THERAPEUTIC BUDGET MODELLING: A POSSIBLE ROAD TO BUDGETARY ALLOCATIONS IN THE PUBLIC HEALTH CARE SETTING

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ABSTRACT

In South Africa, 70% of the country's population is dependent on the public health care sector (especially the primary health care structure) for their basic health care needs. The objective of the study is to analyse the cost and usage-related perspectives of medicines, to formulate a therapeutic budget model, for use as a planning and control instrument in the usage of medicines at a public primary care level. Data utilised in this study were obtained from patient records of six local primary health care clinics [N=1 313] in Potchefstroom over a 24-day period. The medicines used by these patients were coded using the proposed medicine classification system.The average cost of medicines per consultation was R8.25 ± 10.98 [N=R19 669.50] for all medicines. The average cost per medicine item was R 4.19 ± 9.54 [N=4 691] for all medicines [N=R19 669.50]. Of the main groups of medicines issued to patients in the clinics, those displaying a total cost of treatment and usage of ≥ 5%, constituted 88.20% and 84.08% of the total medicines used [N=4 691] respectively. From the study it was projected that R2 607 357.00 (231.23% more than the actual budget allocation) is needed for the optimal functioning and management of the six clinics in Potchefstroom. It is foreseen that compiling of a therapeutic budget modelling system would significantly help the public sector to prepare and plan budgetary policies for better medicine formulary and resource management.

OPSOMMING

In Suid-Afrika is 70% van die land se bevolking van die openbare gesondheidsorgsektor (veral die primêre gesondheidsorgstruktuur) afhanklik vir hulle basiese behoeftes aan gesondheidsorg. Die doel van hierdie studie was om die perspektiewe op die koste en gebruik van medisyne te ontleed, om 'n model gebaseer op terapeutiese klassifikasie vir 'n begroting te formuleer wat as 'n instrument vir beplanning en beheer van die gebruik van medisyne op die vlak van primêre sorg aangewend kan word.Die data wat in hierdie studie gebruik is, is uit die rekords van pasiënte van ses plaaslike primêregesondheidsorgklinieke [N=1 313] in Potchefstroom oor 'n periode van 24 dae verkry. Die medisyne wat deur hierdie pasiënte gebruik is, is volgens die voorgestelde klassifikasiestelsel vir medisyne gekodeer. Die gemiddelde koste van medisyne per konsultasie was R8.25 ± 10.98 [N=R19 669.50] vir alle medisyne. Die gemiddelde koste per medisyne-item was R4.19 ± 9.54 [N=4 691] vir alle medisyne [N=R19

669.50].
Van die hoofgroepe medisyne wat in die klinieke aan pasiënte uitgegee word, het dié wat 'n totale koste van behandeling en gebruik van ≥ 5% bedra onderskeidelik 88.20% en 84.08% van die totale hoeveelheid gebruikte medisyne uitgemaak [N=4 691]. Uit hierdie studie is geprojekteer dat R2 607 357.00 (231.23% meer as die werklike toegekende begroting) nodig is vir die optimale werking en bestuur van die ses klinieke in Potchefstroom. Dit word voorsien dat die opstel van 'n modelleerstelsel vir 'n begroting gebaseer op terapeutiese klassifikasie die openbare sektor beduidend kan help om beleid vir begroting met beter beheer van medisyne en hulpbronne voor te berei en te beplan.

INTRODUCTION

Although South Africa has made substantial progress in ensuring equity in the primary health care service provision, the country still faces a major challenge (Committee of Inquiry, 1995:6), as the public health structure does not provide for a proper monitoring system to measure the rate at which medicine is being distributed or to statistically determine and document the balance between demand, procurement, and expenditure. In the absence of this system, medicine distribution is seriously affected (DSM workshop, 2001a). Budgets allocated to provinces in South Africa are without guidance and statistical data thus *hindering calculation of actual requirements* (Blok, Zweygarth & Summers, 2002:32). In most of the provinces, budget allocations do not necessarily correlate with the actual expenditure, as the budgets are usually calculated based upon the historical allocations (Blok *et al*. 2001:32). This has caused scenarios where funds are exhausted prematurely, causing a deficit. Therefore it affects the effective and efficient rendering of other crucial health care services. Buch (2000:57) observed that the inequity is also compounded by other factors including reduction in health budgets, a high inflation rate, low staff morale; all these despite substantial moves having been made in ensuring equity in the primary health care service provision in South Africa (Van Rensburg, Viljoen, Heunis, Van Rensburg & Fourie, 2000:3). Medicine usage patterns in the public health care sector can be directly related to the efficiency of the distribution system, which is dependent on the financial allocation and expenditure in the public sector.

