patients seen in terms of gender, age group, HIV status, and ARV therapy.

Table 3.1.1: General details:

Number of records reviewed (n)	1185
Female patients	631 (53%)
Male patients	554 (47%)
Adults	800 (67.5%)
Children (Age < 14 years)	385 (32.5%)
HIV positive patients	812 (68.5%)
HIV negative patients	279 (23.5%)
Unknown HIV status	94 (8%)
HIV positive patients on ARV therapy	77 (9%)
HIV positive patients not on ARV therapy	735 (91%)

Table 3.1.2 below illustrates the profiles of gender and age group in relation to HIV status.

Table 3.1.2: Profile of patients:

	Total (n)	Male (%)	Female (%)	Average age	Median Age
Children					
HIV positive	287	161 (56%)	126 (44%)	1.7 years	8 months
HIV negative	98	54 (55%)	44 (45%)	3 years	1 year
Adults					
HIV positive	525	230 (44%)	295 (56%)	36.5 years	35 years
HIV negative	181	77 (43%)	104 (57%)	45.9 years	44 years
Unknown HIV Status	94	32 (34%)	62 (66%)	44.5 years	41 years

Table 3.1.3 demonstrates cost differences between HIV positive and negative patients with respect to average length of stay, costs of drugs, procedures and the like.

Table 3.1.3: General cost differences between HIV Positive & HIV Negative patients

	HIV Positive cases (n = 812)	HIV Negative cases (n = 279)	Unknown HIV status (n = 94)
Average Length of stay per patient	9.5 days	7 days	7.5 days
Average cost of Procedures, lab tests etc	R 1134.49 (n=812) *[15% of total patient cost]*	R 978.16 (n=279) *[18% of total cost]*	R 1107.35 (n=93)* *[18% of total cost]*
Average cost of drugs, fluids etc	R 587.48 (n=758)* *[8% of total cost]*	R 259.16 (n=265)* *[5% of total cost]*	R 415.03 (n=85)* *[7% of total cost]*
Cost of Length of stay (PDE cost x length of stay)	R5766 *[77% of total cost]*	R4265.2 *[78% of total cost]*	R4548 *[76% of total cost]*
Average total cost to hospital per patient	R7448.9	R5489.5	R6018.9

* ('n' was reduced in the instances where drugs were not prescribed or procedures were not done for a particular patient)
Sums of the percentage proportion costs slightly exceed 100% as figures have been rounded off.

From Table 3.1.3, one could observe that HIV positive cases were, on average, staying more than two days longer than HIV negative cases *($p < 0.001$),* which was considered statistically significant. Likewise, the average total cost of treating an HIV Positive case

was also considerably higher than treating an HIV Negative case *($p < 0.001$)*. The cost of drugs and fluids was found to more than double for an HIV Positive patient as compared to an HIV Negative patient *($p<0.001$).*

It could be clearly noted from Table 3.1.3, that more than 75% of the total hospital cost was the cost of the length of stay.

Table 3.1.4 below showed the total amounts spent in the hospital during the study period with regards to drugs, procedures and total costs. This applied to the 812 HIV positive patients reviewed.

Table 3.1.4: Total hospital expenditure for the study period: HIV positive patients

	HIV positive (n=812)
Sum costs of all drugs, fluids etc	R445 309
Sum cost of all investigations	R921 214
Total cost to hospital (including cost of length of stay)	***R6 048 515***

The patients reviewed in this study were those who were admitted and discharged from the medical and pediatric departments at the hospital, and had therefore received tertiary level health care services. However, as part of a strategy to reduce the patient load on the main wards of the Medical department, some wards within the department had been identified to offer a service meant mainly for those patients who were not critically ill but who may have needed short stay admissions under the care of doctors. These other wards were labeled as Level 1 services (or Primary care wards), i.e. a step-down area within the tertiary institute itself. Adult patients were therefore admitted to both tertiary medical and Level 1 wards, whilst children only to tertiary care pediatric wards.

In the following graphs and tables, patients have thus been grouped according to:

- Those admitted and discharged from tertiary care wards, and if HIV positive, not on anti-retroviral therapy
- Those admitted and discharged from Level 1 wards, and if HIV positive, not on anti-retro viral therapy
- HIV positive patients on anti-retroviral therapy discharged either from tertiary or Level 1 wards.

3.2 General Lengths of stay

The following table illustrated the average lengths of stay for patients in relation to gender, age group and if on ARV or not.

Table 3.2.1: Length of stay (LOS) for patients

			n	Average LOS & (Standard deviation)
Tertiary care wards (not on ARV)				
Adult	**HIV+**	**males**	146	10.2 days (7.2)
		females	191	9.8 days (8.6)
	HIV-	**males**	72	7.5 days (8.4)
		females	90	8.2 days (7.9)
Pediatric	**HIV+**	**males**	149	8.2 days (6.9)
		females	112	8.8 days (7.5)
	HIV-	**males**	54	6.2 days (5.6)
		females	44	6.6 days (7.2)
Level 1 wards (not on ARV)				
Adult	**HIV positive cases**		137	6.2 days (4.7)
	HIV negative cases		19	2.9 days (3.4)
Patients on anti-retro virals				
Adult			51	13.6 days (12.8)
Pediatric			26	22.5 days (38.1)

In tertiary wards, the LOS of HIV infected male adults who were not on ARV's was two days longer than HIV uninfected males *(p=0.02).* Likewise, HIV infected children were admitted two days longer than uninfected children, but this comparison was not statistically significant. All patients on anti-retrovirals had markedly longer LOS than HIV infected

patients not treated with ARV's *(p<0.0001)*. In addition, HIV positive adult patients admitted in the tertiary wards had longer admissions than those in Level 1 wards *(p=0.004)*.

3.3 Common conditions in all patients:

The following figures, 3.3.1 and 3.3.2, illustrated the common conditions in adults and children on discharge or death during the study period.

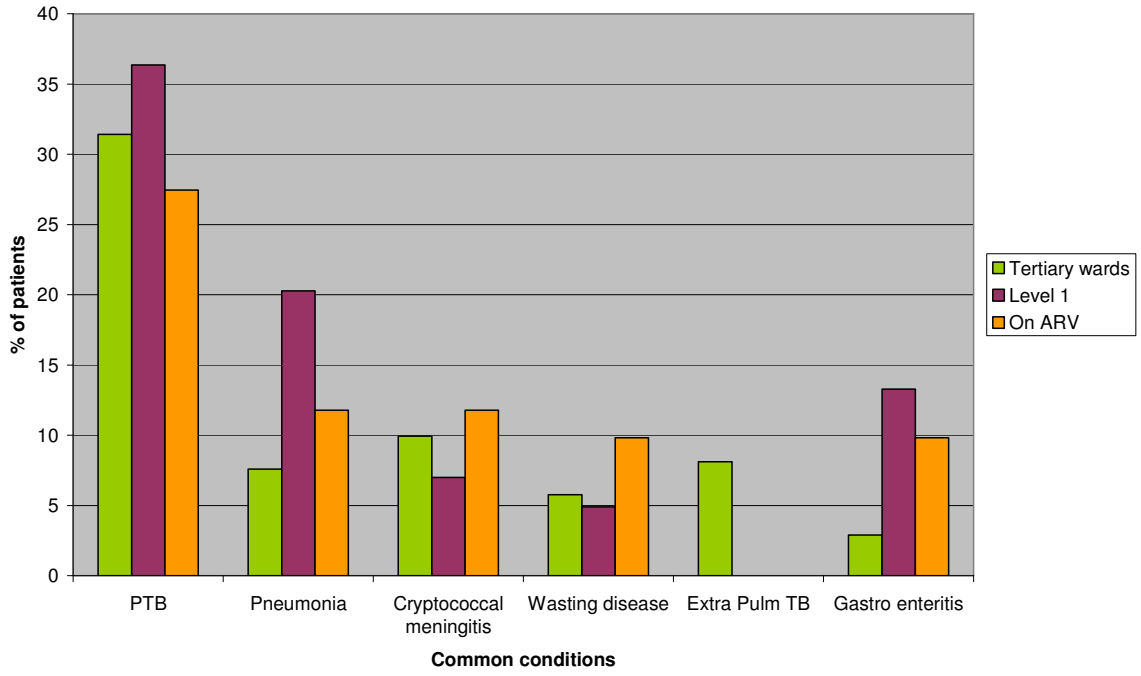


Figure 3.3.1: Common conditions in HIV infected adults

Figure 3.3.1 shows the leading conditions which HIV positive adults were being discharged with at the hospital. Tuberculosis (both pulmonary and extra-pulmonary) was the leading diagnosis and comprised 43% of all adult HIV infected patients (mainly tertiary ward cases) not treated with ARV's. Leading diagnoses in tertiary care HIV negative

adults were mental illness (15% of adult HIV negative discharges), cardiac disease (14%) and hypertension (11%). Level 1 HIV negative patients who were discharged had mainly asthma (26% of Level 1 HIV uninfected discharges), pneumonia (16%) and gastroenteritis (11%).

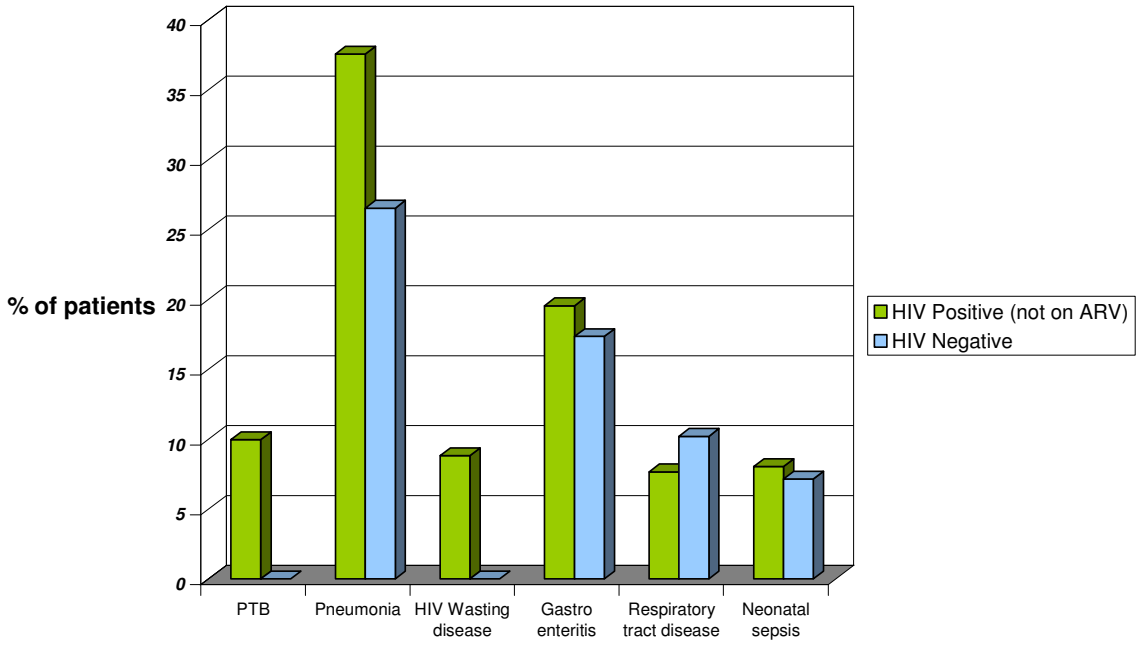


Figure 3.3.2: Common discharge diagnoses in children

Figure 3.3.2 shows the common conditions children were being discharged with in tertiary care wards, excluding those on ARV therapy. Pneumonia and Gastroenteritis were the commonest conditions in HIV infected children. Amongst children who were on ARV therapy, the common discharge conditions were very similar to those not on therapy.

