Comparing Public, Contractor and Private Hospitals: Evaluation of Outcomes of Care

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ABSTRACT

Purpose: To identify any differences in the outcomes of medical care between contractor, public, and private hospitals, in the context of a study of whether or not the South African government should provide district hospital services itself, or contract out their management to the private sector.

Methods: The three contractor hospitals were paired with three adjacent public hospitals and three private hospitals. Tracer conditions (appendectomy, hernia repair, normal delivery, caesarean section) were studied, with quality defined in terms of the presence or absence of poor outcomes of care. An audit system was used to assess the extent to which peri-natal deaths were avoidable.

Findings: There were no sustained or systematic differences between health outcomes in contractor or public hospitals, except for avoidable factors in peri-natal deaths where contractor hospitals scored worse. There was much evidence suggesting serious quality of care problems in both contractor and public hospitals.

Conclusions: The contractual arrangement did not appear to lead to either better or worse outcome quality; however quality did not feature either in contract specification or in monitoring arrangements. Quality of care was potentially capable of much improvement, and better contract specification would contribute to this.

INTRODUCTION

There is a developing literature on hospital efficiency in low and middle income countries [1], [2], [3]. While such studies commonly find substantial differences in costs between hospitals, it is impossible to conclude that lower cost hospitals are more efficient (or more costly hospitals less efficient) without complementary data on quality of care. However, it is very rare for such studies to explore the extent to which quality of care, whether specified in terms of structure, process or outcome [4], might differ between hospitals. The overall aim of the study reported here was to assess, from the perspective of the South African government, whether or not it was better to provide district hospital services itself, or to contract out their management to the private sector. It was therefore vital to look not only at the costs of the arrangements, but also at the quality of care provided.

The study question was addressed by comparing the cost and quality of care of three existing 'contractor' hospitals, which were managed by a single private sector company and provided standard district hospital-type care in three rural areas, with three public hospitals in adjacent and similar areas. The three contractor and three public hospitals had between 170 and 364 beds, and provided a basic range of medical, surgical and maternity services. In addition, three 'pure' private hospitals, serving insured higher income populations, were also studied to examine the performance of private hospitals when not under contract to the government. More detailed information on the characteristics of the study hospitals (size, patient mix, length of stay etc) is provided in Broomberg, Masobe and Mills [4]. Extensive studies on quality were conducted, covering structure, process and outcomes of care. This paper reports the study on outcomes: the results of the other components of the study are available elsewhere [5] [6] [7].

Including a study component on health outcomes was considered very important, since differences in health outcomes would be an issue that policy makers would want addressed in order to consider any policy changes based on the results of the study. However, the study encountered the problems referred to by Palmer in her review of the use of health outcomes data to compare providers: designs that yield strong evidence cannot be applied because experimental controls are lacking [8]. In

addition, given the rudimentary nature of record-keeping in South African district hospitals, large sample sizes were unobtainable. Nonetheless, the study does shed some light on similarities and differences in outcomes, as well as illustrating some of the possibilities and difficulties of undertaking this type of study in a developing country context.

Given the absence of this type of research in a country setting such as that in South Africa, it was not possible to set up specific hypotheses for testing and the study was rather exploratory. There were, however, some expectations about the nature of the differences that might be expected given the influences operating on the providers, and these guided the design of the methods. The key influences were thought to be two-fold: the extent to which medical care was under the control of hospital management (and hence problems could readily be remedied or quality improved); and the way in which the hospitals were paid (affecting their incentive to remedy problems or improve quality).

The three contractor hospitals were managed through a relatively flat management structure, with a chief executive at hospital level in charge of hospital management, and with a clear line of accountability to, and close monitoring by, the company's head office [9]. This picture was somewhat complicated by the fact that staffing arrangements differed, for historical reasons, between the three contractor hospitals: in one of the hospitals (referred to below as S) only the senior management team was employed by the contractor[a], in hospital M, all staff except the medical staff were employed by the contractor, and in hospital H the contractor employed all staff. Publicly employed staff formally reported to their government superiors rather than to the hospital manager: in hospital S where only the management team was employed by the contractor, this dual employment situation created tension and conflict.

Contractor hospitals were paid on a per diem basis, with outpatients paid as a proportion of an inpatient day. This provided an incentive to restrict inputs since the lower were capital and running costs, the greater would be the margin between income and expenditure. However, it was also

[a] This arrangement had come about because after the first 2 years of the contract, the contractor had asked the government to take back employment of all nursing and most domestic staff because it could not control staff costs or productivity

important for the hospital to attract patients to the hospital, which in terms of outcomes of care might imply ensuring that no deaths occurred that were clearly attributable (in the community's eyes) to failures in hospital care.

Public hospitals were managed in a very hierarchical way, with separate vertical lines of responsibility for administration, nursing, and medical care. The Hospital Superintendent had very limited ability to manage the hospital as a whole. Funds were provided in the form of an itemised budget, whose amount was determined by historical allocations rather than performance or patient volume.

The private hospitals had small and tightly integrated management structures. However, since they did not employ physicians, they had limited influence over their style of practice. Hospital income came largely from medical aid schemes – a form of voluntary health insurance – which paid for care largely on a fee-for-service basis, and to hospitals chosen by patients with the advice of their physician.