According to the Department of Finance's Medium-Term Expenditure Framework (MTEF) database, the total government expenditures for all ministries increased from R 158 billion in 1995/96 to R174 billion in 1996/97, and was projected to increase to R 240 billion by 2001. According to McIntyre, Baba and Makan (1998:30), this in real terms would mark a decline in the per capita expenditure, since the expenditure increase did not take into account factors such as rapid population increase and inflation rates. McIntyre *et al*. (1998:31) calculated the decline to be R3 960 in 1995/96 to R3 720 in 2000/01. For health care, expenditure increased from R16.5 billion in 1995/96 to R22.1 billion in 1997 and was projected to increase to R26.4 billion in 2000/01.

The 1995/96 national health services budget accounted for approximately 10% of total government expenditure, and it was estimated that in 2000/01 it would be 11% (McIntyre *et al*. 1998:31), it was thus necessary to have a reliable method to improve allocative efficiency of budgets. During the 2000/01 financial year, for the months of October and November, R1.66 billion was spent on national health services. Out of this amount, the North West Province spent R151.95 million for the same period (Coetzer, 2002). During the same period in 2001, the pharmaceuticals and surgicals budget expenditure for the North West Province was R12.66 million (Department of Health, 2001b).

If we look at the current trends and budget allocations, there has not been much change since 1995. According to the Health System Trust (2004b), the per capita health expenditure (amount spent on health per person) was R529.00 (in Rands). For the public sector, this is often calculated for the population without medical aid coverage (public sector dependent population), while for the private sector this is usually calculated for the number of medical schemes beneficiaries. The percentage of national Gross Domestic Product (GDP) that was spent on health care in 2001 was 8.8%. With this picture in mind, it is therefore necessary to have a reliable method to improve the budget allocation efficiency. This study proposes a model which might bring such efficiency and provide a correlation between the budget and the medical expenditure, thus corroborating McIntyre's suggestion that it is necessary to have a

uniform and reliable method to forecast resource allocation in the public health care sector (McIntyre *et al*. 1998).

In the financial year 2005/06, the nine provinces spent on average 98% or R214.8-billion of their adjusted budgets of R219.2-billion in 2005/06. According to the National Treasury, the expenditure on health totalled R46.9-billion or 99.5% of the R47.2-billion total adjusted budget for health, and was the third-largest (21.39%), after education and social development, on provincial budgets (Mail & Guardian, 2006). The spending pattern reflected a 16.6% or R6.7-billion increase compared with audited spending in 2003/04 (Manuel, 2004:13).

In line with the issue that this paper seeks to address, a Public Health Conference (PHASA, 2006) with the theme "making health systems work" was held in May 2006. In his paper at the conference Blecher (2006), revealed that South Africa had the highest Gross Domestic Product (GDP) expenditure, at 8.5%. He argued that there was a need to introduce new financial management principles, and referred to the new buzz word "stewardship in health care financial management" to emphasise his point. Blecher was in fact echoing Kirigia (2005:5), speaking from the World Health Organization's (WHO) perspective for Africa, that health systems should be one of the critical areas to be monitored as "the effectiveness of public health programmes largely hinges on the effectiveness of the underlying health system".

It is worth pointing out that some of the views expressed above are partly realised in the strategic priorities for the South African National Health Systems 2004-2009 (SAHR, 2005:13). Of the key activities that were specified in the priorities were planning, budgeting, monitoring and evaluation with specific reference to strengthening health planning and budgeting and also to strengthening the use of a health information system (SAHR, 2005:15). This is because, in South Africa, 70% of the population depends on the public health sector for their basic health care needs (John, 2003).

