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ARTICLE

Paediatric admissions to hospitals in the Cape Town Metro district: A survey

Anthony Westwood, *MB ChB, DCH (SA), FCPaed (SA), MMed, MD*
Michael Levin, *MB ChB, FCPaed (SA), MMed, Dip Allerg, PhD*
School of Child and Adolescent Health, University of Cape Town, and Department of Paediatrics, New Somerset Hospital, Cape Town

Jo Hageman, *MB ChB, MFamMed*
Helderberg Hospital, Department of Health, Provincial Government of the Western Cape

Corresponding author: *A Westwood (anthony.westwood@uct.ac.za)*

A point prevalence survey of 381 paediatric medical inpatients in the 11 public hospitals in Cape Town in November 2008 showed that 70% of them were in central hospitals, with 39.4% requiring level 3 (sub-specialist) care. Numbers of children in hospital and their levels of health care requirement did not vary by sub-district of residence. Seventy-seven per cent of patients were under 5 years of age; 5% were teenagers. Few patients changed level of care during admission, but 10% did not need to be in hospital at the time of review. Median length of stay was 4 days, with children with level 3 needs having the longest lengths of stay. An under-provision of level 1 beds was demonstrated. HIV infection had been identified in 12% of admissions. While children with level 3 problems were well catered for in terms of bed provision, level 1 and step-down/home care provision were deficient or inefficiently utilised.

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The Western Cape Department of Health's Comprehensive Service Plan (CSP) set out a blueprint for service reconfiguration in the public health services of the province to 2010.[1] Based on the District Health System, the CSP set up levels of service to be rendered within facilities and in communities with the aim of patients having access to 'the right treatment at the right place at the right cost'. In order for the CSP to be implemented, there was a need to understand what service shifts would be required.

Inpatient paediatric services exist in most public hospitals in metropolitan Cape Town. Not all facilities have been aligned to sub-districts, and in particular the two main central hospital paediatric services at Red Cross War Memorial Children's Hospital (RCCH) and Tygerberg Children's Hospital (TCH) have acted as referral sites for primary healthcare clinics for many years, while simultaneously providing specialist (secondary or level 2) and a large range of sub-specialist (tertiary or level 3) services including intensive care unit (ICU) beds. RCCH also houses national services such as transplant facilities.

This survey of paediatric inpatient services aimed to provide data to assist in planning service shifts. The survey, based on similar surveys carried out in recent years in Cape Town,[2,3] aimed to describe the level of care requirement of children in all public hospitals in the city at the time of admission and at the time of review.

Methods

Study design and population

A descriptive folder review of current paediatric inpatients on designated midweek days in November 2008 was undertaken by three experienced clinicians based in level 1, 2 and 3 facilities in the province. Patients in paediatric medical wards, including short-stay wards, and paediatric ICUs were reviewed. In multi-specialty level 3 wards, surgical cases were omitted from the survey. Tuberculosis and convalescent hospitals were not included in the survey. While the aim was for all three clinicians to review each case, this was not achieved in all cases. Except at one small hospital (4 beds) and in one level 3 ward (16 beds), at least two of the three clinicians reviewed the cases. Fig. 1 shows the hospitals, their level of care and the Cape Metro sub-districts.

Data

Demographic data collected included age, gender and sub-district of origin. Admission data included referral source (the original source was sought if a child had been transferred to a ward from a short-stay area or emergency unit), reason for admission, main organ system involved, underlying conditions and level of care (see box). Data from the day of review included length of stay and level of care.

Level-of-care decisions were based on the criteria set out by Henley *et al.*[2] and the packages of care developed by the Western Cape Department of Health in consultation with local clinicians (unpublished document: L1/L2/L3, Acute hospital packages of care, Department of Health, Provincial Government Western Cape. August 2009, and see box).

Analysis

Simple descriptive statistics were employed to analyse totals and proportions for all data. Lengths of stay were calculated as means, since average length of stay (ALOS) is the indicator used in the CSP, but medians were also calculated as the data were not Gaussian. Comparisons between Metro East (Tygerberg, Khayelitsha, Northern and Eastern sub-districts: Fig. 1) and Metro West (Western, Klipfontein, Mitchell's Plain and Southern sub-districts: Fig. 1) geographical service areas (GSAs) were done for levels 1 and 2.