In terms of the effects these differences might be expected to have on the outcomes of medical care, some possibilities can be suggested:

- The privately-run hospitals (both contractor and pure private) had greater ability to control and influence care provided than public hospitals, though this was limited in the case of private hospitals by the lack of control over medical staff, and in contractor hospital S by lack of control over both medical and nursing staff
- The privately-run hospitals had a direct financial incentive to attract patients to the hospitals since their income depended on this; in contrast the public hospitals received a budget that was completely unrelated to performance.

Both these influences might be expected to result in better health outcomes at the privately-run hospitals. In addition, it must be recognised that whereas the public and contractor hospitals were serving very similar populations, the pure private hospitals served a much more affluent and educated population. Hence some differences in health outcomes was to be expected between the public and contractor hospitals on the one hand, and the pure private hospitals on the other hand, as a result of the different patient populations.

METHODS

The approach of selecting tracer conditions for analysis was chosen, to address the problems that might be caused by any differences between the hospitals in case-mix and severity. Two of the tracers were obstetric conditions - normal vaginal deliveries (NVD) and caesarean sections, while the other two were surgical conditions - hernia repair and appendectomy cases. These four conditions were selected on the basis that they are relatively simple and homogenous, at least in comparison to most other types of cases treated in these hospitals, and this could be expected to reduce, if not eliminate, the problem of varying severity across the study hospitals.

Quality of care was defined largely in a negative sense, that is by the presence or absence of evidence of poor outcomes of care. In this context, poor outcomes were defined in two ways: firstly, by the prevalence of a set of indicators of potential problems in the outcomes of care; and secondly, by the proportion of cases in which expert clinicians judged there to be evidence of poor outcomes which might possibly or clearly have been avoided. This approach required the development of a set of indicators for each of the tracer conditions, sample selection and analysis of patient records for the prevalence of indicators, and evaluation of a sub-sample of cases by expert clinicians.

An initial list of indicators for each tracer condition was developed by the first author. Criteria for indicator selection included their assumed sensitivity and specificity in detecting potential problems in the outcomes of care, and the assumed availability of the necessary information. The initial lists for each tracer condition were independently reviewed by two expert clinicians in each case (obstetrician/gynaecologists for the NVDs and caesarean sections, and specialist surgeons for hernia repair and appendectomy cases), and consensus on the lists achieved. The lists, and corresponding data capture forms, were piloted at three of the study hospitals, following which modifications were made primarily involving the removal of indicators for which relevant data were not readily available. The piloting process also highlighted specific indicators which were suitable or unsuitable for selection of cases for further evaluation by the expert clinicians.[b] The final list of indicators is shown in

[b] For example, in both the hernia repair and appendectomy groups, analysis of patient records indicated that reasons for delays between initial presentation and operation, or between admission to hospital and operation, were never provided in the patient records, nor was it possible to assess whether or not these delays had affected negatively the outcomes

Table 1.

Table 1: Indicators of problems in the outcomes of care in tracer conditions*

All obstetric cases	1. Maternal mortality: all deaths occurring within 1 month of childbirth 2. Peri-natal mortality: all deaths occurring within 2 weeks of birth, and where birthweight above 1000g
Normal deliveries	1. Third degree tear 2. Failed assisted delivery 3. Puerperal sepsis 4. Other complications
Caesarean sections	1. Post operative wound sepsis 2. Anaesthetic complications 3. Other complications
Appendectomy	1. Evidence of delay between first presentation and operation 2. Evidence of delay between admission to hospital and operation (evidence of rescheduling of operation, or evidence of wait of more than 24 hours before operation) 3. Absence of basic investigations prior to surgery (basic investigation defined as at least one of: white cell count, urinalysis, abdominal X-ray) 4. Negative histology (any findings other than acute appendicitis on histological examination of appendix tissue) 5. Peritonitis during operation or in post-operative period 6. Post-operative wound sepsis 7. Other post-operative complications 8. Death following appendectomy or due to appendicitis 9. Anaesthetic complications
Hernia repair (groin hernias only)	1. Evidence of delay between admission and operation (evidence of rescheduling of operation for logistic rather than medical reasons) 2. Absence of pre-operative assessment by anaesthetist/medical officer for fitness for surgery 3. Post-operative wound sepsis 4. Other post-operative complications 5. Death following hernia repair 6. Anaesthetic complications

* Data capture forms for the four tracer conditions are available in [10]

All caesarean sections and NVDs conducted at each hospital during the study year (1994) were identified from the maternity registers and surgical tracer cases identified in public and contractor

of care. All cases identified by these indicators alone were therefore excluded from further evaluation by the expert clinicians. Cases identified by the indicators concerned with pre-operative assessment, and with histology results (in the appendectomy group) were excluded for similar reasons

hospitals from the operating theatre registers. Systematic samples were drawn. In the private hospitals, total numbers of cases of the surgical tracers and samples were obtained from the hospital information system. Absolute sample sizes and corresponding percentages of the sampling populations differed between hospitals, in part because of logistical constraints on the number of cases that could be analysed, and in part because of variable success in record retrieval among hospitals.

