

# Where does all the money go?

## An audit of cost and waste distribution in a second-tier peri-urban hospital

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**Objective.** To determine the probable effect of increasing clinical frugality on health system expenditure by measuring cost distribution and waste at an individual patient level.

**Design.** Retrospective cost analysis evaluating the distribution of variable costs (i.e. costs excluding salaries and other fixed expenses) and wastage (i.e. expenditure without adequate clinical gain).

**Setting.** A peri-urban regional referral (level 2) hospital and two district hospitals.

**Subjects.** 500 folders (350 inpatient and 150 outpatient).

**Results.** Accommodation costs accounted for the largest proportion of overall admission costs (42.3%), followed by drugs (19.5%), intravenous fluids (15.4%), laboratory investigations (12.9%) and radiology (10%). Waste accounted for 4.4% (R15.15, SD 41.92) of mean inpatient variable costs of R344.33 (median R208.89, minimum R19.06, maximum R5 627.25) and this mean admission cost concealed a group of high-cost admissions, with the most expensive 5% accounting for 27.1% of total variable costs and 24.9% of waste.

**Conclusion.** Four concepts important for economical bedside decision-making emerged:

1. Cumulative costs mount rapidly, even if individual items appear cheap.
2. The savings achieved by foregoing the use of an individual item (the variable cost) may be considerably less than the listed total cost to the State of that item (fixed costs are unaffected by reduced short-term utilisation.)
3. More care when ordering investigations and therapy may reduce waste.
4. Global views of hospital costs conceal a group of patients whose care is more expensive than average but who may be difficult to identify prospectively. Although the wastage rate in this group is about the same as the global rate, it may represent a useful target for future study.

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In an era of increasing fiscal constraints, the spending behaviour of doctors is coming under scrutiny, with issues of value-for-money and cost-effectiveness being raised in both the private and the public sectors.<sup>1-4</sup> Much of the targeted cost-cutting in both sectors is directed at putting a lid on the use of both expensive drugs and investigations — the so-called 'meat axe' approach decried by Eddy.<sup>5</sup> While it is clear that cutting expensive items will make a difference to the total bill, little formal attention has been given to the issue of wastage on so-called 'small ticket' items. Hospital administrators urge clinicians to practise frugally, but in general exhortations to save money in 'cheap' areas go unheeded because potential waste is considered small when compared with potential patient benefit, and it is often difficult to assess the need for an individual test other than at the bedside. Another reason why doctors may ignore this challenge is that they are taught to do so. Doctors lobby for the interests of the individual patients under their care, and issues of cost are considered of secondary importance — a view to some extent supported by the literature on cost-effective practice emanating from the USA.<sup>6</sup> The main counter-argument concerns the issue of 'opportunity costs': where resources are limited, the allocation of a scarce resource to one patient means that others are disadvantaged.<sup>7,8</sup> Little attention has been given to determining if the latter is true at an individual patient level — while medical audit is starting to come of age, it is generally still directed at standards of quality rather than cost of care, and also tends to be applied in new or controversial areas.<sup>9-13</sup>

Public service health care is a unique employment situation in that doctors are paid to allocate resources to improve health, but very little control is exercised over how this is done. It is assumed that doctors providing optimal treatment to similar patients will use equal amounts of resources, and that health finance distribution will thus be equitable. However, if doctors differ in both their innate propensity to order tests and drugs, and in their understanding of the costs involved, then resource utilisation will be unequal.<sup>8,14</sup> If it is assumed that the more cost-conscious practitioners are still delivering optimal care, then the behaviour of the less frugal is wasteful.

It is estimated that at Cecilia Makiwane Hospital (CMH) the average medical officer (MO) 'signs out' between R100 000 and R200 000 per year in tests, drugs and admission costs; and specialists overseeing MOs could be responsible for expenditure of R1 - 3 million per year. In spite of this, very few staff seem aware of the costs of the items they order, and no formal attempt is made to evaluate waste. There is widespread ignorance about the relative contributions of drugs and investigations to costs, there is no reward for frugal behaviour, no penalty for waste, and the lack of guidelines on what constitutes societally and medically acceptable behaviour<sup>15-18</sup> constitutes a major disincentive to attempts to curb costs. There is also an ingrained medical ethos that maximal investigation is important to reduce diagnostic uncertainty.<sup>19</sup> It was postulated that variations from the ideal in the cumulative use of relatively cheap items could lead to potentially significant waste.