Ethics

Permission was obtained from the medical superintendents and heads of departments in each hospital as well as from the Research and Ethics Committee of the University of Cape Town.

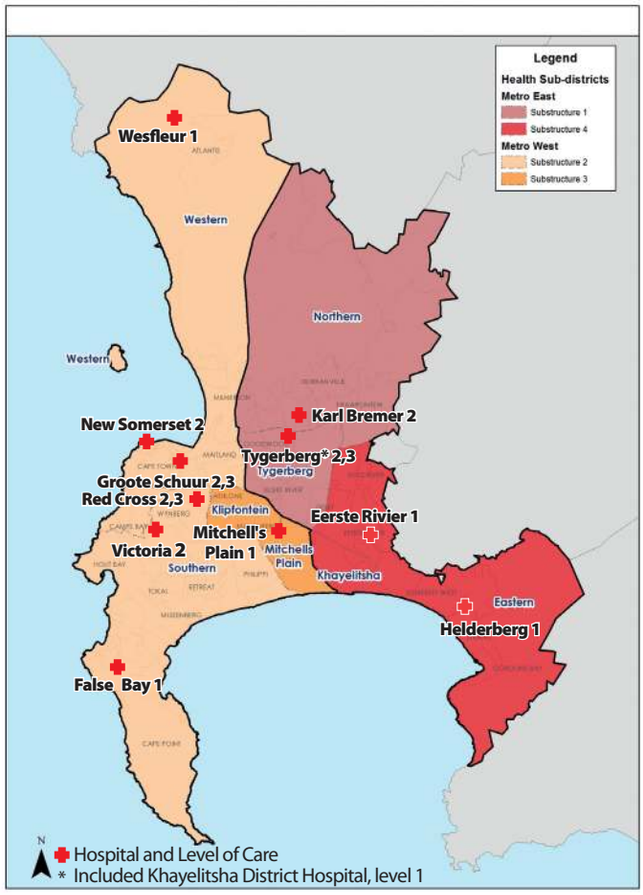

Fig. 1. Cape Metro district hospitals and sub-districts.

Results

A total of 381 patients (184 females, 195 males, 2 not recorded) were surveyed in 11 hospitals. Seventy per cent of patients (265 of 381) were in the three central hospitals (RCCH, TCH and Groote Schuur Hospital (GSH)). About 80% of the beds were occupied at the times of review.

Geographical spread

There were 240 patients in beds in Metro West GSA and 141 in Metro East GSA (Table 1). There were almost equal numbers of patients from Metro East and Metro West GSAs (53% v. 47%).

Fig. 2 shows the Cape Town sub-district origins of the patients according to level of care on admission. There were no statistically significant differences between them.

Table 1 shows that 61 patients came from beyond the Metro area (42 Western Cape, 14 Eastern Cape, 4 another country). The majority (84%) of these patients required level 3 care.

Ages

Table 2 shows the age distribution of the patients. Children under 5 years of age occupied 77% of the beds, 45.3% of all children being infants. The oldest and youngest patients were more likely to be in central hospitals. There were 19 teenagers (ages 13 - 19 years), comprising 5% of all patients. All but 2 teenagers were in central hospital paediatric wards receiving level 3 care, although 1 could have been at home if there had been a home ventilation programme, and 1 other was waiting for transport back to the Eastern Cape province.

Levels of care

Level 1
Children's ward staffed by a medical officer – provides care for acutely ill children who need short-term admission.

Level 2
Children's ward staffed by a general paediatrician – provides for the diagnosis and treatment of uncommon and/or severe diseases, and for the complications of acute illnesses.

Level 3
Subspecialist and intensive care – includes diagnostic and treatment services provided by subspecialists. Such services generally require highly sophisticated and advanced technological and support facilities.

Criteria for admission to subspecialist services:
- Specialised equipment, procedures and investigations
- Diagnostic expertise
- Management expertise
- Specialised nursing, e.g. dialysis, oncology
- Research

Possible questions to assess level of care (as used in previous audits)

What level of care did the patient require AT THE TIME OF ADMISSION?
- Diagnosis and/or treatment could be done as an outpatient
- As outpatient, but patient lives too far away
- As outpatient, but not possible to schedule diagnosis/treatment as an ambulatory patient
- Children's ward staffed by a medical officer/family physician (level 1)
- Children's ward staffed by a general paediatrician (level 2)
- Children's ward staffed by a general paediatrician, with regular subspecialist consultation (level 3)
- Dedicated subspecialist ward (level 3)
- Intensive care (level 3)