All retrieved records were analysed on site by the first author, and records showing the presence of one or more of the indicators reviewed again to exclude records where there was clearly insufficient information to justify further evaluation by the expert clinicians. One (contractor) hospital did not give permission to photocopy the relevant record sections and so had to be excluded. All identification signs were removed from the photocopies. The record samples of hernia repair and appendectomy cases were analysed sequentially and independently by the two specialist surgeons who had developed the lists of indicators, to evaluate whether or not the records demonstrated evidence of one or more poor outcomes of care, and whether these outcomes were possibly or clearly avoidable. Avoidability was defined as a situation in which the outcome of note could have been prevented had one or more actions been undertaken or omitted. The analyses made by the two surgeons turned out to be the same in all cases; thus adjudication of divergent results was not required.

The obstetrical tracer condition cases were evaluated using an audit system, developed by the Department of Obstetrics and Gynaecology, University of Pretoria, which focused primarily on a detailed analysis of the causes and avoidability of peri-natal and maternal mortality [11], [12]. Poor outcomes as related to the presence of the other indicators for NVD and caesarean sections were also analysed, although outside the framework of the audit system. This system involved a systematic analysis of all cases of peri-natal death in infants weighing more than 1000g, with the initial aim of classifying each case in terms of the primary obstetric cause of death (defined as the major maternal factor contributing to the death of the infant). In a second stage, the cases were analysed for the presence of avoidable factors (defined as potentially avoidable actions taken or omitted which might have affected the outcome of peri-natal death). Avoidable factors were classified as *patient-*

oriented, *administrative* and *medical management* related. The *patient-oriented* category, which relates to actions undertaken or omitted by the patient, was further divided into inappropriate response to a complication (e.g. failure to present to hospital after premature rupture of membranes), non or late attendance at ante-natal clinics, and intervention in the pregnancy (e.g. attempted abortions). *Administrative* factors were defined as those relating to logistical and other problems within the clinic and hospital system, and included transport problems, laboratory-related problems, lack of adequate equipment in theatres, and lack of adequately skilled or trained staff. These problems were further divided into those associated with the hospital itself and those occurring outside the hospital (e.g. related to clinic transport systems, or clinic laboratory services). The *medical management* category included all factors which could be attributable to actions undertaken or omitted by the clinical staff caring for the patient. This category was further divided into *honest errors* (situations in which appropriate action was undertaken given the available information, but where information was inaccurate), *oversight* (situations in which information pointing to an abnormal situation was available, but was overlooked or not acted upon), and *gross deviation from accepted practice* (a situation in which a potentially dangerous and/or inappropriate intervention was carried out). In a final stage of the analysis, the avoidable factors were classified as either Grade 1 (actions which, if altered or avoided, could *possibly* have modified the outcome) or Grade 2 (actions which, if altered or avoided, would *probably* have modified the outcome). All cases submitted were reviewed and discussed by a group of clinicians from the Department of Obstetrics and Gynaecology of the University of Pretoria (the University of Pretoria group). The final classification of avoidable factors was undertaken by one senior member of the group in order to eliminate inter-observer bias. Results were analysed using proprietary software, the Peri-natal Problem Identification Programme.

A less systematic analysis of the causes of maternal mortality was undertaken. All records were analysed by the same group of clinicians, and where possible, the presence of avoidable factors identified and an attempt made to judge whether or not the maternal death was possibly or probably avoidable.

The prevalence of indicators was analysed using Microsoft Excel Version 5. The Chi-square test, and where appropriate Fishers' exact test, was applied to test for the statistical significance of observed differences in the prevalence of indicators between the hospital groups.

The major methodological problems related to the reliance on patient records as the primary source of data. In several of the hospitals, the quality of record keeping on clinical aspects of care was so poor that it was not possible to detect the presence of indicators, and even where these were detected, the records were often judged to contain insufficient information to allow for accurate evaluation by the expert clinicians. Record keeping appeared to be a particular problem in the case of the surgical tracer conditions, and less so in the obstetrical conditions since maternity care tends to be recorded on standard forms. These problems explain in part the very small numbers of surgical cases submitted for expert review, although other factors also influenced sample size including small total numbers of cases in some of the hospitals, low prevalence of some of the indicators, and the unsuitability of some of the indicators for case selection purposes.

Where record keeping is generally poor, it is likely that the occurrence of problems in clinical care will be underreported. This tendency may be aggravated by deliberate underreporting of mistakes or other aspects of care likely to reflect badly on the clinical staff, which may provide an additional explanation for the low prevalence of indicators for some of the tracer conditions. There is a risk that those hospitals where record keeping was of a higher standard would show higher prevalence of indicators of poor outcome.

Specific problems were encountered in record analysis at the private hospitals: since private hospitals do not employ medical staff, much of the care of their patients is undertaken by doctors on an outpatient basis, and information not recorded in hospital notes. Even medical care provided in the hospitals was poorly recorded since the doctors rarely wrote in the patient records.

Poor record keeping was also evident in the absence of central records of anaesthetic complications in all of the study hospitals, thus preventing systematic analysis of this aspect of care for surgical and

caesarean section cases. The hospitals submitted statutory reports but did not keep copies or any other centralised record of complications.

RESULTS OF EVALUATION OF OUTCOMES OF CARE IN TRACER CONDITIONS

Hernia repair

Table 2 provides the results for hernia repair. Small numbers made comparisons difficult. There was some variability between hospitals in the prevalence of indicators, which was particularly noticeable in the case of delays between admission and operation which occurred only at hospital M (range of 8-13 days, mean 9.7 days) and hospital L (range 7-31 days, mean 14.6 days). At hospital L, cases characterised by delays showed a common pattern of repeated cancellation of the operation, with no explanations provided in most cases. Where reasons were given, these were largely logistical, such as lack of theatre time, or unavailability of surgeons. The major effect of these delays was inconvenience to the patient, longer length of stay and higher costs rather than poor medical outcome, since the majority of cases were chronic hernias which did not require urgent surgical intervention.