This article attempts to look at some of these issues, paying particular attention to waste and the relative

contributions of therapy and investigations to the total variable cost of admissions in a regional (level 2) general hospital.

## Explanation of terms

### **Variable costs**

Costs that are not fixed (unlike, for example, salaries and building rentals) vary according to the volume of items processed. In this article, costs which could be influenced by the ordering or not of a test are assumed not to vary significantly with volume, as the high patient load means that in most instances economies of scale have already occurred and would still occur, even with slightly lower usage. Variable (or incremental) costs thus reflect the savings achievable by foregoing the use of the items, or the change in total costs arising from an alteration in activity level.<sup>20</sup>

### **Opportunity costs**

In any area of finite resources, expenditure on a particular item means fewer resources to expend on other items. Opportunity costs thus reflect 'lost' opportunities for alternative use of a resource.<sup>7</sup>

### **Waste**

Not infrequently, investigations and treatments can be identified retrospectively as having been of limited or no clinical utility. More importantly, use of decision analysis<sup>21</sup> (or simply common sense) allows the prospective identification of such items. Waste is therefore defined as expenditure which more careful thought or greater knowledge could have identified as unlikely to produce clinical gain.

## Aims

The primary aim was to increase clinicians' understanding of the distribution of expenditure in terms of drugs, investigations and accommodation. This might make it easier to decide when the cost of an intervention was likely to have an important impact on hospital finances, and, equally importantly, when the impact was likely to be negligible.

The secondary aim was to quantify the amount of waste that could be ascribed to the ordering behaviour of doctors, and to estimate the feasibility of its reduction.

## Methods

### **Selection**

Five hundred folders were examined. The folders of 300 discharged inpatients at CMH (200 medical and 100 surgical), 150 outpatients and 50 folders from referring hospitals were reviewed. Folders were examined as they became available over a 2½-month period. Time constraints and the logistics of attempting to track down lost folders

precluded the collection of all folders during a specified time interval, and because data collection from a single folder could take up to an hour, only small numbers of folders, e.g. between four and ten, depending on the time available, were taken at any one time from the top of the pile with the knowledge of the ward sister/secretary. On the next occasion a different ward would be chosen in an attempt to obtain folders from all the medical and surgical wards at CMH and all adult medical wards of the two referring hospitals selected. (The two referring hospitals were chosen on the basis of their proximity to CMH.) No paediatric inpatient or outpatient folders were examined. For outpatients, batches of consecutive folders from the dispensary were collected until 150 had been examined.

### **Exclusion criteria**

Patients' folders were excluded from the analysis if important sections were missing or if there were insufficient data due to a very short admission. The usual reason for the latter was death of a patient within hours of admission. Apart from exclusions, folders were incorporated as they became available after discharge. Whenever a batch of folders was obtained, each folder in the batch was utilised unless excluded because of one of the two previously mentioned criteria.

### **Data collection**

The folders of discharged patients were examined in detail by reading all the doctors' notes and all laboratory and radiology reports, and all drug and fluid charts. The nursing notes were used to attempt to clarify discrepancies or omissions in the doctors' notes, and an attempt was made to judge whether the findings were compatible with the listed diagnoses. Where there was a discrepancy, the deduced diagnosis was utilised. Problems with patient management during the ward stay were identified. In the context of this information, each intervention was then classified as necessary or wasteful.

### **Costing**

Clinicians in private practice can obtain costs from service providers who derive their figures from a combination of fixed and variable costs. However, from the perspective of the public service clinician, these figures largely overestimate the savings that would be achieved by not doing a test. They also perhaps underestimate the contribution of drugs, where the cost price lists are more readily available and widely quoted, and no allowance is made for salaries and other overheads. For example, to forego the measurement of urea and electrolytes in a patient may have definite costs in terms of potentially poorer patient management and added doctor anxiety, but does not generate the same savings in the hospital setting as would occur if all tests were sent away to a private laboratory. The hospital staff and the machines are still operational, and in the short term the only saving would be on the reagents not used. In the long term, if the number of tests fell significantly, it could be argued that fewer laboratory staff would need to be employed, and that overheads would thus fall. This outcome is unlikely in view of the continual growth in the number of patients attending public service hospitals.<sup>7</sup>

Detailed information on the costing assumptions required for this study are available from the author.