3.4: CD4 counts and common discharge conditions:

The following graph shows the common discharge conditions as per CD4 count range. Only 287 HIV positive patients in the study group had CD4 values recorded in their files. More than half those patients with CD4 counts less than fifty had been discharged with pulmonary tuberculosis, indicating that this was the common condition sicker patients were being admitted and discharged for.

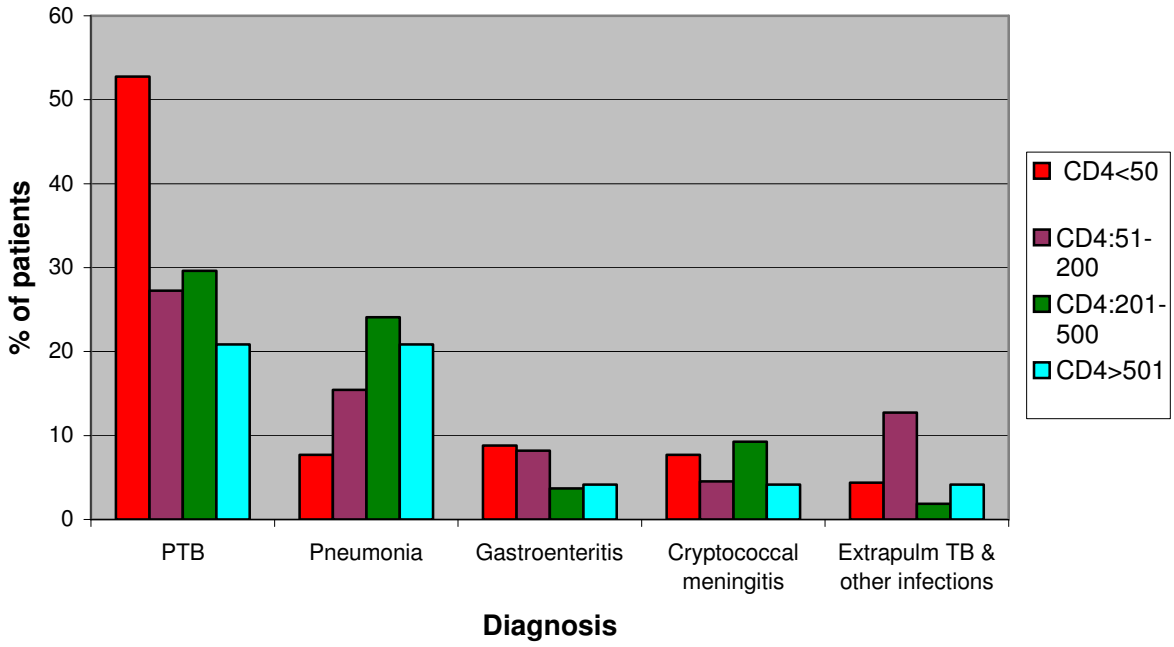


Figure 3.4.1: CD4 counts and common discharge conditions

3.5: General Comparison of costs

The following table illustrated the average costs of drugs, procedures, length of stay, and total costs of patients in tertiary care and Level 1 wards.

Table 3.5.1: General Comparison of average costs.

		Cost of LOS	Cost of drugs	Cost of investigations	Total costs
HIV Positive adults (Tertiary care)	Male	R 6,232	R 762	R 1,289	R 8,256
	Female	R 5,943	R 899	R 1,323	R 8,095
HIV Positive Children (Tertiary care)	**Male**	R 5,019	R 270	R 1,149	R 6,427
	Female	R 5,329	R 147	R 1,072	R 6,533
HIV Negative adults (Tertiary care)	**Male**	R 4,559	R 245	R 1,264	R 6,048
	Female	R 4,974	R 259	R 1,049	R 6,273
HIV Negative Children (Tertiary care)	**Male**	R 3,756	R 452	R 924	R 5,107
	Female	R 4,042	R 93	R 737	R 4,869
	Patients on ARV's	R 10,116	R 821	R 1,566	R12, 471
	HIV Positive Level 1 patients	R 3,747	R 533	R 500	R 4,725
	HIV Negative Level 1 patients	R 1,763	R 163	R 271	R 2,188

Table 3.5.1 showed that HIV positive patients on ARV therapy had considerably higher costs of length of stay, due to their increased duration of stay *($p<0.001$)*, compared to the other patients. (Refer Table 3.2.1 for lengths of stay)

HIV positive adult patients had significantly more spent on drugs compared to adult HIV negative patients, or children *($p<0.001$)*. Patients on ARV therapy also had more spent on drugs compared to children, and adult HIV negative patients *($p<0.001$)*. The other observed differences were not statistically significant.

Table 3.5.1 again clearly demonstrated that the bulk of the total hospital cost was the cost of the length of stay (over 70% of total cost), indicating that the longer a patient was admitted, the higher the cost was to the hospital. Drugs and investigations contributed to a much lower proportion of the total costs (approximately 20-30%).

Patients on ARV therapy also had more than three times the amount being spent on investigations compared to Level 1 patients *($p<0.001$)*. Patients admitted and discharged from the tertiary care wards also had higher costs of investigations compared to Level 1 cases *($p<0.001$)*.

The last column in Table 3.5.1 denoted the average total cost of the patients. Patients on ARV therapy clearly had the highest total costs compared to Level 1 HIV positive patients and tertiary care patients *($p<0.0001$)*. Tertiary care patients also had significantly more total costs than Level 1 cases *($p<0.001$)*.

The mean cost of care of all HIV negative adult patients during admission was significantly less than the mean cost of all HIV infected patients *($p<0.001$)*. Similarly for children, the mean cost of admitting an HIV infected child was comparatively higher than for the negative child *($p>0.05$)*.

Death was recorded in fifty-one records of which 49% were adults and 51% were children. Of the total deaths, 94% were HIV infected, but this high percentage was obviously due to the focus of the study. There was no statistically significant difference in costs *($p>0.05$)* between those who had died and those who had survived their admissions.

3.6: Tertiary care patients:

Tables 3.6.1 and 3.6.2 show lengths of stay and costs for HIV positive patients in tertiary care wards, per diagnosis. Table 3.6.3 indicated cost drivers for this category of patients.

Table 3.6.1: LOS for common conditions among HIV positive patients in tertiary care wards

Diagnosis	Age group	Number of patients (n)	Average LOS & (Standard deviation)
Tertiary care wards: HIV positive cases (not on ARV)			
PTB	**Adult**	120	9.7 days (7.8)
	Child	26	9.7 days (7.9)
Pneumonia	**Adult**	29	9.4 days (5.3)
	Child	98	7.8 days (6.4)
Extra pulmonary TB	**Adult**	31	9.5 days (4.5)
	Child	7	10.4 days (8.1)
Gastroenteritis	**Adult**	11	8.9 days (4.8)
	Child	51	7.5 days (7.9)
Cryptococcal meningitis	**Adult**	38	11.1 days (7.9)
	Child	1	15 days (0)
HIV Wasting disease	**Adult**	22	9.1 days (5.7)
	Child	23	11 days (8.7)

From the findings in Table 3.6.1, tertiary care patients with cryptococcal meningitis were staying longer than those with the other mentioned conditions (adult cases more than three days longer than those with gastroenteritis and pneumonia, $p>0.05$).

Table 3.6.2: Average costs of care among HIV positive patients in Tertiary wards

Diagnosis	Age group	Cost of LOS	Cost of drugs	Cost of investigations	Total costs (ZAR)
Tertiary care wards: HIV positive cases (not on ARV)					
PTB	**Adult**	R5912	R864	R1204	R7944
	Child	R5879	R249	R1338	R7456
Pneumonia	**Adult**	R5691	R691	R1233	R7567
	Child	R4754	R156	R955	R5854
Extra pulmonary TB	**Adult**	R5756	R1212	R1062	R7913
	Child	R6351	R117	R1674	R8139
Gastroenteritis	**Adult**	R5426	R787	R790	R7002
	Child	R4538	R159	R1160	R5842
Cryptococcal meningitis	**Adult**	R6747	R1188	R1362	R9234
	Child	R9135	R266	R2969	R12369
Wasting disease	**Adult**	R5508	R714	R1610	R7800
	Child	R6673	R213	R1315	R8182

There were some difference in costs of lengths of stay in the various conditions *(p>0.05).* The cost of drugs in adult patients with PTB was more than five times that of children with Pneumonia *(p<0.01)*. Children discharged with Gastroenteritis and Pneumonia had the least cost for drugs compared to other conditions and age groups *(p<0.05).* There were no statistical differences in the costs of investigations. However, an adult admitted and discharged with cryptococcal meningitis in tertiary care wards was costing the hospital significantly more compared to a child with pneumonia *(p<0.05).*

Table 3.6.3: Cost drivers in Tertiary wards:

		Most commonly used pharmaceuticals	**Pharmaceutical cost drivers**	**Most common procedures**	**Cost drivers in Procedures**
HIV positive	**Adults**	Antibiotics e.g. (Augmentin, Bactrim, Ciprobay, Flagyl etc), Paracetamol, Fungizone, IV fluids, Anti-TB drugs	Antibiotics, IV fluids, flucanozole, acylovir, blood transfusion	CXR, CD4 counts, FBC, U&E, TB tests (Sputum AFB, & TB Bactec)	Scans (CT scan, MRI, Ultrasounds etc), Special procedures (Gastroscopy, Bronchoscopy, EEG, EMG etc), Thyroid function tests, LFT, HIV PCR
	Children	Antibiotics (Gentamycin, ampicillin, bactrim, penicillin, etc), Flucanozole, Nystatin, Prednisone	Blood transfusion, acyclovir, antibiotics, quinine, IV fluids	CXR, FBC, U&E, HIV tests (Elisa & PCR), C-reactive protein	Scans (CT, ultrasound/USS), Special procedures like gastric washings, Fine needle aspiration cytology), HIV PCR, LFT, U&E
HIV Negative	**Adults**	Antibiotics, anti-hypertensives, IV fluids, paracetamol, Furesemide	Blood transfusions, IV fluids, antibiotics, Heparin & Haloperidol injections	CXR, FBC, U&E, LFT, Blood glucose	Scans, special procedures, hemodialysis, HIV PCR
	Children	Antibiotics, paracetamol syrup, nystatin, prednisone, anti-TB drugs	Antibiotics, IV fluids, blood transfusion, Digoxin	FBC, U&E, CXR, C-reactive protein, blood culture	Scans (Echo, CT, USS),Special procedures (gastric washings, cardiac catheterization etc), HIV PCR, LFT

The above table illustrates the common procedures and pharmaceuticals that were utilized by tertiary care patients, as well as the cost drivers.

3.7: Level 1 wards:

Tables 3.7.1, 3.7.2 and 3.7.3 demonstrated lengths of stay, costs and cost drivers in patients discharged from Level 1 wards at Chris Hani Baragwanath hospital during the study period.

Table 3.7.1: LOS of common conditions admitted and discharged from Level 1 wards

Diagnosis	Age group	n	Average LOS & (Standard deviation)
Level 1 HIV positive cases (not on ARV)			
PTB	**Adult**	52	5.8 days (4.4)
Pneumonia	**Adult**	29	5.8 days (4.3)
Gastroenteritis	**Adult**	19	5.8 days (4.7)
Cryptococcal meningitis	**Adult**	10	6.1 days (3.3)
Wasting disease	**Adult**	7	5.7 days (1.5)

Table 3.7.1 showed that HIV positive cases were being admitted for more or less similar durations, irrespective of diagnosis *(p>0.05).* Likewise, costs were similar too, with no significant differences.

Table 3.7.2: Average costs of common conditions in Level 1 wards

Level 1 HIV positive cases (not on ARV)		**Cost of LOS**	**Cost of drugs**	**Cost of investigations**	**Total costs**
PTB	**Adult**	R3549	R567	R402	R4464
Pneumonia	**Adult**	R3549	R478	R521	R4499
Gastroenteritis	**Adult**	R3526	R505	R460	R4465
Cryptococcal meningitis	**Adult**	R3715	R659	R505	R4747
Wasting disease	**Adult**	R3480	R945	R442	R4732

Table 3.7.3: Cost drivers in Level 1 wards

		Most common pharmaceuticals	Pharmaceutical cost drivers	Most common procedures	Cost drivers in Procedures
HIV positive	**Adults**	Antibiotics, Flucanozole, IV fluids, Anti-TB drugs, Imodium	Antibiotics, IV fluids, Flucanozole, Blood transfusion, Keyexalate	FBC, U&E, CXR, CD4 counts, TB tests (sputum AFB & TB Bactec)	USS, Special procedures (Hemodialysis, gastroscopy, FNAC), HIV PCR, viral loads, LFT
HIV Negative	**Adults**	Antibiotics, IV fluids, anti-TB drugs	Antibiotics, IV fluids, Anti-epileptics (Rivotril, Phenytoin IV)	FBC, U&E, CXR	LFT, CXR, U&E

Cost drivers in Level 1 patients were also similar to tertiary care cases.

3.8: Patients on ARV therapy:

The following three tables demonstrated lengths of stay, costs and cost drivers for patients on ARV therapy.

Table 3.8.1: LOS in patients on ARV therapy

Diagnosis	Age group	n	Average LOS & (Standard deviation)
Patients on ARV therapy			
PTB	**Adult**	14	20 days (18)
	Child	8	19.3 days (12.8)
Pneumonia	**Adult**	6	15 days (11.6)
	Child	8	41.3 days (64.2)
Gastroenteritis	**Adult**	5	5.8 days (4.3)
	Child	3	5.7 days (0.6)
Cryptococcal meningitis	**Adult**	6	15.5 days (9.7)
	Child	0	
Wasting disease	**Adult**	5	13.4 days (12.6)
	Child	1	51 days (0)

From Table 3.8.1, it could be observed that, excluding those patients with gastroenteritis and HIV Wasting disease, those with other conditions were staying longer ($p>0.05$).

Table 3.8.2 Average costs of common conditions in those on ARV therapy

Patients on ARV therapy	Age group	Cost of LOS	Cost of drugs	Cost of investigations	Total costs
PTB	**Adult**	R12267	R769	R1298	R14333
	Child	R11723	R599	R1226	R13548
Pneumonia	**Adult**	R9135	R1175	R1744	R12053
	Child	R25121	R1642	R2813	R29370
Gastroenteritis	**Adult**	R3532	R315	R458	R4305
	Child	R3451	R203	R1241	R4895
Cryptococcal meningitis	**Adult**	R9440	R1727	R1238	R12117
Wasting disease	**Adult**	R8161	R521	R3508	R12189
	Child	R31059	R1235	R2859	R35152

From the above table, the most significant difference was that the hospital was spending almost eight times more on investigations in adults with HIV Wasting disease, as opposed to those admitted and discharged with Gastroenteritis ($p<0.05$).

Table 3.8.3 Cost drivers in patients on ARV therapy

	Most common pharmaceuticals	Pharmaceutical cost drivers	Most common procedures	Cost drivers in Procedures
HIV positive adults & children	Antibiotics (Augmentin, Bactrim, Flagyl, Ciprobay etc), Anti-TB drugs, IV fluids, Flucanozole, ARV's (Stavudine, Efavirenz, Lamivudine etc)	Antibiotics, ARV's, IV fluids, blood transfusions, flucanozole	FBC, U&E, CXR, LFT, blood cultures	Scans, Special procedures (FNAC, gastroscopy, bronchoscopy etc), LFT, HIV PCR, Thyroid function profiles

3.9: Areas of increased expenditure:

The following table showed the distribution of costs per drug between HIV positive and non-HIV cases. The figures indicated that the cost per HIV positive patient was much higher than for the non-HIV patient (which included the HIV negative and 'Unknown' status cases).

Table 3.9.1: Pharmaceutical Cost per patient

Amounts spent in Rands/ per patient for:	HIV positive (n=812)	Non-HIV cases (n=373)
Intravenous fluids	R95/patient	R69/patient
Augmentin	R64/patient	R62/patient
Flucanozole	R50/patient	R19/patient
Acyclovir	R26/patient	R1/patient

Table 3.9.2: Frequency of investigations

Common Investigations/per patient	HIV positive cases (n=812)	non-HIV cases (n=373)
CT Scan	1 scan done for every 11 cases *(Total 71 scans)*	1 scan for every 9 patients *(Total 41 scans)*
Chest X-ray	1 X-ray per patient *(Total 755 X-rays)*	1 X-ray per patient *(Total 259 X-rays)*
Full blood count	Nearly 2 tests per patient *(Total 1174 tests)*	1 test per patient *(Total 473 tests)*
Liver Function test	1 test for every 2 patients *(Total 357 tests)*	1 test for every 3 patients *(Total 128 tests)*
HIV PCR test	1 test for every 6 cases *(Total 135 tests)*	1 test for every 18 patients *(Total 21 tests)*
Urea & Electrolytes	2 tests per patient *(Total 1475 tests)*	1 test per patient *(Total 536 tests)*

Table 3.9.2 also showed the frequencies of investigations per patient, for both HIV positive and non-HIV cases.

Both the above tables listed items that had been identified as significant cost drivers in this paper. It was thus observed that HIV positive patients were using more of the above-mentioned resources than the non-HIV cases.

3.10 Budget implications

One of the key objectives of this study was to determine the financial burden of HIV/AIDS for the institute and the implications of the findings in terms of budget planning and resource allocation. Attempting to determine the cost burden of HIV/AIDS for this institute was quite complex, considering that exact numbers of HIV/AIDS cases admitted to the overall hospital were not clear. The study results managed to provide an estimate of what the average cost of an HIV infected patient was for the institute and what the average length of stay was.

By using data collected by nursing staff in the institute of daily head counts of HIV positive patients (adults and children) across all the departments, and using the average length of stay for HIV positive patients determined in this study, for both adults and children (calculated as 9.5 days), it was possible to determine an approximation of the number of HIV positive cases seen during January to July 2005 throughout the entire hospital.

$$\textbf{Actual numbers of patients} = \frac{\textbf{Total number of patients days}}{\textbf{Average length of stay}}$$

Once the actual numbers were calculated, the average cost per HIV positive patient estimated in this report was used to determine the proportion of the total hospital expenditure that could be attributed to HIV/AIDS, as illustrated in Figure 3.10.2. Figure 3.10.1 below showed that approximately 600-800 HIV positive patients (both children and adults) were being admitted per month in the entire hospital, in 2005.