Inadequate pre-operative assessment was likely to have more serious consequences than operative delay, since many patients presenting with hernias tended to fall within older age groups in whom the risks of anaesthetics may be significant. It was not clear whether the lack of records of pre-operative assessment implied that such assessments were not done, or simply not recorded. In the case of the private hospitals, for example, all anaesthetics were carried out by specialist anaesthetists, and pre-operative assessment was standard practice even though it may not have been recorded.

There was a generally worse picture of care at the public than at the contractor hospitals, though small numbers and variation by hospital made generalisation dangerous and none of the differences were statistically significant at the 5% level. The private hospitals demonstrated lower prevalence rates than the other two groups for all except one indicator, though only the difference in delays between hospital admission and operation was statistically significant at the 5% level.

Only three cases could be submitted for further expert review. One was assessed to involve a poor outcome that was probably unavoidable (hospital T), one to be possibly avoidable (hospital M) and one to be clearly avoidable (hospital T). The latter was a particularly serious example of a surgical error with severe consequences for the patient.

Table 2: Prevalence of indicators of poor outcome for hernia repair

	Contractor			Public*		Private							
	M	H	S	T	L	D	P	N	Contractor	Public	Private	Con vs. Pub** chi-square (P)	Pvte. vs. Pub/Con*** chi-square (P)
N	17	4	3	13	32	63	63	47	24	45	173		
Delay between admission and operation	3	0	0	0	12	0	0	0	12.5% (3)	26.7% (12)	0%	1.107 (>0.25)	19.088 (<0.05)
Inadequate pre-op assessment	11	0	2	10	9	18	5	28	54.2% (13)	42.2% (19)	29% (51)	0.482 (>0.25)	2.308 (>0.1)
Wound sepsis	0	0	0	0	1	0	1	0	0%	2.2%(1)	0.58% (1)	0.103 (>0.25)	0.073 (>0.5)
Other complications	1	0	0	2	1	0	0	0	4.2% (1)	6.7% (3)	0%	0.014 (>0.45)	1.478 (>0.1)
Mortality	0	0	0	0	0	0	0	0	0%	0%	0%	n/a	n/a

Notes: *Public hospital B omitted since no hernia repair cases were identified at this hospital during study year
** chi-square test for significance of difference between the contractor and public hospitals.
*** chi-square test for significance of difference between the private hospitals and combined contractor and public hospitals.
n/a - chi square test not applicable where no differences identified.

Appendectomy

Data on appendectomy (Table 3) again showed marked variation between individual hospitals, though with contractor hospitals showing some worrying rates, notably the relatively high rates of delay between presentation and operation, and between admission and operation. At hospital S, both cases in which a delay between presentation and operation were noted appeared to be due to poor initial diagnosis. The delays between admission and operation at hospitals H and S were poorly explained in most cases, and appeared to be attributable to logistical problems within the hospital. In two of the cases at hospital H the delay resulted in emergency appendectomies.

The rates of negative histology were hard to interpret since in a substantial proportion of cases, no results were found in the patient records and there might have been some bias in those records that were filed. In the contractor and public hospitals, the high proportions of cases in which there were no histology records was likely to reflect poor record keeping since histological examination appeared to be done routinely. In the private hospitals these records were likely to be sent to the patients' doctors, rather than filed in the hospital record.

Table 3 shows a somewhat different picture of the treatment of appendectomy cases from that observed for hernia repair. The contractor hospitals showed a poorer pattern of care than the public hospitals across all indicators aside from the absence of histology results and the 'other complications' category, in which the pattern was reversed. Once again, none of these differences were statistically significant at the 5% level. As in the hernia cases, the private hospitals showed a generally superior pattern to the other two groups, with lower prevalence rates of all indicators other than histology results and negative histology finding. With the exceptions of negative histology, other complications and the mortality category, the differences between the prevalence rates in the private group compared to the pooled data from the other two groups were statistically significant at the 5% level.

Table 3: Prevalence of indicators of poor outcome for appendectomy

	Contractor			Public*			Private						Con vs. Pub**	Pvte. vs. Pub/Con***
	M	H	S	T	L	B	D	P	N.	Contractor	Public	Private	chi-square (P)	chi-square (P)
N	10	8	3	8	7	0	62	68	66	21	15	196		
Delay between presentation and operation	1	0	2	0	0	n/a	0	0	0	14.3% (3)	0%	0%	0.840 (>0.25)	10.662 (<0.05)
Delay between admission and operation	0	4	1	0	0	n/a	0	0	0	23.8% (5)	0%	0%	2.395 (>0.1)	21.625 (<0.05)
Inadequate pre-op investigation	1	3	2	2	0	n/a	61	28	61	28.6% (6)	13.3% (2)	76.5% (150)	0.459 (>0.25)	38.832 (<0.05)
Histology results absent	4	8	3	8	7	n/a	62	62	62	71.4% (15)	100% (15)	94.9% (186)	3.29 (>0.05)	4.662 (<0.05)
Negative histology****	3	n/a	n/a	n/a	n/a	n/a	n/a	3	1	50% (3)	n/a	40% (4)	n/a	0.017 (>0.5)
Peritonitis	1	2	0	0	0	n/a	0	0	0	14.3% (3)	0%	0%	0.032(>0.5)	16.087 (<0.05)
Wound sepsis	2	0	0	1	0	n/a	0	0	0	9.5% (2)	6.7% (1)	0%	0.093 (>0.5)	10.662 (<0.05)
Other complications	0	1	0	0	1	n/a	0	2	1	0%	6.7% (1)	1.5% (3)	0.032 (>0.5)	0.817 (>0.05)
Mortality	0	0	0	0	0	0	0	0	0	4.7% (1)	0%	0%	0.029 (>0.5)	0.911 (>0.25)