## Results

### Demographics

The mean age of the entire group of 350 patients was 43.68 years (standard deviation (SD) 20.80), and that of the 50 patients from the referring hospitals was 46.42 years (SD 20.49). The 200 CMH medical ward patients had a mean age of 47.19 years (SD 21.09) compared with 35.3 years (SD 17.79) for the 100 surgical patients. The sample of medical inpatients was obtained in December 1994 and January 1995 (extending into the first 2 weeks of February because of the nursing strike). No records of admissions during the 2 weeks of the strike were used. In spite of the relatively small sample size (5.35% of 3 737 actual admissions for a year, and 25% of admissions during the study period) and known seasonal disease variations, the medical patients showed a similar case-mix to that of the year as a whole. The disease distribution of the 'medical' patients is shown in Table I.

### Overall costs

The mean variable admission cost of R344.33 for the entire group of 300 patients (i.e. excluding referring hospital data) was due mainly to accommodation ('hotel') costs (42.3%), followed by drugs (19.5%), fluids (15.4%), laboratory

investigations (12.9%) and radiology (10%). Laboratory costs were due to biochemical (54.0%), haematological (20.9%), microbiological (13.4%), serological (6.4%) and pathological tests (5.2%). Table II gives component costs in more detail. These global variable costs are far lower than the comparative figures for the private sector, and even, as explained earlier, the 'true' (full) costs as seen by the state.

**Table I. Disease distribution of medical ward patients**

	All year	%	Sample	%
Poisoning	129	3.5	18	9.0
Gastro-enteritis	89	2.4	7	3.5
Tuberculosis	455	12.2	22	11.0
HIV	56	1.5	3	1.5
Malignancy	191	5.1	14	7.0
Diabetes	240	6.4	15	7.5
Epilepsy	281	7.5	20	10.0
Valvular heart disease	86	2.3	5	2.5
Cor pulmonale	157	4.2	8	4.0
Cardiomyopathy	171	4.6	5	2.5
Stroke (CVA)	255	6.8	14	7.0
Pulmonary infection	213	5.7	12	6.0
COAD and asthma	621	8.6	14	7.0
Genito-urinary infections	122	3.3	10	5.0
Dermatological	38	1.0	4	2.0
Miscellaneous	933	24.9	29	14.5
<b>Total</b>	<b>3 737</b>		<b>200</b>	

All year = all medical patients admitted in 1994 whose records were summarised; COAD = chronic obstructive airway disease.

**Table II. Variable costs in the seven major areas of expenditure (R)**

	Fluids	Laboratory investigations	Drugs	Accommodation	Radiology	Admission	Waste	Admission duration (days)
<b>Surgical (N = 100)</b>								
Mean	70.82	17.18	54.18	153.34	36.02	331.55	12.59	9.02
SD	129.14	28.58	137.70	353.60	56.10	587.72	45.31	20.80
Min	0.00	0.00	0.00	51.00	0.00	51.84	0.00	3.00
Max	807.09	168.70	1 069.06	3 553.00	307.70	5 627.25	326.27	209.00
Mean cost/day	7.85	1.91	6.01	17.00	3.99	36.76	1.40	
<b>Medical (N = 200)</b>								
Mean	44.04	57.87	73.37	141.70	33.74	350.72	16.43	8.34
SD	110.95	79.09	209.62	158.55	63.03	470.42	40.06	9.33
Min	0.00	0.00	0.00	17.00	0.00	19.06	0.00	1.00
Max	769.17	813.86	2 222.94	1 632.00	325.09	5 190.63	324.98	96.00
Mean cost/day	5.28	6.94	8.80	17.00	4.05	42.08	1.97	
<b>All CMH (N = 300)</b>								
Mean	52.97	44.30	66.98	145.58	34.50	344.33	15.15	8.56
SD	118.01	69.36	188.93	241.80	60.82	512.59	41.92	14.22
Min	0.00	0.00	0.00	17.00	0.00	19.06	0.00	1.00
Max	807.09	813.86	2 222.94	3 553.00	325.09	5 627.25	326.27	209.00
Mean cost/day	6.19	5.17	7.82	17.00	4.03	40.21	1.77	
<b>Referring (N = 50)</b>								
Mean	11.02	33.48	31.05	116.28	17.18	209.02	29.91	6.84
SD	17.05	59.66	41.64	82.05	20.00	158.08	89.65	4.83
Min	0.00	0.00	0.13	17.00	0.00	17.21	0.00	1.00
Max	68.49	420.76	210.45	374.00	96.40	937.70	597.38	22.00
Mean cost/day	1.61	4.90	4.54	17.00	2.51	30.56	4.37	

All CMH = medical and surgical combined; Referring = referring hospitals.