DEFINITION OF TERM

Therapeutic budget model: The therapeutic budget model aids in identifying areas of specific needs in the medicine demand-procurement-expenditure chain. The therapeutic budget model is based on detailed classification of all medicine items available in the public health care facilities, according to the therapeutic function (see Table 1). The proposed classification system would help in identifying areas of specific need. This helps the managers responsible for budgets, to achieve better control and estimation of projected budgetary allocations for the public health care facilities, based on actual medicine demand-procurement and expenditure data.

OBJECTIVE

The objective of this study was to formulate a therapeutic budget model to be used as a planning and control instrument based on the *actual usage of medicines* at a primary care level in the public sector in Potchefstroom. This model would serve the purpose of aiding the role players in the public health care system not only in preparing and planning budgetary policies for better formulary and resource management, but also in evaluating the operational and clinical policies in an *accurate manner*.

RESEARCH DESIGN

The WHO model on the action programme on essential drugs (WHO, 1993:11), which is used for investigating medicine use in health facilities, was adopted as the model for this study with regard to the method used for data collection. A retrospective sample of patients visiting six local authority primary health care clinics in Potchefstroom from 25 September to 26 October (24 working days) (N=1 313) was selected (see Table 2). The total number of patients who visited the clinics during the study period was 15 240 (see Table 2). Since the numbers of patients were many for the scope of the study, the patients were chosen based upon a 10% stratified sampling system. The reason for choosing a 10% sample population was borrowed from Neuman (2000:217) who postulates that if the sample size is a moderately large one (N=10 000) a smaller sampling ratio of 10% would be sufficient.

Care was taken to ensure that there was minimal disturbance or disruption to the normal activities in the clinics. The researcher went to each clinic and first of all selected the sample population by inspecting the

different patient registers and selecting every tenth patient (thus a 10% systematic sampling is obtained) from each category for the specified period. The accuracy of the gathered data was further enhanced by the personnel of each clinic doing a random cross check of about six to ten survey forms each day.

The study was conducted in two phases; the pilot phase and the main study. The data were collected using a structured survey form, which was formulated by the researcher in consultation with academics from various health disciplines as well as members of the primary health care clinics in Potchefstroom. During the pilot visit the survey form was pre-tested (twenty patients' files were selected based on the sampling method and the information in the patient files were recorded onto the survey form) and all flaws on the survey form were corrected. The patient files which were used in the pilot visit were not used again for the main study. One of the public primary health care clinics of the intended study was used for the pilot visit; this was due to the fact that all public primary health care clinics in the Potchefstroom health district were used for the scope of the main study. The emphasis of the pilot visit was to test the reliability of the sampling method and the validity of the survey form.

The patients were not identified by their names on the survey form, rather the selected patients were assigned a Patient Identification Number (PIN) in line with Neuman's (2000:99) principle of maintaining anonymity and confidentiality. This procedure was followed so as not to violate the Patients Rights Charter (Department of Health, 2004a) and the ethical considerations that are associated with operational research like psychological and legal jeopardy (Neuman, 2000:92), the maintenance of social etiquettes and a professional code of ethics (Leedy, 1997:116). The SAS® system for Windows® (8.2, 2002 version) was used to create the database and to analyse the data by calculating certain descriptive and inferential statistics. The descriptive statistics were frequency tables, percentage expressions, mean value and standard deviation (Steyn, Smit, Du Toit & Strasheim, 1999:6). The Cost Prevalence Index (here after referred to as CPI) is the value obtained when the percentage cost is divided by the percentage frequency of the respective medicine items. If the value of CPI is ≥ 1.5 then the medicine is considered to be expensive and needs further investigation (Serfontein, 2004).

The medicines used by these patients were coded using the proposed medicine Budget Group (BG) (broad general classification), pharmacological groups (active therapeutic class), individual item descriptions with the strength and pre-pack form (this is to differentiate each medicine item as there could be more than one medicine item with the same individual ingredient) and the ATC (Anatomic Therapeutic Chemical) classification system (see Table 1). The diagnoses (based on the ICD-10 coding system) observed in the clinics were also included.