What level of care did the patient require YESTERDAY?
- Intensive care (level 3)
- Dedicated subspecialist ward/bed (level 3)
- Children's ward staffed by a general paediatrician, with regular subspecialist consultation (level 3)
- Children's ward staffed by a general paediatrician (level 2)
- Children's ward staffed by a medical officer/family physician (level 1)
- Chronic care or convalescent hospital
- Hospice or step-down care
- Home care with community-based nursing, physiotherapy, nutritional support
- Day hospital/community health centre
- Home, with visits to day hospital/community health centre

Table 1. Metropolitan areas of origin

	Metro side		
Sub-district of origin	East	West	Total
East	103	63	166
West	5	141	146
Beyond the Metro	29	32	61
Not recorded	4	4	8
Grand total	141	240	381

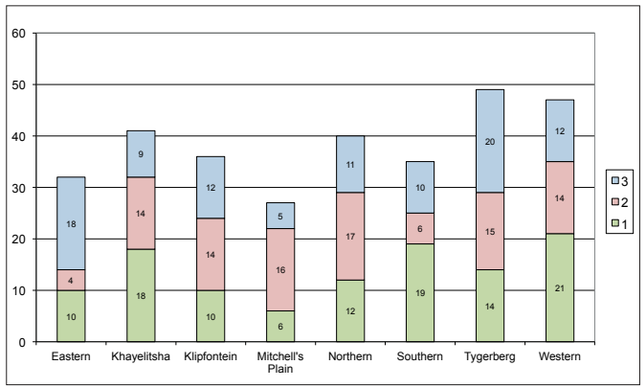

Fig. 2. Levels of care in patients from Cape Town Metro sub-districts.

Table 2. Age distribution of inpatients

Age group	Total	Proportion (%)	Proportion in central hospitals (%)
Not recorded	2		
Neonate	18	4.7	77.8
>1 - 12 months	155	40.6	60.6
1 - 4 years	121	31.7	67.7
5 years and older	85	22.3	84.8
Total	381		

Table 3. Levels of care of the 381 inpatients at admission and review

Level	Admission total (%)	Review total (%)
1	121 (31.8)	107 (28.1)
2	103 (27.0)	96 (25.2)
3	150 (39.4)	134 (35.2)
Other	7 (1.8)	44 (11.5)

Levels of care

Forty-eight beds were designated level 1, 187 level 2 and 241 level 3 at the time of the survey. Table 3 compares overall level of care of the patients on admission and at review. Overall 150 (39.4%) admissions required level 3 services including ICU admission. If patients from beyond Cape Town are excluded, the proportion was 34.6%. At the time of review, 40 patients (10.5%) need not have been in these hospitals (21 awaiting transfer to step-down facilities, 15 discharged but not collected, 4 other social reasons). The majority (89%) of children who were not ready for discharge or transfer to step-down care required the same level of care at review as they had at the time of their admission to the ward.

Length of stay

The overall ALOS to the time of review was 17 days (the date of review was within 1 day of admission in 108 cases (28.3%)). If the 3 patients who had been in hospital for more than a year were excluded, the ALOS fell to 10.2 days with a median length of stay of 4 days. The ALOS for patients who required level 1 care at review was 3.3 days (median 2 days, range <1 - 23 days), for level 2, 7.9 days (median 4 days, range <1 - 63 days) and for level 3, 13.4 days (median 6 days, range <1 - 122 days).

Table 4. Source of referral

	Level 1 (*n* (%))	Level 2 (*n* (%))	Level 3 (*n* (%))	ICU
Self-referred	26 (30)	13 (14)	20 (16)	1
Private practice	10 (12)	6 (7)	5 (4)	2
Clinic	24 (28)	16 (17)	3 (2.5)	0
Community health centre	16 (19)	26 (27)	5 (4)	6
Hospital OPD/elective	4 (5)	9 (10)	34 (28)	1
District hospital	1 (1)	7 (7.5)	5 (4)	1
Regional hospital	1 (1)	5 (5)	20 (16)	5
Tertiary hospital	1 (1)	2 (2)	1 (1)	5
Intensive care unit	0	4 (4)	17 (14)	-
Other	0	5 (5)	8 (6.5)	0
Not recorded or unknown	3 (3.5)	0	4 (3)	0
Total				21

OPD = outpatient department; 'Other' includes convalescent homes, non-profit organisations and tuberculosis hospitals.
Seven patients did not need to be in hospital; they were referred from a variety of sites.