## Cost distribution

Mean variable admission cost distribution is skewed as shown in Fig. 1. The shape of this curve was common to all the costing data shown subsequently. When the admissions are ranked in terms of overall cost, the 15 admissions (5%) that cost most accounted for 27.08% of the total retrievable admission cost of R103 298.58 for this group of 300 patients. The distribution of mean costs for this 5% of patients was also different, with accommodation costs accounting for 38.17%, drugs 33.76%, fluids 15.15%, laboratory investigations 9.46% and radiology 3.46%.

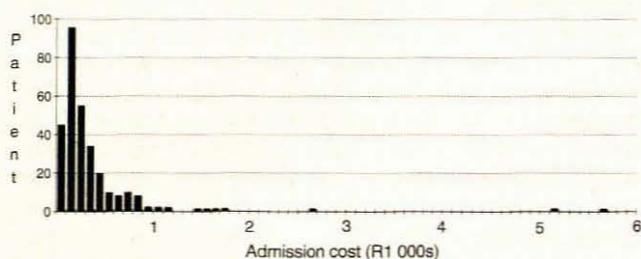


Fig. 1. Distribution of admission costs (300 patients).

## Wastage

The mean waste of R15.15 per patient was 4.4% of the total variable cost of admission (total waste for the sample group was R4 545.24), but the most expensive 5% of admissions wasted proportionally slightly less (4.0%), although they still accounted for 24.9% of total waste. Fig. 2 shows the mean waste for various groups in more detail, and includes data from the referring hospitals for comparison.

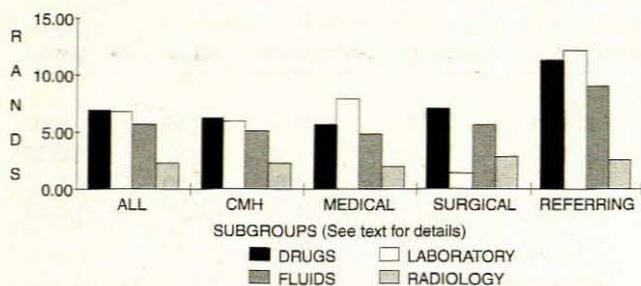


Fig. 2. Distribution of mean waste.

Extrapolations from very small samples are notoriously difficult, but as all the waste evaluations done at an individual folder level were conservative, it is perhaps worth looking at the results as if waste profiles at CMH are representative of the country as a whole. The estimated annual variable waste of R409 000 (95% CI R281 000 - R537 000) at CMH (based on 27 000 admissions) does not take into account the waste from excessive length of hospital stay, which was difficult to evaluate retrospectively. If extrapolated to the country as a whole (and assuming constant proportional waste across hospitals), this variable waste translates into about R75 million per year (95% CI R52 million - R99 million), assuming about 5 million public service hospital admissions per year.<sup>22</sup>

The mean cost of drug therapy was R66.98, with waste accounting for 9.17% of the cost (R6.14). As with overall

costs, drug cost distribution was skewed, with the most expensive 5% of admissions accounting for 44.9% of total drug costs. The percentage waste in this 5% was 6.39% (R519.83 out of R8 131.15). In general, definite wastage was confined to a small number of patients, and could have been identified readily by a drug utilisation review (DUR) programme. When DUR was applied to the referring hospitals, quite dramatic data were obtained: the total drug cost of the 50 patients examined was R1 552.70, and wastage amounted to R579.02 (37.3%). Wastage on the most expensive two admissions (4%) was 56.93% (R189.54/R332.89).

Fig. 3 provides an overview of laboratory test ordering behaviour, broken down into various subgroups. In an attempt to investigate the hypothesis that more cost-effective behaviour can be learned,<sup>23-25</sup> the data were subjected to subgroup analysis comparing 'end-of-year' medical officers and interns with the new group recruited in January of the following year. However there were too many confounding variables for any conclusions to be drawn from the small sample.