The proposed coding system (see Table 1) can be explained as follows: the first level is the budget group, which contains the main group to which the drug belongs; the second level is the pharmacological/therapeutic group under which the therapeutic entity is listed; the third level has the therapeutic subgroup with the chemical substance and the dose, pre-pack and nature of dosage form; the fourth level indicates the level of health care (in other words, 1 = Primary health care, 2 = Secondary health care, 3 = Tertiary health care) and the fifth level indicates the classification of the category of indications to which the drug belongs according to the Essential Drugs Programme (EDP) of South Africa as applied in primary health care as follows.

An example of a preparation containing Diazepam can be classified according to the proposed coding system as

5	First level-budget group – functional
07	Second level – therapeutic group-hypnotic/ sedatives
061	Third level-product identification/individual medicine item – Diazepam10 mg/2 ml injection - chemical substance and dose
1	Fourth level – level of health care - primary health care
N05	Fifth level – EDL classification of indication - Psycholeptics

Thus the preparation containing Diazepam has the code 5-07-061-1-N05 according to the proposed classification system.

Table 1: Proposed coding system

Code	Budget Group (B.G)	Code	Pharmacological/ Therapeutic group	Code	Product description	Level of health care	ATC Code
5	Functional	07	Hypnotic/sedatives	061	Diazepam 10 mg/2 ml injection	1	N05

RESULTS

The three major areas under which the results will be enumerated are the following:

- General analyses
- Diagnoses analyses
- Medicine analyses

The conclusions drawn from the three respective major areas mentioned above are discussed simultaneously with the results, for better inferencing and assimilation capacity.

General analyses

When the different general parameters (as mentioned in Table 2) in the clinics are evaluated, a broad picture of what happens in the public primary health care clinics is revealed.

Conclusions based on general parameters

With reference to Table 2, when the general parameters are evaluated in all the clinics in Potchefstroom health district, the following salient trends were observed:

- The most common dosage form for medicines issued in all the clinics was tablets (65.4%).
- Medicine was supplied to the patients in 96.51% of the consultations in all the clinics.
- The most common dosage regimens prescribed in all the clinics were once daily (o.d), one thrice daily (t.i.d) and one stat. They comprised 46.58% of all dosage regimens prescribed.

Diagnoses analyses

When the general parameters are evaluated, based on criteria of diagnoses in the clinics, (prevalance, cost, gender, CPI and age group), a broad picture of what happens in the public primary health care clinics in terms of diagnoses is revealed. The above parameters are depicted in Table 3.

Conclusions based on the diagnoses analysis

Based on the analysis of Table 3, which shows the disease prevalence patterns in all the clinics in Potchefstroom health district, the following conclusion were reached:

- The average cost of medicine therapy for hypertension as a diagnosis was high when compared to the average cost for all diagnoses (R5.86 ± 8.19), especially with a high CPI of 2.91.
- The age group of >12 < 19 years has a higher incidence of prevalence (43.24%) for the condition, family planning.
- The five diagnoses/conditions/diseases above constituted 69.50% (2 333 items) of medicines issued and 62.77% (R12 346.99) of medicine costs for all diagnoses in the clinics.

Medicine analysis

The general parameters were evaluated and analysed within the framework of a therapeutic budget model on cost-related aspects. From this evaluation and analyses we get a clear picture of the state of affairs in respect to medicine usage and cost patterns in the public

Table 2: General parameter analyses

Parameter 1 - Gender distribution of all patients				**Parameter 2 - Gender distribution of all patients for all consultations**			
Male	342 patients	26.04%		Male	1 195 patients	42.63%	
Female	971 patients	73.95%		Female	1 608 patients	57.37%	
Parameter 3 - Age group distribution of patients in all consultations							
0 < 6 years	251 patients	>6 < 12 years	34 patients	>12 < 19 years	62 patients	>19 < 40 years	525 patients
>40 < 60 years	218 patients	> 60 years	98 patients	Age group unknown	125 patients		
Parameter 4 - Type of patient consultation (all consultations, patient visit more than once) [▲]							
New cases	364 patients	Follow-up	1 991 patients	Patient record not available	329 patients	Re-treatment	112 patients
Parameter 5 - Medicine supply during consultations							
Medicine supplied	96.51%	3 240 Consulta-tions	Medicine not supplied	3.49%	117 Consulta-tions		
Parameter 6 - Reasons why medicine was not supplied							
Patient given advice only	69 patients (58.47%)	Patient referred to hospital	27 patients (22.88%)	Patient awaiting diagnos-tic tests results	22 patients (18.64%)	No stock of medicine	0 inciden-ces