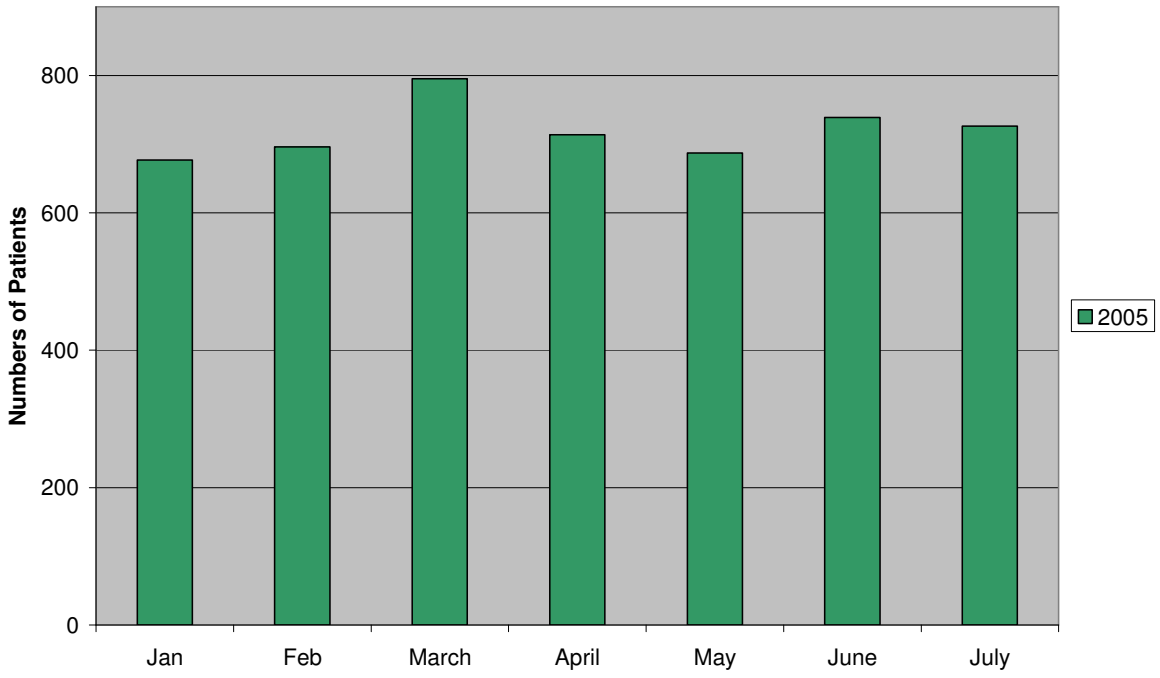


Figure 3.10.1 Burden of HIV/AIDS 2005

Figure 3.10.2 illustrated the amount in millions of rands spent on HIV positive cases in 2005. Although some of the prices used in this study were 2004 and earlier prices, this was assumed to be current for the cost calculation in 2005, as used by the institute.

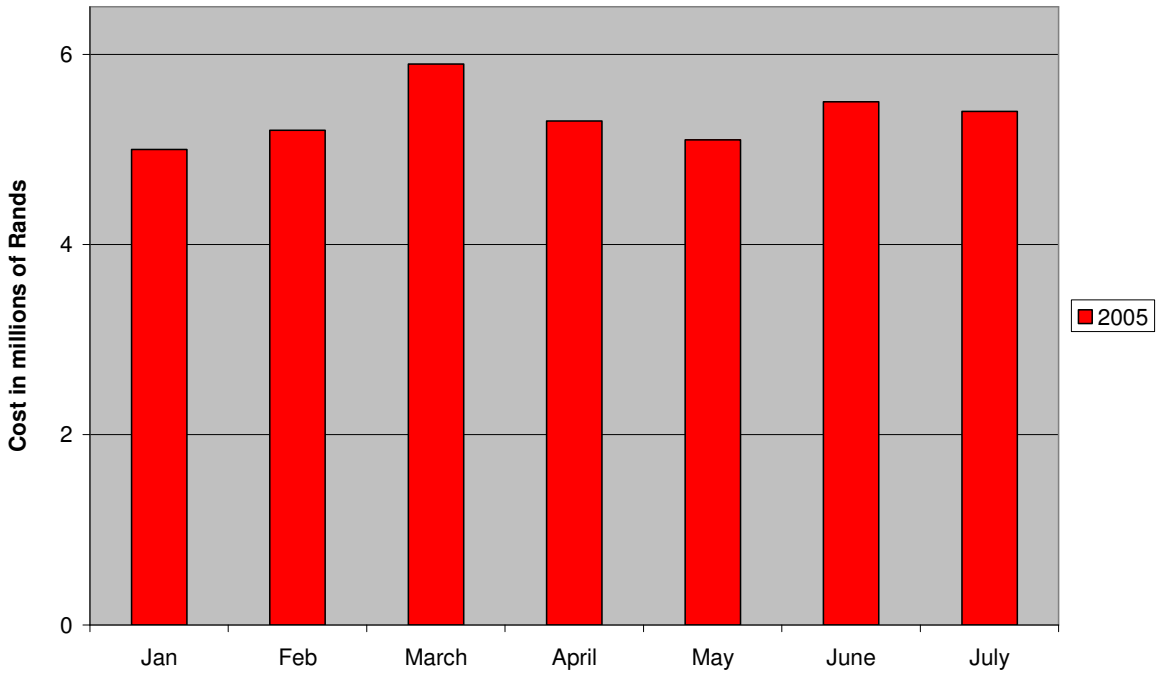


Figure 3.10.2: Costs of HIV positive cases in 2005

In 2005 amounts ranging between R5 million to R6 million was being spent each month on HIV/AIDS inpatients, which was approximately 6% of the monthly hospital expenditure.* The cost of the 812 HIV positive patients included in this report contributed to roughly 7.5% of the average monthly expense, but this slight increase was probably due to the longer coverage period of the study (six weeks).

* This referred to the average monthly expense for April-June 2005, determined at R80 million/month from hospital expenditure sheets.

CHAPTER 4

4.0 DISCUSSION & LIMITATIONS

4.1 Discussion

From the patient records reviewed there were larger numbers of adult patients as compared to children. Also more than half the adult patients were female, both amongst the HIV infected and non-infected patients.

The median age of HIV Positive adults was shown to be 35 years; while the median age for HIV infected children was 8 months age (average age of children was under 2 years).

The average length of stay for the 812 HIV positive cases included in this study was determined at 9.5 days (both adults and children). This had not changed significantly over the years when considering that the Karstaedt et al study of 1996 estimated an average of 9.8 days for adult HIV positive cases.

The results demonstrated that HIV positive patients were on average staying more than two days longer than HIV negative patients. HIV positive patients were also costing the hospital more than 35% the total cost of HIV negative cases. The reasons for this were:

- Increased cost of investigations compared to HIV negative cases
- More than double the expenditure on drugs compared to HIV negative cases

- The cost of the length of stay was higher due to the longer duration of stay, compared to HIV negative patients.

When patients were classified as ‘Adults’ and ‘Children’, it was also noted that HIV positive adults and children stayed longer and had more resources spent on them than HIV negative cases. Also the common conditions for which HIV positive children had been admitted and discharged were Pneumonia and Gastroenteritis (Figure 3.3.2), whilst among adults it was predominantly Tuberculosis (Figure 3.3.1). For hospital and district managers this is an important point as it reiterates the fact that most of these conditions could have been preventable.

Although the results showed that patients admitted in the tertiary care wards were costing the hospital more than those in Level 1 wards, this was obscuring the fact that the resources used to run the Level 1 wards were still tertiary, and hence the costs would still have been predictably higher than if treated at a district hospital. Regarding the appropriate use of resources, the justification of providing Level 1 services within a tertiary care hospital is quite debatable, considering the costs. The results also showed the common HIV infected conditions admitted and discharged in Level 1 wards, and again it was observed that the majority of cases were Pneumonia, Gastroenteritis and PTB. Whether or not the provision of Level 1 services within the hospital should be continued is another important consideration for hospital managers.

The study also highlighted the differences in cost amongst the HIV positive patients who were on ARV therapy. Those with Pneumonia and PTB were staying considerably longer, and also incurred more expenses from drugs and investigations. The data on ARV therapy collected from these patients only reflected that they were on therapy at the time. It was not an indication of prior commencement of ARV therapy. As such the reasons for the differences in costs and length of stay are complex and cannot be inferred from these results, as this was not part of the mandate of this study. However, one could probably presume that these patients were quite ill to begin with. They were therefore probably admitted for longer periods (and hence incurred higher costs from the increased lengths of stay), and were probably eligible to receive ARV therapy at the time as well.[16]

The common conditions amongst HIV negative adults were more of Psychiatric disorders, Hypertension, and Cardiac problems. A profile of the double burden of infectious diseases (Tuberculosis, pneumonia, gastroenteritis) in the HIV positive group and chronic non-infectious diseases in the HIV negative group was also quite evident. Amongst HIV negative children, as was expected; Pneumonia, Gastroenteritis, and respiratory tract infections topped the list.

The main pharmaceutical cost drivers in HIV positive patients were shown to be antibiotics, IV fluids, Flucanozole, and blood transfusions. In terms of investigations and procedures, the cost drivers were Chest X-rays, scans (CT, sonars etc), special procedures, and HIV PCR tests. The study also described the common pharmaceutical items per patient in HIV and non-HIV patients (See table 3.9.1). Amounts spent on Augmentin were more or

less the same in HIV infected and un-infected patients, while Flucanozole, not surprisingly, was more than twice the cost in HIV positive cases. It was also determined that common tests like Chest X-rays, Full blood counts, and Urea & Electrolytes were significant expenses to the institute. In terms of frequencies of investigations too, it was determined that common tests such as Full blood counts and Urea & Electrolytes were performed two times more per HIV positive patient than in the non-HIV patient. Obviously more HIV PCR tests were done too, as for every test done on non-HIV cases, three tests were done for HIV positive patients. CT scans were done more frequently in the non-HIV cases, and Chest X-rays had similar frequencies.

In comparison to the paper by Mathabathe et al, the hospital had spent approximately 65% more for drugs and investigations on the HIV positive patients included in the subject of this report. The reasons for the difference cannot be explained by this study, but could probably have been due to inflation increases or methodological variations.

The numbers of HIV positive patients admitted ranged between 600-800 patients per month in 2005 for the whole hospital. It was not clear if these numbers had increased from previous years or not, however it was obvious from conversations with staff in the Medical and Pediatric departments that they felt they were seeing large increases in the numbers of HIV positive patients. Continued monthly and annual monitoring of this is essential to determine any change in trends rather than relying on anecdotal evidence.

The PDE cost was a financial performance indicator used by the Department of Health to determine if financial resources were being utilized efficiently[15], and as such was not a real indicator of precise utilization per patient. Hence the use of a PDE cost to determine the costs of lengths of stay of the patients reviewed was a challenge. Patients have varying needs, and would thus utilize hospital resources very differently. By using the PDE cost in this study, the investigator attempted to distribute the indirect and some direct costs of resources evenly amongst all inpatients. The lower the PDE cost for the category of health facility, the greater the financial utilization and efficiency, as this meant more patients were being cared for within limited financial resources. The PDE cost, according to the Department of Health, thus varied according to the type of hospital with regards to level of care:

Table 4.1.1: Average PDE costs* for the period April-June 2005 in hospitals in Gauteng Province.[4]

	District Hospitals (n=8)	**Regional Hospitals (n=11)**	**Central/Tertiary hospitals (n=4)**	**Specialized Hospitals (n=5) E.g. TB hospital or Mental health facilities**
Average PDE costs	R 824	R828	R1357	R 633

From the above table, it could be observed that hospitals offering tertiary level services had a higher average PDE cost, indicating the significant expenses in terms of services rendered and patients seen. Again, this highlights the probable cost benefits of treating the common infectious diseases mentioned in this report at district hospital level, rather than at tertiary institute level.