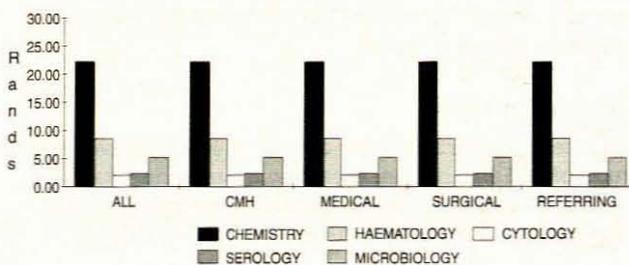


Fig. 3. Laboratory utilisation (mean costs).

Important areas of waste identified were the repetitive ordering of tests whose results would not materially affect patient management, the ordering of a 'group' of tests for a particular identifiable clinical syndrome, and the ordering of tests on a 'dragnet' basis in the hope of finding an abnormal result. This latter practice is particularly extravagant as it frequently leads to the pursuit of abnormal but clinically insignificant data at some expense.<sup>19</sup>

Mean variable radiology costs for the CMH sample were R34.50 (SD 60.82) and were R33.74 for the medical wards, R36.02 for the surgical wards, and R17.18 for the referring hospital sample. Waste accounted for 5.75% of radiology costs in medicine, 8.36% in surgery and 15.19% in the referring hospitals. Actual mean waste figures were R2.30 (SD 23.49), R1.94 (SD 20.53), R3.01 (SD 28.48) and R2.61 (SD 12.27), respectively. Computed tomography required consultant authorisation, but there was significant wastage on middle-price items such as barium meals, which could be ordered without restriction by all medical staff. Apart from cost alone, the workload of the radiology department of these expertise-dependent investigations is considerable.

Mean fluid costs at CMH were R52.97 (SD 118.01), for medicine R44.04 (SD 110.95) and for surgery R70.82 (SD 129.14). Waste accounted for 9.61%, 10.53%, and 8.07% respectively (SDs 18.98%, 21.88%, and 11.09% of respective mean wastes). These figures all included blood product use, which is the reason the surgical costs were higher than the medical wards' mean fluid costs.

The separate review of 150 outpatient charts was designed to look primarily at drug-ordering habits and the validity of diagnoses. Scripts were from a mixture of patients requiring chronic follow-up and of those with acute illnesses. Nurse practitioners in the general outpatients department (GOPD) wrote the cheapest scripts (mean cost R2.50 versus overall mean cost of R7.69) but also prescribed more items (2.67 versus 2.33 in the medical outpatients department (MOPD) and 1.82 in the surgical outpatients department (SOPD), leading to more waste (56% of script cost, versus overall 31.99%, MOPD 16.13% and SOPD 30.75%).

When variable costs were looked at in terms of disease type rather than just overall figures, the largest single item was still accommodation costs. In certain disease states (particularly infections, cardiomyopathies and epilepsy), drugs assume a higher than average position. If one examines total waste within disease types as a percentage of total admission cost, then epilepsy and cardiomyopathies are still important, with infections (in this case urinary tract infections) coming in third. It should be noted that displaying the data in terms of mean costs per inpatient day will serve to 'smooth out' some of these differences, but is perhaps less useful in terms of identifying areas amenable to cost-containment.

Even though the management of certain diseases may be relatively wasteful, their infrequency renders them less important in terms of cost savings. Five diseases (tuberculosis, cardiomyopathies, urinary tract infections, epilepsy and malignancies) account for nearly 60% of total waste (Fig. 4) and attention to the details of their management might be expected to yield useful savings.

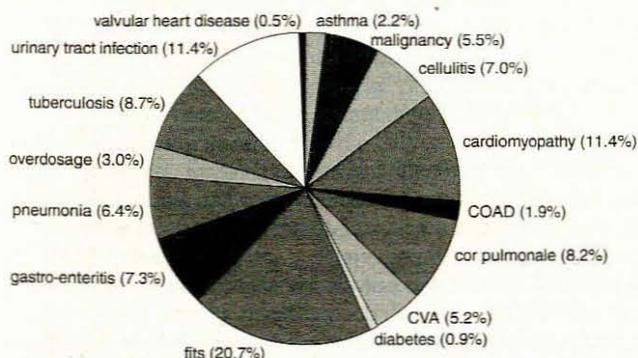


Fig. 4. Waste by disease (as a percentage of total waste).