Parameter 7 - Dosage regimen distribution for all medicines prescribed in the clinics							
o.d[▶]	930 items	1 b.d[▼]	366 items	1 t.i.d.[◀]	528 items	1/4 daily	01 item
2 o.d	356 items	2 b.d	41 items	2 t.i.d.	36 items	1/2 daily	40 items
3 o.d	341 items	3 b.d	02 items	3 t.i.d.	05 items	1 p.r.n.[☻]	02 items
4 o.d	369 items	4 b.d	03 items	1 q.i.d.[♣]	40 items	2 p.r.n.	53 items
5 o.d	280 items	5 b.d	00 items	2 q.i.d.	11 items	3 p.r.n.	300 items
4 p.r.n	03 items	On demand	231 items	Stat.[■]	706 items		
Parameter 8 - Frequency of various pre-packs used in the clinics							
1's	1 142 items	7's	01 item	25's	09 items	80's	06 items
2's	18 items	10's	332 items	28's	1052 items	84's	40 items
3's	01 item	14's	176 items	30's	23 items		
4's	45 items	15's	39 items	50's	03 items		
6's	03 items	20's	902 items	56's	49 items		
Parameter 9 - Frequency of various dosage forms used in the clinics							
Tablets	65.4%	Injections	4.74%	Capsules	1.22%	Fridge Items	0.17%
Syrup	6.63%	Food Items	4.52%	Nasal Drops/ Spray	0.45%	Mixtures	0.13%
Family Planning	6.02%	Creams/ Ointments	2.92%	Powders	0.36%	Eye/Ear Drops	0.06%
Vaccines	5.52%	Suspen-sions	1.47%	External Liquids	0.34%		

[▲]One patient could visit a clinic more than once.

[▶]o.d.- once daily

[▼]b.d.- two times a day

[◀]t.i.d.- three times a day

[♣]q.i.d.- four times a day

[☻]p.r.n.- as needed

[■]Stat.-immediately

Table 3: Top five diagnoses analysis based on prevalence

Diagnoses	Prevalence	Total medicine cost (Rands)	Average medicine cost (Rands)	CPI	Prevalent Gender	Prevalent Age group
Tuberculosis	42.39% (1 423 items)	R6 480.87 (32.94%)	R4.64 ± 5.22	0.78	Males - 61.11% (850 items)	>40 < 60 years (53.03%/70 items)
Family planning	9.06% (304 items)	R1 597.72 (8.12%)	R5.26 ± 1.43	0.89	Females - 15.46% (304 items)	>12 < 19 years (43.24%/16 items)
Hypertension	6.88% (231 items)	R3 935.38 (20.01%)	R18.86 ± 15.94	2.91*	Females - 9.56% (188 items)	> 60 years (46.43%/13 items)
Vitamin deficiency	5.63% (189 items)	R183.71 (0.93%)	R0.98 ± 0.78	0.17	Males - 62.57% (87 items)	> 40 < 60 years (2.27%/3 items)
Pain control	5.54% (186 items)	R149.31 (0.76)	R0.77 ± 1.02	0.14	Females - 6.56% (129 items)	> 60 years (14.29%/4 items)
Total	69.50% (2 333 items)	R12 346.99 (62.77%)	R5.86 ± 8.19	0.90	* CPI marked with a * sign are considered to be significant	

Table 4: General medicine analysis parameters

Total number of consultations	Average medicine cost per consultation (Rands)	Total number of diagnoses	Average medicine therapy cost of diagnoses (Rands)	Average number of medicine items	Total number of medicine items
2 803	8.25 ± 10.98	3 357	5.86 ± 8.19	1.67 ± 1.12	4 691
Average cost of medicine items (Rands)	Total cost of medicine items (Rands)	Patient per consultation ratio	Percentage of patients receiving medicine per consultation (%)	Number of patients	Patient per budget/pharmaco-logical/individual group ratio
4.19 ± 9.54	19 669.50	1:2.13	93.00	1 313	1:3.57

primary health care clinics; the results of which are depicted in Table 4.