* These PDE costs were determined by dividing the total hospital expenditure by the total number of patient days seen for the period. Hence the value for tertiary hospitals is different from the PDE cost used in this study, where costs of pharmaceuticals & investigations were separated.

[4] April-June 2005 Hospital Financial Indicators. As provided by the Directorate of Hospital services at Gauteng Health Department, 20 November 2006.

4.2 Limitations:

- Not all patient records of discharges and deaths from the Medical and Pediatric departments were sent to the researcher, as explained in the Record Flow chart. This was as a result of lost or misplaced records; miscommunication between staff of where records should go; patients walking off with records; backlog of records in wards with no clerks etc. The shorter time frame of the study also probably had an influence. A sensitivity analysis may have been beneficial here in trying to determine the costs of the patient not included in the study, but since the proportion of HIV positive cases in the excluded records was not determined, this was not attempted.
- Data was collected from individual patient records, which generally have a tendency to be incomplete and haphazardly entered. Therefore, the costs incurred by a particular patient were probably different to the true cost to that patient.
- Since this was a cross-sectional survey over one short time period, seasonal variations in admissions could not be adjusted for. In addition, since the costs estimated were for a specified time period, this did not infer that the costs would be similar month after month.
- The ARV rollout at the hospital only started in 2004, and the impact of the rollout was probably too early to evaluate. This study did not look at previous admissions, or when patients were actually put on ARV therapy. Therefore, the long-term cost savings of ARV therapy could not be determined in this project. The study could only cost what the patient was on at the time of the present

admission and discharge. As such, any differences in costs between patients on ARV therapy and those not on therapy have to be viewed with caution, and cannot be directly attributed to ARV drugs at this stage.

- Estimations of indirect costs such as overheads; other consumables and non-consumables; and costs for items such as staff salaries were determined from monthly financial expenditures and might not have been actual reflections of the costs accrued (it might have been more or less), since again hospital statistics, which could have been unreliable, were used for this calculation. The cost data for drugs, investigations and procedures was also not based on current prices, but on prices from 2002 and 2004, which may have been subsidized for government use. This again probably resulted in an underestimate of the true cost to the hospital in 2005.
- The expenses incurred by the hospital have to be balanced against income generated from user fees, and extra funding from special grants such as the national allocation for the ARV roll out. This was not done in this study due to the complex way in which user fees are allocated to an institute, making it extremely difficult to calculate how much was received by the institute in terms of user fees. The funds for the ARV roll out cover costs of ARV drugs, which again were not balanced against the expenses incurred by the hospital. Therefore the estimates of the costs incurred were again probably not a true reflection of the actual costs.
- Since this study was done only in one institute the results could not be generalized to other facilities or similar institutes in the public health sector. In

addition, since this was a tertiary institute costs may have been higher in comparison to other levels of care, and again could not be generalized to other levels of care.

CHAPTER 5

5. CONCLUSIONS & RECCOMENDATIONS:

5.1 Conclusions & Implications for Public Health:

The study has managed to provide an estimate for the average costs of drugs, investigations, length of stay and costs of the length of stay for all the patients reviewed. Whether or not these amounts are reliable is a limitation of this study, especially considering the lack of similar studies in the country, although the paper by Karstaedt et al[12] in 1996 used a similar methodology, but estimated only annual costs of admissions.

The median ages of adults and children calculated in this study raise some relevant questions. How has HIV/AIDS affected the life expectancy of adults in comparison to chronic diseases? Even though the answer to this is beyond the scope of this study, it relates to the probable economic cost burden of HIV/AIDS on the country as a whole. Regarding the young age of HIV infected children, could this have been an indication of the success or failure of the Prevention of Mother To Child Treatment (PMTCT) program in the area? While again the answer to this question was beyond the scope of this study, it demonstrates the need for a multi-layered approach to address the HIV/AIDS epidemic in the hospital and surrounding area.

The hospital had spent over R80 million per month on average during the period April-June 2005 for all inpatients and outpatients across departments, and from the results it was

determined that HIV positive inpatients alone were contributing to roughly 6% of this amount. Yet according to the accounts department of the hospital, for the two months of May and June 2005, 19983 inpatients were admitted to the entire hospital across all departments, and these patients were only billed a sum total of R1.5 million for these eight weeks *(provided by Mr. E Makhou, Accounting section, CHB).* Since the hospital is a public sector facility, it offers highly subsidized user fees for the patients, who are often the poorest of the poor, and quite commonly, most of the amounts billed are not recovered at all. Therefore, the expense to the hospital is obviously much higher, as also demonstrated by the costs of just the 812 HIV infected cases reviewed in this study. Also the longer a patient stayed, the more it cost the hospital, as more than 75% of the cost of care of a patient in this facility could be attributed to the cost of the length of stay. Shisana et al also highlighted this last point in their paper.

The hospital could use the results of this study to advocate for more funds, demonstrating that HIV positive patients were staying longer and hence costing the hospital more. Having more money allocated to their ARV program and Prevention from Mother To Child Transmission (PMTCT) programs could also be argued for in terms of future budget allocations. In addition, the initial guidelines for the allocation of funds from the National ARV program only recommended funding for the diagnostic monitoring of those patients receiving ARV, listing not all, but a few specific laboratory investigations, the focus being on the mainly *outpatient* ARV roll out sites.[17] Funding for investigations done on HIV positive *inpatients* who would eventually receive ARV therapy was not specified, but rather negotiated with institutes. The hospital could again use the results of this study to

show the increased usage of laboratory investigations by HIV positive inpatients, and lobby for more allocations from the national ARV program. With zero-based budget allocations appearing on the horizon, a far cry from the historical budget allocations of similar amounts year after year, the results of this study certainly arm the hospital with sufficient data to plan for some of their future financial needs and resource allocations.

A study by Cleary et al evaluating the cost effectiveness of ARV therapy in South African patients, also showed that while providing ARV's on the whole was economically worthwhile, the cost was still significantly higher than in those not on ARV's. However, here the main costs were from the ARV drugs themselves and relevant laboratory tests.[18] The short to medium term economic impact of the ARV roll out on the hospital discussed in this dissertation, indicating increased costs of patients on ARV therapy, should be considered in the context provided. Hospital managers and policy makers who are involved in the roll out of such programs should be prepared and make allowances for this in their budget plans.

It would have also been informative to compare total costs of conditions across various levels of care in the public health sector in South Africa, but since comparable data on this was unavailable, it was difficult to determine if the total costs to Chris Hani Baragwanath Hospital were significantly higher or not. Similarly, due to lack of comparable data at the time of the study it was not possible to evaluate if the costs of various conditions determined at Chris Hani Baragwanath Hospital were different to costs in the private sector in South Africa or not.

This study has highlighted the significance of understanding the financial burden of HIV/AIDS to hospitals and other health facilities. The 1996 study by Karstaedt et al[12] showed that the common admitting HIV/AIDS cases were Tuberculosis, acute pneumonia and diarrhoeal diseases. Ten years later not much has changed in this scenario. For hospital managers and policy makers this is an important finding as it again highlights the need for ensuring that scarce public health resources are used efficiently for services at the appropriate level of care. The use of tertiary care resources for cases that could have been managed at lower levels of care reflects on the inadequacy of the current district health system in the country and the need to strengthen it significantly. However, while the potential of a strong District Health System may add some relief to the hospital, it is also crucial to develop and implement the right guidelines and care packages needed for various levels of health care in South Africa.

Developing an effective financial tracking system is an essential component of determining costs of cases seen. Most of the large private hospital groups in South Africa have reasonably functioning systems in place[19], and it is probably well past the time for the public sector in this country to follow suit. The cost of implementing such a system, in the face of poor user fee collections and government subsidies, could be a bone of contention among decision makers. However budget allocation cannot and should not occur in a void, and managers need to know how and where resources are being utilized.

The challenge for hospital managers and policy makers is in addressing the issue of HIV/AIDS services at appropriate levels of care, without appearing to offer fewer services to the surrounding communities.

5.2 Recommendations

While South Africa is battling to get a grip on the HIV/AIDS epidemic, it is certainly not an impossible task, as has been shown with the successful results in Brazil. The South American country has managed to reduce the social and economic impact of HIV/AIDS since 1996 when universal and free access of anti-retrovirals was introduced. Local and cheaply produced ARV's were the main reason for the Brazilian government's policy to provide free ARV treatment to all. This has resulted in a cost saving of US$ 677 million in terms of avoided hospital admissions since 1996. Coupled with other programs such as PMTCT, active health education, promotion, increased condom usage etc, Brazil has managed to considerably decrease their death rates due to HIV infection, and slow the spread of the infection.[20]

For health systems managers, policy makers and facility managers, it is important to realize what areas to focus on in trying to reduce the burden of HIV/AIDS on the health sector. The following are a number of issues that could be highlighted as possible recommendations to help reduce costs in this regard:

Changes at hospital level:

- Ensuring that the right cases get admitted to the facility. This entails having an adequate referral system where less complicated and common conditions can be treated at lower levels of care. This also ensures that the resources in the tertiary level hospital are being utilized efficiently.