## Discussion

Should doctors pay any attention to costs? Should we have a detailed knowledge of the price of every item we order? It is argued that if a drug or investigation is necessary, then it should be ordered regardless of cost, because once doctors start to be conscious of the price of everything they do, patient care suffers.<sup>6</sup> This argument is only valid if resources are unlimited, but in practice the amount of money spent on health care is limited in a number of ways.<sup>26-30</sup>

Although it is unclear in South Africa exactly what the public expects from state health, and there is little available information on the precise manner in which the State, as a fiscal body, expects doctors to allocate resources, there is

no doubt that available funds are becoming increasingly limited. In this setting the issue of opportunity costs becomes important; while the 'big' costs are readily targeted, the cumulative effect of repeated use of one or two unnecessary investigations by many doctors may lead to significant waste, with its associated opportunity cost. It is particularly difficult to attempt frugality where people's health is at stake, but it is incumbent on all of us to try, and to develop mechanisms of auditing such behaviour. This effort is likely to be uncomfortable initially, but in the end may make the practice of medicine in the South African public service less frustrating.

Several general issues deserve comment:

**1. Accountability.** The present system does not reward cost-conscious behaviour, and in fact the only feedback in this area at present is likely to be from fellow clinicians commenting on jeopardised standards of care. Individual frugality leads only to tiny increments in central funds. The 'more is better' ethos is still prevalent, and until doctors and nurses realise that cumulative waste directly disadvantages other patients, there will be little incentive to change.

**2. Costing.** Although some institutions are starting to make known the costs of all or some of the more expensive tests and drugs, this knowledge may bias the clinician's bedside approach to investigation and management. In some cases the more expensive item is more cost-effective than a cheaper alternative.<sup>31,32</sup> Individually, expensive items put increasing strain on already overburdened departmental (e.g. pharmacy) budgets, and while frugality in this area may alleviate the strain, unless the issue has been carefully thought through, additional costs may appear in other areas (e.g. admission duration, transport).<sup>33</sup> Thus doctors may end up 'helping' the more vociferous department's budget, but actually having little (or even a negative) effect on total expenditure. It is therefore argued that clinicians cannot make sensible value judgements about resource utilisation without a detailed guide to both costs and the consequences of various cost-redistribution manoeuvres. This sort of information is often scanty and may be less reliable than one wishes,<sup>34</sup> but health administrators who expect clinicians to participate in cost reduction should, with the help of health economists, make such information as freely available as possible.

**3. Ethics.** The ethics of rationing have been discussed at length by others.<sup>6,18,35,36</sup> It is argued that if ways could be found to free up the opportunity costs suggested by the 4.4% wastage in variable costs in this study, then the need for overt rationing in the face of a dwindling health budget could be delayed (although not averted). Assuming none of the waste identified in this study had occurred, an extra 183 patients could have been treated in 1994 in the CMH Department of Medicine, with the same budget. If a programme of waste reduction were sustainable, considerably greater savings could be realised in the long term by a reduction in fixed costs as well. In practice, however, savings of less than 4.4% will be realised, as it is extremely unlikely that all waste identified can be eliminated.

This study was limited in a number of ways. Firstly, it was retrospective and subjective, relying on the value judgements of a single investigator. Clinical decisions were evaluated on the basis of the patient's course and the information in the folders — where information was not

recorded, such evaluations may have been flawed. The sample was judged to be representative on the basis of a comparison with the disease spectrum for the year as a whole; the potential confounding of seasonal variation in disease prevalence was not taken into consideration.

Also the nursing strike may have influenced the disease spectrum of patients presenting in the weeks immediately after the strike. The sicker patients may have gone to other institutions because of initial uncertainty about whether CMH was functioning effectively again. Lastly, costing proved particularly difficult because of the lack of an administrative requirement for exact details of expenditure. The attempt to use variable costs in calculations meant that data on laboratory and radiological investigations were less reliable than the tender prices used for drugs and fluids.