Conclusions based on general framework of medicine analysis

The following conclusion can be made from the analysis of Table 4:

- The average number of medicine items per consultation was 1.67 ± 1.12 for all consultations [n=4 691].
- The average medicine cost per item of R4.19 ± 9.54 is less than the cost in a private primary health care setting, where it was R5.79 ± 1.58 [N=74 679] and less than R259.85 ± 151.97 for a medical claim database (Plaath, 2003:52).
- The average cost of medicines per consultation was R8.25 ± 10.98 [N= R19 669.50] for all medicines (including diagnoses for which medicines were not supplied).

Summary of all parameters according to groups

The parameters are summarised according to the top five budget groups, pharmacological group, individual medicine items and ATC class groups for all consultations in all clinics. The following criteria were also considered in the analyses; the total medicine cost ≥ 5% (R983.48), the total medicine costs in all clinics (R19 669.60/4 691 items), CPI ≥ 1.5, the average medicine cost per group, the frequency, gender and age group. The following trends were observed in Tables 5 to 8.

Conclusions of all parameters according to budget groups

With reference to Table 5 for the top five budget groups in all clinics the following salient points are seen:

- These five budget groups accounted for 88.20% (R17 368.68) of the total medicine costs incurred and 84.08% (3 930 items) of all medicine items used, in all clinics in Potchefstroom health district.
- Cardiovasculars had a significant CPI of 1.53 with an average medicine cost of R6.42 ± 7.82, as it constituted 20.47% (R4 026.85) of the medicine costs in all the clinics.
- Conclusions of all parameters according to therapeutic/pharmacological groups.

With reference to Table 6 for the top five pharmacological groups the following salient points are seen:

- The five pharmacological groups made up 76.59% (R14 886.08) of all medicine costs in the clinics and 61.97% (2 892 items) of all medicine items issued in the clinics.
- The CPI of antihypertensives was a high 1.89 and so was the average medicine cost at R7.85 ± 8.50, considering the fact that 19.09% (R3 699.22) of the total medicine costs in the clinic were in that group.
- The CPI of feeding and nutritional supplements was 3.12 and had a high average medicine cost of R12.99 ± 3.84.

Conclusions of all parameters according to individual medicine items/product description

For the top five individual medicine items, the following salient facts become evident, as indicated in Table 7:

- The top five individual medicine items as indicated in Table 7 cost 45.19 % (R7 562.33) of all the medicine costs incurred at the clinics in Potchefstroom health district during the study period.
- Perindopril 4 mg tablets (28's pre-pack) had a high CPI of 4.46 and an average medicine cost of R18.80 ± 2.40, which was high considering the fact that it constituted 6.47% (R1 133.69) of all costs in the clinics.

Conclusions according to all parameters of the ATC classification

With reference to Table 8, for the top five ATC classes in all the clinics in Potchefstroom health district, the following salient trends can be observed:

- The top five ATC classes constituted 3 108 medicine items, which was 66.25% of all items (4 691 medicine items) according to the ATC class.