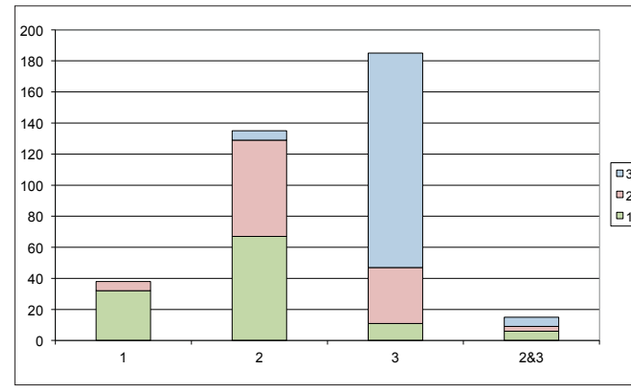

Fig. 3. Level of care according to ward designation.

Referral routes

Table 4 shows the referral sites for admissions to all beds except those in the emergency wards in the central hospitals (329 of the 381 cases). Elective admissions and referrals from specialist outpatient services and regional hospitals constituted just under half of the non-ICU admissions of tertiary cases. Half of the ICU admissions came directly from the district health services. Doctors referred 240 (78.7%) of the 305 referred/elective cases. Nurses referred 18% of cases, mostly (76.3%) from clinics. Only 5 of the 150 level 3 patients had been referred by a nurse.

Level of care and level of ward

Fig. 3 compares actual level of care of admission with the designated level of care of the ward the child was admitted to. Only 28% of level 1 patients were in level 1 wards. Over twice as many patients requiring level 1 care were in level 2 beds as there were in level 1 beds. Levels 2 and 3 patients were largely at the 'correct' level, although level 3 beds still accommodated a significant proportion of level 2 patients at both times.

Clinical problems

Primary reasons for admission are shown by organ system in Table 5. Respiratory and gastro-intestinal problems dominated at levels 1 and 2, mainly in the form of acute lower respiratory infections (48 cases, 21.4%) and gastro-enteritis (56 cases, 25%). At level 3, a wide spread of systems was evident with lung, brain and heart diseases and

Table 5. Main symptom group on admission

	Level of care (admission)			
System	**1**	**2**	**3**	**Total**
Central nervous (CNS)	18	13	24	55
Cardiovascular		2	20	22
Endocrine			7	7
Ear, nose & throat		4	1	5
Eye			1	1
General	15	16	10	41
Gastro-intestinal (GIT)	38	20	11	69
GIT & CNS	1			1
GIT & general	5	3		8
GIT & respiratory	1	2	1	4
Blood			3	3
Immune			1	1
Musculo-skeletal		1	1	2
Multiple		1	1	2
Oncology			24	24
Renal	4	2	14	20
Respiratory	32	34	28	94
Respiratory & general	2			2
Skin	2	5		7
Social	2			2
Trauma	1		3	4
Grand total	121	103	150	374

tumours being leading causes of hospitalisation. 'General' admissions (Table 5) were dominated by under-nutrition or growth concerns ('failure to thrive') (26 cases, 6.8% of all admissions), and general infections or suspected infection.

Overall 65.4% of patients had chronic disease(s) or co-morbid health problems at the time of admission (level 1, 47%; level 2, 65.4%; level 3, 82%). HIV was an identified part of the clinical picture in 78 cases (20.5%): infected 46 (12.1% of total), exposed but PCR negative 16, exposed and PCR unknown 16. Of the 46 patients known to have HIV infection, 8 had level 1 problems, 24 level 2 and 12 level 3, with 2 not needing to be in hospital. Active tuberculosis infection had been identified in 28 admissions (7.3%).

Discussion

This survey was undertaken for a specific purpose: to help managers decide what would be required to meet the service shape described in the CSP.[1] The limitations of this 'snapshot' methodology need to be understood. While the times of sampling aimed to capture levels of activity under normal weekday conditions, one cannot be certain that 'normal' conditions prevailed. This is especially true of sub-specialist patients, where small numbers and variable staffing may lead to almost daily large fluctuations in inpatient activity.

Many patients were recieving care that could have been given at less sophisticated levels, including at home.