Notes: * no appendectomy cases identified at hospital B during study year.

**chi-square test for significance of difference between the contractor and public hospitals.

*** chi-square test for significance of difference between the private hospitals and combined contractor and public hospitals.

**** Number/percentage of histology records on file which are negative.

n/a - chi square test not applicable where no differences identified.

The higher rates of wound sepsis in the contractor and public hospitals relative to the private hospitals were cause for some concern. While none of the case records involving wound sepsis contained sufficient information to allow evaluation by the expert clinicians, high rates of post-operative wound sepsis can be interpreted as indicative of failures in infection control, and therefore of important problems in the quality of surgical care.

Of the four appendectomy cases submitted for analysis by the expert clinicians, three showed poor outcomes that were judged to be unavoidable because patients had presented very late to the hospital, and in the fourth case there was judged to be insufficient information.

Normal deliveries

Table 4 shows a fairly similar pattern of problems for NVD at the contractor and public hospitals, with generally low prevalence rates for all indicators aside from those relating to the use of the partograph. The public hospitals showed slightly higher prevalence rates than the contractors for all indicators except those related to the partograph, although none of these differences were statistically significant at the 5% level. As with the other tracers discussed above, the private hospitals showed generally lower prevalence rates than the other groups across most of the indicators, although the differences between these rates and those of the pooled contractor and public hospitals were not statistically significant.

A total of nineteen cases[c] were submitted for expert analysis, of which six were assessed as involving poor outcomes that were possibly avoidable (for example a case of splenomegaly discharged without investigation at hospital M, and cases of third degree tears (all related to episiotomy) at hospitals S, T, B and D). Of the remaining thirteen cases, one was assessed as having a clearly avoidable poor outcome (puerperal sepsis due to gauze left *in situ* following delivery, at hospital B), while three cases of post-partum haemorrhage (two at hospital B and one at hospital N) were assessed as showing no evidence of an avoidable poor outcome. The final nine cases were assessed as containing insufficient information on which to judge avoidability.

[c] This number excludes the cases involving peri-natal and maternal mortality, which were also evaluated and are discussed separately below.

Table 4: Prevalence of indicators of poor outcome for NVD

	Contractor			Public			Private							
	M	H	S	T	L	B	D	P	N	Contractor	Public	Private	Con vs. Pub* chi-square (P)	Pvte. Vs. Pub/Con** chi-square (P)
N	92	97	65	78	65	123	86	65	62	254	266	213		
Third degree tears	0%	0%	1.5% (1)	2.6% (2)	0%	0.8% (1)	1.2% (1)	0%	0%	0.4% (1)	1.1% (3)	0.5% (1)	0.208 (>0.5)	0.008 (>0.5)
Failed assisted deliveries	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	n/a	n/a
Puerperal sepsis	0%	1.0% (1)	0%	3.9% (3)	0%	1.6% (2)	0%	0%	0%	0.4% (1)	1.9% (5)	0%	1.381 (>0.1)	1.276 (>0.25)
Other complications	1.1% (1)	1.0% (1)	0%	0%	4.6% (3)	1.6% (2)	0%	0%	1.6% (1)	0.8% (2)	1.9% (5)	0.5% (1)	0.490 (>0.25)	0.429 (>0.5)
Partograph absent or not completed	53.3% (49)	57.7% (56)	12.3% (8)	44.9% (35)	27.7% (18)	28.5% (35)	29.1% (25)	13.9% (9)	24.2% (15)	44.5% (113)	33.1% (88)	23.0% (49)	6.655 (<0.025)	15.777 (<0.001)

Notes: *chi-square test for significance of difference between the contractor and public hospitals.
**chi-square test for significance of difference between the private hospitals and combined contractor and public hospitals.
n/a - chi square test not applicable where no differences identified.

Caesarean sections

Table 5 shows relatively low prevalence rates for all indicators for caesarean section, with the contractor hospitals showing higher rates than the public group in the case of wound sepsis, and with this pattern reversed for the 'other complications' category. Once again, none of the observed differences between the public and contractor groups were statistically significant at the 5% level. The data for the private hospital group showed a lower prevalence than the other two groups for both of the indicators for which data were available, and the difference between the mean private hospital prevalence rates and those of the pooled public and contractor rates was statistically significant in the case of wound sepsis, but not in the case of 'other complications'.

Eleven cases were analysed by the expert clinicians. Five were assessed as unavoidable (two at hospital H, two at hospital L, and one at hospital P). A further five cases were assessed as showing poor outcomes that were possibly avoidable, all involving cases of wound dehiscence requiring secondary suturing, and all occurring at two of the public hospitals. The final case, in which a patient sustained a bladder injury during the operation at a public hospital, was evaluated as a clearly avoidable poor outcome.