- Decreasing the length of stay of patients, where possible. In this study the bulk of the cost was the PDE cost from the increased duration of stay. This has to be seriously looked at, either in terms of using step-down facilities, or quicker discharges of patients if possible.
- Development of standard protocols to avoid duplication of investigations and procedures.
- Re-evaluation of the Level 1 service offered in this hospital. While the idea behind the creation of Level 1 wards was to reduce the load on the main Medical Wards, one cannot escape the fact that tertiary level resources and thus costs are being used to run this service. Hence the probability of phasing out this service or merging it with a District Hospital should be seriously considered.
- Support and resources for the provision of ARV therapy. While the findings in this study showed increased costs and lengths of stay for those patients on ARV therapy, this could merely have been a reflection of the extent of illness, and did not necessarily rule out the benefits of ARV therapy. Providing ARV therapy would result in a healthier HIV Positive population that in the long term may require lesser and shorter admissions[20]. The ARV rollout commenced in April 2004 in the hospital and surrounding district, but the impact of this in terms of affecting hospital admissions is still to be investigated in depth. Since the rollout began, only 10% of all the

HIV positive patients seen in the district have been put on ARV's till date. *(ART Rollout Report 02 Sept 2005. Health Information Department, 17th floor, Gauteng Health Department)*

- Anti-TB prophylaxis to eligible HIV positive patients. A significant number of the HIV positive cases in this study had some form of Tuberculosis. Anti-TB prophylaxis could well be of benefit to the hospital in the long term. This is scope for future research as well.
- An effective financial tracking system. Currently the hospital has no way of knowing what has been spent on a patient. It follows that having a system to track costs would definitely be of benefit to the hospital managers. Health care workers along with other relevant staff need to capture all the costs related to a patient, which in itself is another challenge that needs to be addressed first.

Changes at district level:

- Support of a strong and effective District Health System. It follows that having less people infected with the HIV virus is the key to reducing the burden of the infection on the system. Health Promotion and Preventive campaigns need to be strengthened and heightened. 90% of all clinics and 100% of the hospitals in the district concerned offer PMTCT services, yet the impact of this in terms of preventing mother to child transmission of HIV infection is still unclear in the area *(PMTCT 1st Quarter Report April-June 2005. Mrs L Mnisi, Deputy Director,*

HAST Directorate, Gauteng Department of Health). More focus on developing strategies to ensure adequate follow up of PMTCT mothers and babies is also crucial.

- Fast tracking and addressing the challenges in accreditation of clinics to ensure the provision of ARV therapy within the district. This again should in the long run ensure a 'healthier' HIV infected population, thus reducing the burden on the hospital.
- Provision of anti-TB prophylaxis to eligible HIV positive patients.

This again highlights the importance of a multi-collaborative approach and a strong District Health system. While INH prophylaxis for HIV positive patients is strongly recommended by the World Health Organization guidelines, and as a result, now part of South African National TB guidelines[21], implementation is still a huge challenge.

Changes at National/Provincial level:

- Negotiating with Pharmaceuticals to reduce prices of ARV drugs, and other relevant drugs.
- Creating opportunities in South Africa to manufacture low-cost, effective generic drugs as in countries like India and Brazil.
- Development of an effective financial tracking system that can be incorporated nationally.

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APPENDICES

APPENDIX I:

CHRIS HANI BARAGWANATH HOSPITAL 2005 COSTING STUDY – CODES & COSTS

Code	Investigation	Cost (In Rands)
01	CXR	96
02	CT Scan	1524
03	USS	267
04	FBC	34.95
05	Diff	22.16
06	U&E	84.4
07	LFT	207.86
08	ESR	15.03
09	Ca Mg PO4	70.31
10	HIV Rapid	39.95
11	HIV Elisa	80.75
12	HIV PCR	429.57
13	Viral Load	300
14	Glucose	20.49
15	CRP	49
16	Bld cult aerobic	79.64
17	Bld cult anaerobic	79.64
18	Sputum AFB x 2	28.04
19	TB Bactec	14.09
20	CSF	115.42
21	Hep A	82.99
22	Hep B	82.99
23	Hep C	82.99
24	TFT	214.89
25	Urine MC&S	146.12
26	Lipase	29.33
27	ALT	30.6
28	CD4	60
Code	**Procedure**	**Cost (In Rands)**
40	Bone Marrow	149.04
41	Liver Biopsy	62.55
42	Pleural Tap	62.55
43	Ascetic Tap	62.55
44	Biopsy Lymph node	62.55
45	Biopsy Skin	62.55

46	Bronchoscopy	2942
47	Gastroscopy	2942
48	Echocardiogram	332
49	ECG	350
50	EEG	2050
51	EMG	2685

Code	Drug name	Dosage	Cost (In Rand)
100	Acetylycysteine/Parvolex inj	200mg/ml	9.9/ml
101	Acyclovir injec/Zovirax	250mg	76.22
102	Acyclovir oral	400mg	0.87
103	Acyclovir syrup	200mg	10.2
104	Adalat/Nifedepine	30mg	0.95
105	Akineton inj	5mg	13.27
106	Aldactone	100mg	4.7
107	Aldomet	250mg	0.25
108	Allergex tab	4mg	0.06
109	Amikacin injection	100mg	7.9
110	Amikacin injection	250mg	10.74
111	Amikacin injection	500mg	8.89
112	Amikacin injection	1gm	27.46
113	Aminophylline	250mg/vial	1.17
114	Amoxil oral	250mg	0.16
115	Amoxil oral	500mg	0.38
116	Amoxil syrup	125mg/ml	4.11
117	Amoxil syrup	250mg/ml	6.26
118	Amphogel	10ml	0.03
119	Ampicillin injection	250mg/vial	1.19
120	Asprin/Disprin	300mg	0.12
121	Asthma pumps (Becotide)	one spray	15.03
122	Atenolol tab	100mg	0.43
123	Atrovent Nebs	Nebs	1.7
124	Augmentin injection	0.6gm vial	14.13
125	Augmentin IV	1.2gm	24.4
126	Augmentin oral	375mg	1.63
127	Augmentin syrup	5ml	0.8
128	AZT syrup	50mg/5ml	0.72
129	AZT/Zidovudine	300mg	1.6
130	Bactrim inj	80mg	3.75
131	Bactrim oral	I tab	0.12
132	Bactrim oral	tablet	0.12
133	Bactrim syrup (50ml)	48mg/ml	0.03
134	Berotec syrup	2,5mg	0.6

135	Betaphen/Penicillin oral	250mg	0.18
136	Brufen syrup	100mg	0.43
137	Brufen tab	200mg	0.06
138	BUSCOPAN	10MG	0.4
139	Buscopan syrup	5mg	1.13
140	Cefepime injection	500mg	41.97
141	Cefotaxime IV	500mg	7.49
142	Cefoxitin injection	1gm	37.2
143	Ceftazidime injection	500mg	65.76
144	Ceftazidime injection	1gm	74.54
145	Cefuroxime injection	250mg	12.72
146	Chloramphenicol oral	250mg	0.39
147	Chloramphenicol/Cloromycetin inj	1gm	9.58
148	Ciprobay IV	2mg	1.3
149	Ciprobay oral	250mg	0.37
150	Ciprobay oral	500mg	0.46
151	Claforan inj	500mg	7.47
152	Clarforan IV	1gm/vial	9.9
153	Clarithromycin	500mg	16.9
154	Cloxacillin injection	500mg	4.52
155	Cloxacillin oral	250mg	0.31
156	Cloxacillin oral	500mg	0.47
157	COVERSYL		
158	Cyclokapron	500mg	0.3
159	D4T syrup	1mg/ml	0.4
160	D4T/Stavudine	20mg	0.6
161	D4T/Stavudine	30mg	0.5
162	D4T/Stavudine	40mg	0.4
163	Daktarin		
164	Decadron inj	4mg	4.73
165	Decadron IV	4mg/vial	4.73
166	Decadron oral	05mg	0.34
167	Diamicron	80mg	0.16
168	DIAZEPAM	5MG	0.07
169	Diazepam inj	5mg	1.03
170	Diclofenac inj	25mg	0.24
171	Diclofenac/Voltarin	50mg	0.22
172	Digoxin	0.25mg	0.17
173	Digoxin syrup	0.05mg/ml	0.78
174	Digoxin inj	0.25mg	6.59
175	Doxycycline oral	100mg	0.14
176	Efavirenz/Stocrin	200mg	3.47
177	ENALAPRIL/RENITEC	5MG	0.1
178	EPANUTIN ORAL	100MG	0.27
179	Epanutin oral	100mg	0.27

180	Epanutin syrup	125mg/ml	3.5
181	Epanutin/Phenytoin IV	50mg/ml	10.53
182	Epilim syrup	200mg	1.6
183	Erythromycin IV	1gm	120.08
184	Erythromycin oral	250mg	0.64
185	Erythromycin syrup	125mg	0.5
186	Etomine inj	10mg	0.37
187	Etomine oral	40mg	1.62
188	Fentenol spray		20.86
189	Flagyl IV	500mg/ml	0.05
190	Flagyl oral	400mg	0.16
191	Flagyl syrup	40mg/ml	0.15
192	Flixotide spray	one spray	45.19
193	Flucanozole IV	2mg	0.1
194	Flucanozole tab	200mg tablet	19
195	Flucanozole tab	50mg	10.35
196	Folic acid tab	5mg	0.05
197	Fungizone tablets/Amphotericin	one tablet/10mg	2.23
198	Gentamycin injection	10mg/ml	1.32/ml
199	Glucophage	500mg	0.13
200	Glucophage	850mg	0.26
201	Glycomin	5mg	0.06
202	Griseofulvin	500mg	1.22
203	HCTZ/RIDAQ	25MG	0.1
204	Heparin injection	5000u/ml	8.72
205	Immodium	1 tab	0.09
206	Immodium	one tablet	0.09
207	Immodium syrup	1mg/5ml	0.57/5ml
208	Insulin/Actraphane	100 UNITS/ML	6.94
209	Insulin/Actrapid	100u/ml	7
210	Insulin/Humalog	100u/ml	13.8
211	Insulin/Humulin N/Humulin R/Humulin 30:70	100u/ml	5.7
212	Insulin/Protophane	100u/ml	10.6
213	Iron tablet	one tab	0.06
214	Isoptin/Verapamil	240mg	0.1
215	KCL injection diluted	1 vial (10mls)	1.72
216	Keflex oral	250mg	0.37
217	Keflex syrup	250mg	0.56
218	Kefzol injection	500mg	3.56
219	Keyexalate	1gm	0.896
220	Klacid inj	500mg	119.01
221	Klacid syrup	125mg	0.69
222	Lamivudine/3TC	150mg	0.6
223	Lamivudine/3TC syrup	10mg/ml	1.15