Summary based upon therapeutic budget model prediction

According to the therapeutic budget model the total

Table 5: Top five budget group analyses based on total cost

Budget group	Medicine Usage	Total medicine cost (Rands)	Average medicine cost (Rands)	CPI	Prevalent Gender	Prevalent Age group
Respiratory	1 931 items (41.16%)	33.06% (R6 503.59)	R3.37 ± 4.25	0.80	Males - 58.26%	> 19 < 40 years 53.03% /977 items
Cardiovascular	627 items (13.37%)	20.47% (R4 026.85)	R6.42 ± 7.82	1.53*	Females - 82.29%	> 40 < 60 years 43.06% /267 items
Gastro-intestinals	766 items (16.33%)	17.59% (R3 460.98)	R4.52 ± 6.05	1.08	Females - 50.39%	> 19 < 40 years 46.39% /354 items
Endocrines	347 items (7.40%)	10.65% (R2 095.72)	R6.04 ± 3.91	1.44	Females - 97.98%	> 19 < 40 years 67.09% /157 items
Immunologicals	259 items (5.52%)	6.52% (R1 281.54)	R4.95 ± 8.16	1.18	Females - 58.30%	0 < 6 years 89.33% /226 items
Total	3 930 items (84.08%)	88.20% (R17 368.68)		1.05	*CPI marked with a * sign are considered to be significant	

Table 6: Top five pharmacological/therapeutic groups analysis based on total cost

Pharmacological group	Medicine Usage	Total medicine cost (Rands)	Average medicine cost (Rands)	CPI	Prevalent Gender	Prevalent Age group
Antimycobacterials	1 715 items (36.81%)	30.81% (R5 972.49)	R3.48 ± 4.21	0.84	Males - 59.69%- 850 items	> 19 < 40 years 55.19% (775 items)
Antihypertensives	471 items (10.11%)	19.09% (R3 699.22)	R7.85 ± 8.50	1.89*	Females - 81.58%- 186 items	> 40 < 60years 49.79% (232 items)
Feeding & nutritional supplements	213 items (4.54%)	14.07% (R2 767.50)	R12.99 ± 3.84	3.12*	Females - 57.07%- 117 items	0 < 6 years 47.92% (133 items)
Vaccines	247 items (5.27%)	6.49% (R1259.22)	R5.09 ± 8.33	1.22	Females - 59.63%-65 items	0 < 6 years 88.68% (94 items)
Contraceptive (injectables)	246 items (5.24%)	6.13% (R1 187.65)	R4.83 ± 0.36	1.16	Females - 100.00%- 246 items	> 19 < 40 years 78.29% (119 items)
Total	2 892 items (61.97%)	76.59% (R14 886.08)		1.24	* CPI marked with a * sign are considered to be significant	

Table 7: Top five individual medicine items/product description analyses based on total cost

Individual medicine items	Medicine Usage	Total medicine cost (Rands)	Average medicine cost	CPI	Prevalent Gender	Prevalent Age group
Rifampicin 300/150 INH tablets (20's pre-pack)	535 items (12.97%)	14.32% (R2 157.23)	R4.03 ± 4.51	1.10	Males - 66.17% /354 items	> 40 < 60 years 62.99% / 3 337 items
PVM maize meal mix 1kg	152 items (3.68%)	12.06% (R2 111.94)	R13.89 ± 4.05	3.28*	Females - 55.92% /85 items	0 < 6 years 53.95% / 82 items
Perindopril 4mg tablets (28's pre-pack)	60 items (1.45%)	6.47% (R1 133.69)	R18.80 ± 2.40	4.46*	Females - 71.67% /43 items	> 60 years 51.67% / 31 items
HREZ (Myrin plus) tablets (100's pre-pack)	250 items (6.06%)	6.40% (R1 119.83)	R4.46 ± 6.12	1.06	Males - 67.20% /168 items	> 19 < 40 years 55.60% / 139 items
Haemophillius influenzae conjunct vaccine (10 dose)	47 items (1.14%)	5.94% (R1 039.64)	R22.12	5.21*	Females - 61.70% /29 items	0 < 6 years 100.00% / 45 items
Total	1 044 items (25.30%)	45.19% (R7 562.33)		1.79*	* CPI marked with a * sign are considered to be significant	

Table 8: Top five ATC class analyses based on usage

ATC Class	Medicine Usage	Prevalent Gender	Prevalent age group
Antimycobacterials	1 706 items (36.56%)	Males - 1 024 items / 34.17%	> 19 < 40 years 46.80% / 915 items
Vitamins	474 items (10.04%)	Males - 262 items / 13.12%	> 19 < 40 years 13.81% / 270 items
Sex hormones and genital modulators of the genital system	306 items (5.27%)	Females - 306 items / 11.36%	> 19 < 40 years 7.93% / 155 items
Antihypertensives	267 items (5.24%)	Females - 215 items / 7.98%	> 60 years 26.80% / 93 items
Analgesics	355 items (4.54%)	Females - 233 items / 8.65%	> 19 < 40 years 5.32% / 104 items
Total	3 108 items (66.25%)		