The surge of infectious diseases in the first half of the year in Cape Town could not be reflected in this survey. The designation of level of care has limitations, even after agreement between the observers with relatively tight definitions. Patients with chronic and co-morbid disease do not fit easily into levels of care when acutely ill: their care requirements depend on the sophistication of the continuum of the health care system (e.g. shared care), a factor not measured by the methodology employed here. The level-of-care allocations are therefore likely to have worked reasonably for some patients, e.g. those with single pathologies, but may not have been appropriate for others, e.g. those with long-term health conditions.

The most striking deviation from the tiered service configuration looked to in the CSP was the high number of patients with simple problems being looked after in level 2 and 3 services, i.e. services too sophisticated for the patients' needs. Over 120 patients required level 1 care on admission, yet the Metro only had 48 level 1 beds. Paediatric departments in hospitals with general paediatricians (level 2 in the CSP) are responsible for all admitted children, half of whom may not need paediatric specialist input. A significant part of this apparent mismatch can be ascribed to the lack of more than four designated level 1 beds allocated to five of the eight sub-districts. The survey demonstrates that the change from more complex care requirements to level 1 care during hospital admission plays a relatively small role in this mismatch. The CSP envisages three large district hospitals in three high-density areas of Cape Town. This survey gives an indication of the required bed complement in these new services; however, there are likely to be geographical and economy-of-scale reasons for some children with level 1 problems being admitted to level 2 hospitals in some areas in the future.

The integrity of the definitional aspects of the methodology of the survey is given credence by the length-of-stay data: median length of stay rose with complexity of care. Median length of stay reflected the underlying ALOS norms used in CSP bed calculations.[1] Prolonged lengths of stay in some complex cases led to higher means at levels 2 and 3 in the groups surveyed here. Such patients tended to have complications of HIV disease and feeding/intestinal failure issues. Most were in central hospitals and the reviewers did not consider them to be suitable for convalescent care.

That level 1 patients were a minority in Cape Town's paediatric hospital beds requires comment, as district-level care is expected to provide the majority of care in South Africa. Cape Town has good access to primary health care, comparatively good socio-economic indices and low overall HIV rates. This is likely to reduce the number of children requiring admission for common infections and malnutrition, most of whom require level 1 care, compared with other parts of the country. In addition, survival of children with long-term health conditions and those born prematurely is likely to be better in this environment, increasing the proportion of children requiring more complex levels of care. For quality-of-care purposes, small infants below 3 months of age who require admission were designated as level 2 in the comparatively compact urban area of Cape Town, potentially skewing the level of care pattern compared with elsewhere in South Africa. There are few pure district hospital beds in Cape Town.

That over 10% of inpatients should not have been in hospital is significant. This accords with previous surveys.[2] Delays in access to tuberculosis hospitals and convalescent hospitals are remediable. Stronger hospital social work departments and stronger connections to community services are required. Discharge planning (including the deployment of bed managers) could improve the situation.

In a census in 1999, HIV-infected children occupied 6.8% of acute paediatric beds, compared with 12.1% in this survey.[3] The 1999 survey

included paediatric surgical beds, making comparison difficult, as fewer HIV-infected children are likely to have been in such wards. Our figures for HIV prevalence came at a time of widespread mother-to-child transmission prevention and during a rapid expansion of antiretroviral therapy for children in the province. Numbers are likely to decrease in the future.

Teenagers constituted 5% of admissions, occupying 3.6% of available beds. A number of these patients had been referred to paediatric services by adult medical services in the central hospitals. Given that there may have been young adolescents in adult wards at the time of the survey and the special needs of teenage inpatients, the need for the continuing development of adolescent inpatient care at GSH[4] and the possibility of a similar development at TCH are supported by these data. However, the survey re-emphasises that paediatric inpatient services must be particularly geared to small children and especially infants. Providing appropriate care for small babies remains the core business of Cape Town's public hospitals.

Conclusions

A majority of inpatients in beds in Cape Town's public hospitals required specialist care. There is a shortage of level 1 beds. Many patients were receiving care that could have been given at less sophisticated levels including at home. Level 1 patients had health problems dominated by infectious and nutritional problems, as in the rest of South Africa. HIV-related disease was responsible for a relatively low proportion of inpatient bed occupancy. However, overall co-morbid and chronic disease was common among inpatients, a significant number of whom are teenagers.

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