224	Largactil syrup	25mg	0.5
225	Largactil tab	50mg	0.1
226	Lasix	40mg	0.08
227	Lasix IV	10mg	0.5
228	Lipitor	10mg	4.6
229	Lorazepam injection		
230	Maxalon injection	10mg	1.31
231	Maxolon oral	10mg	0.04
232	Melleril oral	50mg	0.31
233	Minoxidil tab	10mg	0.4
234	Mist Expect	1 bottle	2.74
235	Mist Pot KCL		
236	Morphine injection	15mg/ml	1.73
237	Multivitamins syrup	one bottle	15.12
238	NaHCO3 inject	50ml	23.93
239	Nevarapine	200mg	1.1
240	Nystatin syrup	1drop	0.27
241	Otosporin drops	1 drop	0.3
242	Panado oral	500mg	0.05
243	Panado syrup (100ml)	120mg/5ml	0.03/ml
244	Pen G injection	2.4 MU/vial	3.12
245	Pen G injection	1.2 MU	3.49
246	Pethidine inj	50mg	2.39
247	Phenergan injection	25mg/ml	1.36
248	Phenergan oral	10 mg	0.05
249	Phenergan syrup	5mg/5ml	0.34/5ml
250	Phenobarb injection	200mg	9.67
251	Phenobarb tab	30mg	0.09
252	Prednisone oral	5mg	0.06
253	Prednisone syrup	15mg/ml	0.7
254	pyridoxine oral	25mg	0.09
255	Rifafour	one tablet	0.88
256	Rifanah Junior	3gm/sachet	1.04
257	Rim Cure	one tablet	0.82
258	Rivotril inj	1mg	18.25
259	Rocephin IV	1gm	13.17
260	Salbutamol inj	1mg	17.4
261	Salbutamol syrup	2mg	0.18
262	Salbutamol tab	2mg	0.09
263	Salbutamol/Ventolin spray	one spray	14.32
264	Seranace inj	5mg	17.42
265	Solucortef injection	100mg	7.34
266	Spectrapain	one tablet	0.14
267	Stemetil inj	12.5 mg	2.75
268	Stemetil oral		

269	Tazocin/Piperacillin inj	2gm	39.04
270	Tegretol/Carbamazepine injection	100mg/5ml in 250ml	83.56
271	Tegretol/Carbamazepine oral	200mg	0.17
272	Theophylline syrup/Neulin	25mg	0.35
273	Thiamine injection	100mg/ml	1.3
274	Thiamine oral/Vit B complex	100mg	0.01
275	Tobramycin inj	40mg	5.2
276	Tramadol oral	50mg	0.48
277	Tritace/Ramipril	2.5mg	0.9
278	Tryptanol/amitriptyline oral	25mg	0.1
279	Vancomycin inj	500mg	50.94
280	Vit A tab	50 000u	1.39/tab
281	Vit B complex tab	0ne tab	0.02
282	Vit B syrup	one bottle	2.29
283	Vit B12 inj	1ml	1.7
284	Vit C injection	100mg/ml	0.05
285	Vit C tab	500mg	0.15
286	Vit K tab	10mg	4.1
287	Zantac inj/Ranitidine	25mg	0.7
288	Zantac syrup/ranitidine	150mg	7.8
289	Zental syrup/Albendazole	100mg	2
290	Zinnat syrup	125mg	0.46

Code	**LAB Tests**	**Cost (In Rand)**
400	17-Alpha-Hydroxy-Progesterone	74.43
401	Abnormal Haemaglobin	83.72
402	ABO Group Rh	21.6
403	Acetoaminophen Level	64.71
404	Acetylcholine Receptor A/B	95.94
405	Acid Phosphatase Cellular	31.05
406	Activated Protein C Resistance	155.88
407	Additional Cytogenetic Analysis	453.53
408	Adenosine Deaminase	30.6
409	Adenosine Deaminase - M	30.6
410	AHG Inhibitors	344.97
411	Alanine Transaminase - A	30.6
412	Albumin - A	27.2
413	Alcohol (In Blood) - M	70.21
414	Aldolase - A	30.6
415	Aldosterone	74.43
416	Alpha 1 Antitrypsin - M	40.8
417	Alpha Feto-Protein R I A	71.12

418	Amicacin level	64.71
419	Ammonia - M	43.61
420	Ammonia (Ammonia Monitor)	25.5
421	Amylase -M	29.33
422	Amylase Total - A	29.33
423	ANA (Hep 2 Cells) Screening	91.68
424	Anaerobe Confirmatory Screen	25.8
425	Anaerobes Id Finegold	56.67
426	Androstenedione Ria	74.43
427	Angiotensin Convert Enzyme M	50.92
428	Anti-DNAse B	44.85
429	Anti-Gastric Parietal	91.68
430	Antigen Detection with Monoclonal Antibodies	61.83
431	Anti-Mitochondrial Fluorescent	91.68
432	Anti-Nuclear Factor Fluorescent	91.68
433	Anti-Proteinase 3 Ab's	91.68
434	Anti-Smooth Muscle Ab's	91.68
435	Antistreptolysin O - Macro	49
436	Antithrombin Iii Chromogenic	131.85
437	Aspartate Transaminase - A	30.6
438	Aspiration Performance Only	109.44
439	Automated Bld Cult Aerobic Growth	79.64
440	Automated Blood Cult Anaerobic Growth	79.64
441	B12 vitamin Assay	74.43
442	Bactec MGIT bottle	14.09
443	Barbiturates Spectro - M	64.71
444	Benzodiazepines - Emit S Qn	64.71
445	Beta Lactamase Test	25.8
446	Beta-2 Microglobulin	73.6
447	BHCG Titre Profile	70.21
448	Bilharzia Elisa Test	74.13
449	Bilharzia Fluorescent -IgG	68.71
450	Bilharzia Fluorescent -IgM	68.71
451	Bilharzia Microscopic	28.04
452	Bilirubin Direct Automated	18.08
453	Bilirubin Total - A	23.85
454	Biochem ID Bacterium Abridged	18.06
455	Biochem ID Bacterium Extended	71.64
456	Bleeding Time-Excl Simplate	41.58
457	Bone Marrow Cytological	125.88
458	Bone Marrow Trephine (Biopsy)	206.25
459	Brucella Abortus Agglutination	31.48
460	B-type Natriuretic Peptide	281.06

461	Buffy Layer Examination	113.95
462	Ca-125 Tumour Marker	119.88
463	Ca-19.9 Tumour Marker	119.88
464	Caeruloplasmin - M	25.5
465	Calcitonin	107.64
466	Calcium - A	20.49
467	Calcium Ionized	38.25
468	Cannabinoid - Emit	64.71
469	Carbamazepine Level	61.12
470	Carcino Embryonic Antigen Ria	114.55
471	CD10 Common All Marker/Nep	115.21
472	CD103 Hairy Cell Markers	115.21
473	CD117 Stem Cell Factor Recepto	115.21
474	CD11b Monocyte/Myeloid Marker	115.21
475	CD11c Hairy Cell Leukaemia Mar	115.21
476	CD13 Late Myeloid Marker/Amp	115.21
477	CD14 Monocyte Marker	115.21
478	CD15 Granulocyte Marker	115.21
479	CD19 Early To Late Pan B Marker	115.21
480	CD2 Pan T Cell/Nk Marker	115.21
481	CD20 Late Pan B Marker	115.21
482	CD22 B Marker ; Precursor	115.21
483	CD23 FCE Receptor/B-CLL Marker	115.21
484	CD25 Il2 Receptor Hcl Marker	115.21
485	CD3 Pan T Cell Marker	115.21
486	CD30 Ki1 Reed Sternberg Cell M	115.21
487	CD33 Early Pan Myeloid Marker	115.21
488	CD34 Haematopoietic Precursor	115.21
489	CD38 Plasma Cell Marker	115.21
490	CD4 Helper T Cell Marker	115.21
491	CD4 PLG	60
492	CD45 LCA White Cell Marker	115.21
493	CD45ra Naive T Cell Marker	115.21
494	CD5 Pan T Cell/B-Cell Marker	115.21
495	CD56 Ncam Nk Marker	115.21
496	CD7 Early to late Pan T Cell	115.21
497	CD8 Suppressor T Cell Marker	115.21
498	Cell 1 Culture	91.68
499	Cell Culture 1	97.19
500	Cell Culture 2	291.56
501	Cellognost - Amoebiasis	56.67
502	Chloride - A	14.62
503	Chloride C	14.62
504	Chlorides Colourimetric	14.62
505	Cholesterol HDL - A	39.1

506	Cholinesterase Total - M	42.33
507	Chromosome Analysis 1	874.67
508	Chromosome Analysis 2	1749.33
509	Chromosome Studies Bone Marrow	1749.33
510	CI Esterase Inhibitor	91.68
511	Citrate Agar Electrophoresis	160.74
512	Clostridium Difficile Toxin	171.83
513	CMV IgG Elisa	74.13
514	CO2 Content -A	29.33
515	Combined Antigen Specific IgE	140.18
516	Complement C3	49
517	Complement C4	49
518	Complement Comp C6	20.64
519	Copper Atomic Absorption	108.63
520	Cortisol	74.43
521	Coxsackie Virus Ab (1st)	429.57
522	C-Peptide Ria	70.3
523	C-Reactive Protein (Ultra sens)	65.78
524	C-Reactive Protein Nephelometer	49
525	Creatine Kinase - A	32.4
526	Creatine Kinase M-B -A	32.4
527	Creatinine - A	20.49
528	Cryoglobulin Qual - M	20.4
529	Cryptococcal Latex	31.48
530	Cryptococcus Titration	31.48
531	CSF Cell Count	19.78
532	CSF Culture - Growth	36.12
533	CSF Culture - No Growth	36.12
534	CSF Micro	28.04
535	Culture Aerobic	36.12
536	Culture Anaerobic	25.8
537	Culture Campylobacter Fetus	56.67
538	Cysticercosis EIA	74.13
539	Cytomegalovirus Dir If (Rapid)	68.71
540	D-Dimer (Xdp Test) Semi Quan	50.94
541	D-Dimer Quantitative	164.97
542	Diff Count and Comment Manual	22.16
543	Digoxin Level Abbot Tdx	74.43
544	Dihydroepianrostene Sulphate	74.43
545	Direct Coombs Test	21.87
546	Disc Sensitivity (Per Org)	45.84
547	Disc Susceptibility test Mycology	45.84
548	DNA Crithidia Fluorescent	91.68
549	DNA Extraction	263.93
550	DNA Ploidy Flow Cytometry	126.45