With regard to the data themselves, there were several areas of concern. Foremost was the considerable proportional wastage at the referring hospitals, which may reflect a lack of formal guidance for the staff working there. Although this study was not designed to address quality of care, the potential problems in this area also need recognition, especially in view of the current policy of decentralisation. This issue is particularly important because of the potential economic impact of increasing the workload (and thus the potential wastage) at already overburdened peripheral hospitals. Patient statistics commonly reflect outcome only in terms of mortality and referral rate; the health status of those sent home and those referred elsewhere is unquantified, and initial impressions suggest that overview data may obscure a considerable pool of poorly managed patients whose total health care costs could have been reduced by more efficient initial care.

The second area of interest concerns the relatively high cost of intravenous fluids, which accounted for more than one-sixth of the variable cost of admissions.

The fluid wastage figures refer to costed wastage, where charted fluids were identified as unnecessary and classified as such. Potentially, wastage was far more than these figures due to a lack of clear fluid orders. Nurses therefore often give relatively arbitrary amounts or, equally commonly, there was insufficient reliable recording of all fluid delivered. It was estimated (but not quantified) that about one-third of fluids in use in the adult ward were not ordered in writing on a daily basis.

One of the aims of this pilot study was to attempt to establish whether the use of a drug utilisation programme would be cost-effective. If all inpatient episodes of drug wastage were identified and, as importantly, prevented, then the hospital studied would save around R165 000 per year. This figure must be weighed against the cost of a DUR programme, but it should also be remembered that an equally important function of such a programme is to improve quality of care, which is far more difficult to quantify.

There were a number of readily identifiable problems with outpatient drug ordering, some of which are reasonably easily remedied. More disturbing, however, was the quality of note-keeping, reflected in the inability to attach a diagnostic label to a high proportion of folders, simply because of inadequate or incomplete data. Of particular concern was the large amount of 'drug per symptom' prescribing in the general outpatients situation, perhaps

reflecting a patient profile more similar to that of general practice. Although it can be surmised that the majority of these patients were not particularly ill, it is still disturbing that these practice habits may well reflect the situation at some peri-urban and rural clinics. This finding is particularly disturbing in the light of the current policy to devolve more medical care to the level of the clinics.

## Proposals

1. Careful attention should be given to the way in which costs are portrayed to doctors. Although cost information is necessary, the costs portrayed should reflect real potential savings or additional patients treatable at no additional cost.
2. Health administrators should be aware that while it is relatively easy to streamline a drug or investigation budget, the distant consequences in terms of impact on health and costs must be evaluated. Reducing hospital stay may cut the inpatient 'hotel' fee but increase the outpatient transport fee, or even increase the number of investigations done on outpatients if doctors feel less secure about sending home patients whom they would rather be observing in the wards.<sup>33</sup>
3. Audit of health expenditure needs to be an ongoing process to evaluate the consequences of previous cost-saving steps.
4. The mindset of doctors needs to be altered to include a feeling of responsibility for resource utilisation, based on the concept that resources wasted now may mean poorer care for other patients later.
5. Formal education of doctors in basic economic principles pertaining to rationing should be an integral part of both pre- and postgraduate training, and the ethical issues involved need to be addressed at the same time.
6. Funding could perhaps be decentralised to a departmental level so that savings realised remain within the ambit of those eliminating waste and are not 'lost' in a central pool. Care should be taken that this strategy did not allow doctors with a special interest in certain diseases to direct resources to those areas<sup>10</sup> — an overall proportional budget by disease and prevalence would have to be agreed on and maintained. Such decentralised 'clinical budgeting', perhaps accompanied by appropriate incentives and based on quality and cost-effectiveness data from clinical guidelines directed at heads of department (for their local interpretation) rather than individual medical officers, might be expected to have a more lasting impact on cost-containment and appropriateness of therapy than occasional exhortations from health administrators to save money.
7. The large amount of detailed local clinical economic analysis that needs to be performed before meaningful guidelines can be given to heads of department can be prioritised by projects like this study. While formal local clinical guidelines are both difficult to develop and have accepted, individual clinicians given authenticated data on readily identifiable areas of waste ('waste avoidance guidelines'?) may well practise more frugally. Such data could also be more rapidly collated and dispersed than more formal practice guidelines, but should obviously be accompanied by sensible alternative suggestions to the wasteful practice under consideration.

# Conclusion

Medical audit incorporating cost of care allows clinical economic decision-making to be put into perspective. This study highlights the disproportionately high expenditure and wastage on somewhat unexpected illnesses. It also supports the contention that education that leads to waste reduction could result in significantly more cost-effective use of scarce resources.

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