Table 9: Budget allocation break-down in the clinics in Potchefstroom

Clinic	Budget allocated [Monthly] Rand (R)	Actual expenditure [Monthly] Rand (R)	Budget allocated [Yearly] Rand (R)	Projected annual expenditure Rand (R)	Percentage of budget variance (%)
1	11 038.50	15 710.58	132 462.00	188 527.00	142.33
2	10 574.42	44 942.70	126 893.00	539 312.00	425.01
3	38 823.25	55 133.10	465 979.00	661 597.00	142.01
4	13 142.50	27 302.66	157 710.00	327 632.00	207.34
5	8 303.50	26 836.26	99 702.00	322 035.00	323.19
6	12 085.08	40 704.18	145 021.00	488 450.00	336.81
Total	93 967.25	210 629.48	1 127 607.00	2 607 357.00	231.23-Average

projected annual expenditure for all public Primary Health Care (PHC) clinics in Potchefstroom was R2 607 357.28, which was 231.23% above the allocated annual budget of R1 183 732.00. The Potchefstroom Health District has increased the budget based upon the recommendations of this study and currently a consistent trend in their budgetary allocations was noticed as observed in Table 9.

Conclusions based on the therapeutic budget model

The following conclusions can be formulated from the results based on Table 9:

- The existing budget allocation is not sufficient to manage the procurement of medicines in the public primary health care clinics in Potchefstroom Health district.
- The therapeutic budget model would help in identifying areas of specific need in medicine demand-procurement-expenditure strategies.

RECOMMENDATIONS

The following recommendations are made, based on an analysis of the results and related conclusions using the data in Tables 2 and 3, namely:

- The improvement of the documentation system and data capturing mechanism for patients in all the clinics.
- An investigation as to why hypertension has a prevalent percentage in 6.88% of all consultations in Potchefstroom Health district.
- An investigation as to whether there is an over-use and tendency to prescribe vitamins and mineral supplements to the patients regardless of the clinical merit.

The following general recommendations, based on reviewing all the conclusions of the data in Tables 4, 5, 6, 7 and 8 are aimed to effectively control diseases and outcomes, in the public primary health care clinics of Potchefstroom health district:

- An investigation as to whether there is an overuse and tendency to prescribe feeding and nutritional supplements among patients in the age group of 0 < 6 years, regardless of the clinical merit, based on the conclusions drawn from the pharmacological group classification system; as malnutrition was not seen as one of the top five disease/condition/diagnoses.
- A cost-effective analysis of injectable contraceptives versus oral contraceptives, based on the pharmacological groups classification system conclusions.
- A cost-effectiveness analysis of Perindopril tablets in managing hypertension and a medicine usage study of antihypertensives in particular, to investigate the possibility of overuse of antihypertensives in the clinics; based on the conclusions drawn from the parameters for the individual medicine items.
- A clinical investigation into whether there is a possibility of replacing the PVM maize meal

mix with cost-effective yet therapeutically equivalent items, based on the conclusions drawn from the parameters for the individual medicine items.

The implementation of a therapeutic budgeting system is recommended based on the conclusions drawn from Table 9, to achieve better resource management in both the public and private health care settings and also to achieve the following:

- Proper preparation and planning of budgetary policies in a phased manner based on scientific evidence (direct correlation with medicine usage).
- Evaluation of budgetary compliance, cost-efficiency of therapy and Standard Treatment Guideline (STG)/Essential Drug List (EDL)/ formulary compliance.
- Better procurement strategies based on demand, expenditure and inventory control.
- Better delivery and maintenance of quality health care by evaluating operational and clinical policies.

The above recommendations are also a motivation for follow-up research on therapeutic budget modelling, and increasing the scope of study, to include more geographical areas (health districts, regions, provinces, for example) and levels of health care (district hospital, provincial hospital, for example).

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