Table 5: Prevalence of indicators of poor outcome, for caesarean section

	Contractor			Public			Private							
	M	H	S	T	L	B	D	P	N	Contractor	Public	Private	Con vs. Pub* chi-square (P)	Pvte. vs. Pub/Con** chi-square (P)
N	48	87	56	66	63	76	85	91	71	191	205	247		
Wound sepsis	6.3% (3)	8.0% (7)	10.7% (6)	13.6% (9)	1.6% (1)	0%	0%	0%	1.4% (1)	8.4% (16)	4.9% (10)	0.4% (1)	1.444 (>0.1)	12.862 (<0.001)
Anaesthetic complications	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	n/a	n/a
Other complications	0%	2.3% (2)	0%	3.0% (2)	7.9% (5)	1.3% (1)	0%	1.1% (1)	0%	1.0% (2)	3.9% (8)	0.4% (1)	2.218 (>0.1)	2.904 (>0.05)
Elective cases	33.3% (16)	26.4% (23)	19.6% (11)	16.7% (11)	31.8% (20)	14.5% (11)	60% (51)	74.7% (68)	70.4% (50)	26.2% (50)	20.5% (42)	68.4% (169)	1.490 (>0.1)	126.94 (<0.001)

Notes: * chi-square test for significance of difference between the contractor and public hospitals.
** chi-square test for significance of difference between the private hospitals and combined contractor and public hospitals.
n/a - chi square test not applicable where no differences identified.

Analysis of peri-natal mortality

Tables 6 and 7 show the analysis of peri-natal mortality, table 6 for individual hospitals and table 7 for hospital groups. Both public and contractor hospitals had high peri-natal mortality rates with substantial variation between hospitals, the public hospitals showing the highest rate of the three groups, and the private hospitals showing a much lower rate. Table 7 indicates that the difference in mean rates between the public and contractor group was not statistically significant at the 5% level, while the difference between the private and pooled public/contractor rates was statistically significant.

Tables 6 and 7 also show the attribution of avoidable factors to different causes. In both the contractor and public groups and in five of the six hospitals, over 80% of avoidable factors were attributable to hospital-related problems (defined as including hospital-related administrative factors and medical management factors). Within this group, a higher proportion of avoidable factors was attributable to hospital administrative problems in the contractor hospitals and group than in the public hospitals and group, with the converse applying in the case of problems related to medical management. In this latter case, it is worth noting the high percentages of avoidable factors attributable to medical management (actions undertaken or omitted by hospital staff) in both of the groups, with the figure for the public hospitals and group being particularly disturbing. A low percentage of avoidable factors in both groups was attributable to patient-related factors, with the remainder of avoidable factors attributable to the other administrative category, in this case relating primarily to clinic transport systems. As table 7 indicates, only the difference between the proportions of avoidable factors attributable to hospital administrative problems was statistically significant at the 5% level.

Table 6: Analysis of peri-natal and maternal mortality, by hospital

	Contractor			Public			Private		
	M	**H**	**S**	**T**	**L**	**B**	**D**	**P**	**N**
Births	2424	1407	1262	4392	2044	1205	1056	801	751
Peri-natal deaths	102	31	63	119	148	63	5	15	15
Maternal deaths	4	0	4	4	3	3	0	0	0
Peri-natal mortality rate (per 1000)	42.08	22.03	49.92	27.09	72.41	52.28	4.73	18.73	19.97
Maternal mortality rate (per 100 000)	165.02	0	316.96	91.07	146.77	248.96	0	0	0
Analysis of peri-natal mortality									
N	25	23	n/a	24	20	13	2	9	8
Poor notes	3	6	n/a	2	4	3	2	9	8
Avoidable factor/s	15 (68.2%)	14 (82.3%)	n/a	8 (36.4%)	8 (50%)	8 (80%)	n/a	n/a	n/a
Grade I	1	6	n/a	1	1	4	n/a	n/a	n/a
Grade II (% of total avoidable factors)	14 (93%)	8 (57.1%)	n/a	7 (87.5%)	7 (87.5%)	4 (50%)	n/a	n/a	n/a
Attribution of avoidable factors									
Total avoidable factors	18	20	n/a	11	12	13	n/a	n/a	n/a
Patient related	0	2 (10%)	n/a	0	1 (8.3%)	2 (15.4%)	n/a	n/a	n/a
Admin. Factors (hospital related)	6 (33.3%)	8 (40%)	n/a	3 (27.3%)	2 (16.7%)	0	n/a	n/a	n/a
Medical management	9 (50%)	8 (40%)	n/a	7 (63.6%)	9 (75%)	9 (69.2%)	n/a	n/a	n/a
Hospital total	15 (83.3%)	16 (80%)	n/a	10 (90.9%)	11 (91.7%)	9 (69.2%)	n/a	n/a	n/a
Admin factors (non hospital)	3 (16.7%)	2 (10%)	n/a	1 (9.1%)	0	2 (15.4%)	n/a	n/a	n/a

Notes: n/a - not applicable, since the data for hospital S and for the private hospitals are incomplete for the reasons outlined in the text