551	EasyQ Viral Load	300
552	EBV Ebna	38.7
553	EBV IgM	80.5
554	Echinococcal Haemagglutination	56.67
555	EIA for ACLA IgG	74.13
556	EIA for ACLA IgM	80.5
557	Electron Microscopy	649.23
558	Electrophoresis Qualitative	25.5
559	Electrophoresis Qualitative	25.5
560	Elisa for TB Antibody IgM	74.13
561	Elisa TB Antibody IgG	74.13
562	Enzyme-Linked Immunoassay	71.04
563	ESR	15.03
564	EXF Cytology Additional Unit	56.91
565	EXF Cytology (Gynae) 1st Smear	80.28
566	EXF Cytology (Gynae)1st&2nd Smear	160.55
567	Exfoliative Cytology (General)	97.76
568	Factor B Radial Immunodiff	18.06
569	Factor IX Xmas Assay	193.05
570	Factor V Assay	193.05
571	Factor VII Assay	193.05
572	Factor VIII Assay	193.05
573	Factor VIII Related Antigen	362.43
574	Factor X Stuart Prower	193.05
575	Factor XI Assay	193.05
576	Factor XII Assay	193.05
577	Faeces General Parasitology	28.04
578	Ferritin Assay Ria	74.43
579	Fibrinogen Degradation Product	26.92
580	Fibrinogen Quantitative	21.6
581	Fine Needle Aspiration Cytology	357.49
582	FISH Analysis	226.77
583	FISH Preparation	453.53
584	Fluorescent Treponemal (TFA)	68.71
585	FMC7 Non Hodgkins Lymphoma Mar	115.21
586	Folate (serum)	74.43
587	Follicle-Stimulating Hormone	74.43
588	Free Hormone (T.3)	98.94
589	Frozen Section In Lab	156.75
590	Full Blood Count Incl Platelet	34.95
591	Fungal Cultures	25.8
592	Fungal Identification	71.64
593	G6PD Fluorescent Screen Test	47.97
594	Gastrin	74.43
595	Genotype Per Person PCR	388.74

596	Gentamicin Levels	70.11
597	Gentamicin Levels	70.11
598	Glucose - A	20.49
599	Glutamyl Transpeptidase - A	30.6
600	Glycated Haemoglobin - A	40.8
601	Glycophorin-A Red Cell Marker	115.21
602	H & E Stain By Linear Staining	46.27
603	Haemoglobin Alkali Resistant	27
604	Haptoglobin - M	53.47
605	Hb Electrophoresis Qual	160.74
606	Hb Only	11.04
607	Hb-H by Staining Method	13.5
608	HCG Monoclonal - Qual	56.81
609	Hepatitis per antigen	82.99
610	Herpes EIA IgG	74.13
611	Histochemical Studies Group 1	142.98
612	Histochemical Studies Group 2	142.98
613	Histology 1 Additional Block	80.09
614	Histology 1 Block	138.13
615	Histology-PCR	388.74
616	HIV Elisa	80.75
617	HIV PCR	429.57
618	HIV Rapid Screen Test	39.95
619	HLA Dr Marker	115.21
620	Human Growth Hormone - Hgh	74.43
621	Human IgG Subclasses	119.88
622	Identification Mycobacteria	56.67
623	IgG specific Ab titre: ELISA/EMIT	74.13
624	Immmunophenotyping per marker	115.21
625	Immunofluorescence	142.98
626	Immunoglobulins IgA - A	43.95
627	Immunoglobulins IgE - Total	74.43
628	Immunoglobulins IgG - A	43.95
629	Immunoglobulins IgM - A	43.95
630	Immunoperoxidase	276.26
631	Immunosuppressant Drugs	124.11
632	Indirect Fluorescent Test	142.98
633	INR (PTT Correction Studies)	66.39
634	Insulin	74.43
635	Intrinsic factor	74.43
636	Iron - A	40.5
637	Kinyoun Stain for Mycology	47.56
638	LA/SSB Od Ratio	91.68
639	Lactate - A	61.12
640	Lactate Dehydrogenase Total	30.6

641	Lipase -M	29.33
642	Lithium Flame Emission	31.05
643	Luteinizing Hormone -Lh-	74.43
644	Macroduct and Pilogel	181.56
645	Magnesium Colorimetric - A	20.49
646	Malaria	32.08
647	Malaria Rapid Kit	56.91
648	Measles IgG (Elisa)	74.13
649	Measles IgM (Elisa)	80.5
650	MIC MBC Kill (MIC or Tube)	70.11
651	Micro TB Misc.	17.2
652	Micro TB Misc. Fluor	28.04
653	Microalbumin In Urine	70.3
654	Microscopy Only Stained Prep	28.04
655	Microscopy Only Wet Prep	28.04
656	Mucopolysacharides Quan	94.91
657	Mumps IgM	80.5
658	Mumps Virus IgG	73.87
659	Mycoplasma IgG	74.13
660	Mycoplasma IgM	80.5
661	Myoglobin Ria	74.34
662	Myoglobulin Qual - M	70.21
663	Neuropathological Examination	756.3
664	Nor-Metanephrine Hplc Profile	442.26
665	Occult Blood - Qual - M	12.75
666	Oestradiol Total	74.43
667	Osmolality - M	38.25
668	P M Exclude Histopathology	799.05
669	Panel Typing	206.23
670	Para Protein - Immuno Fixation	265.37
671	Parathyroid Hormone	102.42
672	Parvovirus IgG ABS	74.13
673	PCV	10.8
674	Perinuclear Ab's	91.68
675	pH	5.1
676	Phenobarbitone Emit - A	64.71
677	Phenytoin Levels Abbot	64.71
678	Phosphatase Alkaline - A	29.33
679	Phosphorus - A	20.49
680	Plasma Catecholamines By Hplc	468.27
681	Plasma Renin Activity - Pra	113.31
682	Platelet Count - Manual (1)	13.5
683	Pneumocystis IFA	68.71
684	Polymerase Chain Reaction (PCR)	380.02
685	Porphobilinogen - Quant	84.92

686	Porphyrins Quant M	113.22
687	Potassium - A	20.49
688	Prenatal Genotype PCR	777.48
689	Profile Gases and pH-Automated	102.55
690	Progesterone	74.43
691	Prolactin	74.43
692	Prostatic Specific Antigen	86.85
693	Protein C Assay	181.53
694	Protein Electrophoresis -Quan	63.67
695	Protein Electrophoresis Quan M	50.92
696	Protein S Assay	224.82
697	Protein Total - A	17.6
698	Protein Total M	17.6
699	Prothrombin Index Pi Manual	30
700	PTT Test	33.15
701	Pyruvate - M	25.5
702	R/M Culture TB	62.55
703	R/M Culture TB No Growth	62.55
704	Radiometric Mycobact Antibiotic Sensitivity	143.19
705	Rast Test each Allergen	71.12
706	Red Cell Folate	104.76
707	Releasing Hormone Response	299.7
708	Respiratory Syncitial Virus	200.47
709	Reticulocyte Count	18
710	Rh Only	21.6
711	Rheumatoid Factor Neph	49
712	Rickettsial Agglutination	31.48
713	Ristocetin Co Factor	193.05
714	RNP Od	91.68
715	RPR Quantitative Slide	20.64
716	RPR Slide Test	12.9
717	Rubella IgG/IMX	74.13
718	Rubella IgM Elisa	80.5
719	S H B G	74.43
720	Salicylates (Abbot Tdx)	64.71
721	Salmonella Typhi Agg	31.48
722	Sens Mother Antibody Invest Bl	30
723	Serological Id of bacteria: abridged	18.06
724	Serological Identification of bacteriu: extended	58.39
725	Serotyping of Meningococci	58.39
726	Serotyping of Streptococci	41.8
727	Shell Vial Cult Cytomegaloviru	91.68
728	SLE Inhibitors	149.85

729	Smith Od Ratio	91.68
730	Sodium	20.49
731	Special Stains	43.83
732	Stains Group 1 Cresyl Violet Etc	46.27
733	Stains Group 2 Solochrome Etc	46.27
734	Stains Group 3	46.27
735	Surface Kappa LC Marker	115.21
736	Surface Lambda LC Marker	115.21
737	Sweat Chloride Electrode	14.62
738	Testosterone Total	74.43
739	Theophyline Level (Abbot Tdx)	64.71
740	Thrombin Time	42.93
741	Thyroglobin Haemagglutination	56.67
742	Thyroglotulin	74.43
743	Thyroid Fluorescent	68.71
744	Thyroid Function Profile	214.89
745	Thyroid Haemagglutination	56.67
746	Thyroid Stimulating Hormone	117.45
747	Thyroxine Free -Free T4	98.94
748	Tobramycin - Emit	64.71
749	Toxocara Canis Eia	71.12
750	Toxoplasma EIA Test	74.13
751	Toxoplasma Titre IgM	80.5
752	Transferrin - A	66.22
753	Treponema Haemagglutination	56.67
754	Tricyclic -Emit S.Qn	64.71
755	Triglyceride -A	44.88
756	Troponin T	113.22
757	U&E	84.4
758	Urea - A	20.49
759	Uric Acid Automated	21.42
760	Urine Bacterial Inhibition	21.76
761	Urine Culture	36.12
762	Urine Dipstick & screening tests	8.5
763	Urine Microscopy	28.04
764	Valproic Acid Levels	64.71
765	Vancomycin Levels	70.11
766	Vanillyl Mand Acid Qual Elect (VMA)	67.41
767	VDRL Quant Slide (8 Dilutions)	20.64
768	Viable Cell Count	7.74
769	Viral Load	482.8
770	Virus neutralisation each add.Ab	85.91
771	Virus PCR	429.57
772	Vitamin A - M	37.8
773	Vitamin D (Ria)	449.55

774	Vitamin E - M	21.6
775	WBC Only - Automated	11.04
776	Western Blot for ANA/ENA	423.81
777	Yeast ID Auxanogram	71.64
778	Yeast ID Disc Method	18.06
779	Yeast ID Germ Tube Test 1	18.06
780	Yersinia Serology	31.48
781	Zinc Atomic Absorption	108.63
	FLUIDS & BLOODS PRODUCTS (per unit)	
782	Whole blood (per unit)	811
783	Packed cells/red cell concentrate	733
784	Fresh frozen plasma	586
785	Platelets (adult)	3728
786	Pediatric Platelet concentrate	2619
789	Autologous blood	848
790	Stem cell concentrate	5069
791	Vaculitre (1 litre)	38.74
792	Vaculitre (2 litre)	43.03
793	Jelco	2.96
794	IV set	1.24