Table 7: Analysis of peri-natal and maternal mortality, by hospital group

	Contractor	Public	Private	Con. vs. Pub. chi-square (P)	Pvte. Vs. Pub./Con. Chi-square (P)
Births	5093	7641	2608		
Peri-natal deaths	196	330	35		
Maternal deaths	8	10	0		
Peri-natal mortality rate (per 1000)	38.01	50.59	14.48	1.59 (>0.05)	46.995 (<0.05)
Maternal mortality rate (per 100 000)	160.66	162.27	0.00	0.021 (>0.05)	2.583 (>0.05)
Analysis of peri-natal mortality					
N	48	57	19		
Poor notes	9	9	19		
Avoidable factor/s*	29 (74.4%)	24 (50%)	n/a**	4.39 (<0.05)	n/a
Grade I	7	6	n/a	0.17 (>0.05)	n/a
Grade II (% of total AF)	22 (76%)	18 (75%)	n/a	0.06 (>0.05)	n/a
Attribution of avoidable factors					
Total avoidable factors	38	36			
Patient related	2 (5.3%)	3 (8.3%)	n/a	0.004 (>0.05)	n/a
Administrative factors (hospital related)	14 (36.8%)	5 (13.9%)	n/a	3.972 (<0.05)	n/a
Medical management	17 (44.7%)	25 (69.4%)	n/a	3.647 (>0.05)	n/a
Hospital total	31 (81.6%)	30 (83.3%)	n/a	0.012 (>0.05)	n/a
Admin. factors (non hospital)	5 (13.2%)	3 (8.3%)	n/a	0.086 (>0.05)	n/a

Notes: * Cases in which notes which were too poor to analyse were excluded from the denominator (total number of cases analysed) for the purposes of calculating the proportions of avoidable factors.
** Not applicable, since patient records at private hospitals prevented identification of avoidable factors.

Analysis of maternal mortality

The data on maternal mortality rates (Tables 6 and 7) showed a similar pattern to that of peri-natal mortality, with the contractor and public hospitals and hospital groups showing similar and very high rates, but with no statistically significant difference between the public and contractor groups or between the pooled mean and the rate of zero at the private hospitals. The variation between individual hospitals was greater than was observed for peri-natal mortality rates.

Only six of the eighteen maternal deaths could be analysed by the University of Pretoria Group (two of eight cases in the contractor group, and four of ten cases in the public group), since permission was denied to copy files at hospital S, and the remaining files in the other hospitals could not be located. In both of the analysed cases at the contractor hospitals, there was evidence of poor quality of care, and the maternal death would probably have been avoidable had the clinical staff acted

differently. One of the cases at the public hospitals similarly indicated evidence of poor clinical care resulting in a maternal death that could probably have been avoided, while a second showed evidence of poor examination and possible anaesthetic problems, suggesting that the death might possibly have been avoided. In the remaining two cases, the notes were not adequate for assessment.

DISCUSSION

The analysis of the sample cases of all four tracer conditions did not identify any statistically significant differences between the public and contractor groups, in either the prevalence of indicators of poor outcomes, or in the expert analysis of the avoidability of poor outcomes. This general conclusion notwithstanding, the analysis did identify some variation within and between groups, as well as some particularly disturbing evidence of poor quality of care at individual hospitals within both groups.

The evidence of poor quality of care at individual hospitals, while limited to very small numbers of cases, suggested some general problems in the quality of medical treatment in both the contractor and public hospital groups, particularly in comparison to the private hospitals. In the hernia repair cases, for example, there was evidence of lengthy delays between admission to hospital and operation at one each of the contractor and the public hospitals, with some indication that these were attributable to logistical problems such as lack of staff and/or theatre time. While delays of this kind are not particularly serious in most cases of chronic hernia repair, some cases can require urgent intervention, as was the situation with one of the cases at one of the contractor hospitals where the delay was unacceptable.

The analysis of appendectomy cases revealed 8 instances, all at contractor hospitals, in which long delays between initial presentation and admission to the hospital, or between admission and operation, strongly suggested poor quality of care since delays of this kind can have serious medical complications. In the former instance, the main problem appeared to have been poor initial diagnoses, while the delays between admission and operations were due to a combination of

logistical problems at the hospitals involved. Both contractor and public groups demonstrated fairly high rates of wound infection relative to that observed in the private hospitals, providing further evidence of avoidable quality of care problems.

The analysis of peri-natal and maternal mortality rates showed a generally similar pattern to that observed in the tracer case analysis, with disturbing evidence of poor quality of care in both contractor and public hospitals, but with only limited statistically significant differences between the two groups. In the case of peri-natal mortality, for example, both groups showed very high rates (with the public group showing a higher rate than the contractors), relative to the rate observed in the private hospitals. No data on national peri-natal mortality rates were available in South Africa, preventing comparison of these hospitals with the overall national picture. While many factors aside from the quality of hospital care strongly influence peri-natal mortality rates, such as socio-economic and other characteristics of user populations, there was no explicit evidence to suggest that the populations using these 6 hospitals were particularly more predisposed to peri-natal mortality than the majority of the South African population. Indeed, the high rates identified could, at least partially, be attributed to the quality of health care delivered by the local health services, including the study hospitals, since the expert analysis of the peri-natal cases showed a very high prevalence of avoidable factors, with a statistically significant difference between the prevalence of 74% in the contractors and 50% in the public hospitals. Further analysis of these factors indicated that over 75% of these avoidable factors in both of the groups were of such a nature that the death could *probably* have been avoided, had different actions been taken. As disturbing is the conclusion that over 80% of the total avoidable factors identified in both groups were attributable to hospital-related factors, including problems in medical management and administrative problems, as distinct from factors related to the patient or to other administrative factors beyond the hospitals' control. Wilkinson [13] found a not dissimilar peri-natal mortality rate in a different South African rural district hospital and its clinics, of 29/1000 in the first year of study and 39/1000 in the second year. This study implemented measures to improve quality of care at the start of the period, and interestingly found that avoidable causes of death (in this study defined as those due to error or omission in basic care by a doctor or midwife) declined from 9.6% of deaths in the first 6 months to 3% in the last 6 months.

In the analysis of maternal mortality rates, both the contractor and public groups showed similar, high mean rates relative to those observed in the private hospitals, although here again there was no statistically significant difference between the two groups (with this result almost certainly attributable to the very small total number of cases evaluated). While national data on maternal mortality were poor, indirect estimates suggested a very high national rate of 250 per 100,000, which substantially exceeded the rates observed here [14]. The conclusions on the extent to which the deaths were preventable by hospital action supports findings elsewhere in Africa reviewed by Thaddeus and Maine [15].

These findings indicate the importance of approaches to improving quality at both public and contractor hospitals. Initiatives such as that of the Council for Health Services Accreditation of Southern Africa (COHSASA) are clearly vital[16].

CONCLUSIONS

These various evaluations of the outcomes of care lead to two main conclusions. The first is that there were no sustained or systematic differences between the performances of the contractor and public hospitals, except in the single instance of the proportions of avoidable factors in the analysis of peri-natal deaths where quality of care in the contractor hospitals appeared to be worse than in the public hospitals. Hence neither management structures nor financial incentives appeared to exert a strong effect on health outcomes. Indeed, it is of interest that the main difference in avoidable factors in peri-natal deaths was attributable to hospital administrative factors (despite the exclusion, though lack of data, of the one contractor hospital that had evident management problems due to the dual employment arrangement). Secondly, this analysis provided a range of evidence suggesting serious problems with the quality of care delivered at some of the hospitals in both the contractor and the public groups.

Both of these conclusions should be interpreted in the context of a number of important methodological concerns. Many of the analyses relied on small samples, particularly those concerning the surgical tracer conditions and the maternal mortality cases. A second problem emerges from the

fact that many of the sampled records contained inadequate information, as a result of very poor record keeping in many of the hospitals. This hampered both stages of the outcome analyses, contributed to the small total sample sizes, and almost certainly led to an underestimate of the true prevalence of poor outcomes, as well as to an inadequate assessment of their causes. There may also have been a perverse negative correlation between the quality of record keeping and the quality of care, since it would have been easier to identify instances of poor outcomes in those hospitals which kept better records. Finally, the analysis assumed a causal relationship between poor outcomes and poor quality of care within the hospital, thus ignoring the impact of non-hospital factors on the outcomes measured. Such factors would include, among others, patient socio-economic and demographic factors, access to health services, and the quality of local primary health care services. There was no obvious evidence that any of these factors differed systematically between the hospitals in the contractor and public groups, although it is conceded that these were not studied in any depth, so that some material differences may well have not been identified. The use of expert analysis, which aimed to identify instances of poor quality of care directly attributable to the hospitals, was included to address this issue.

Judging quality of care is a key problem for health service managers and policy makers. In the context of the policy question examined in the overall study, of whether or not it was better for the government to provide district hospital services itself or to contract them out, the quality assessment proved to be of vital importance since the contractor hospitals were able to provide services at considerably lower unit cost than the public hospitals studied. While many of the results shown in this paper were inconclusive, they at least demonstrated that there were few very clear differences in outcomes of care between the contractor and public hospitals studied, and hence on the whole the lower unit costs were not at the expense of lower quality. Indeed, the studies of structural and nursing quality showed that in certain respects contractor hospitals scored better in terms of these aspects of quality [5], [6].

It should also be noted that despite the existence of contracts for these hospitals between the government and the hospital company, there was extremely limited specification of the contractor's obligations, and no details of the nature of monitoring or penalties for non-performance [5]. International interest in contracts arises partly from their value in increasing the transparency of

management arrangements, and being explicit about what funds are being provided for what level of performance[17]. In the case of these contracts, there was neither any clear specification of the quality of care required (whether in structural, process or outcome terms), nor any real monitoring of services provided. Hence it cannot be concluded from this study that the contracts failed in obtaining improved performance in terms of outcome quality, since they had not sought to do this. The studies of structural and nursing quality did suggest that the contractor hospitals had in place more effective management systems, and hence had the potential to improve quality of care if they were explicitly required to do so. However, given the difficulties of specifying performance in terms of health outcomes, beginning the process of monitoring by focusing on indicators of structural and process quality is likely to be preferable.

The full range of tracers included in the study have been included in this paper partly to demonstrate some of the difficulties associated with seeking to assess outcomes in a setting such as rural South Africa. The methodological difficulties encountered, particularly with respect to poor records and obtaining sufficiently large sample sizes, support the arguments of Palmer [1] that process data may reveal more about performance than outcome data, with the possible exception of tracer conditions such as peri-natal mortality where a large sample size can be obtained and poor performance is more readily identified.

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