Workload and casemix in Cape Town emergency departments

Lee A Wallis, Michele Twomey

Introduction. Little is known about the nature of patients presenting to emergency departments (EDs) in South Africa. This study aimed to provide evidence on ED usage in Cape Town by studying patients at four community health centre (CHC) EDs, with details of the severity of their presentation and their disposal.

Methods. A total of 16 392 patients presented in this 8-week prospective observational study, and 15 681 were included in the descriptive data analysis. One-quarter were children.

Results. There were clear and predictable peaks in attendance after 16h00 and at weekends, with a steady stream of patients presenting overnight. Case severity was evenly distributed between emergency, urgent and routine care. Nearly 10% of patients were referred on to a higher level of care.

Conclusion. The data from this study present a model for staffing and resource allocation. It has implications for the provision of emergency care in CHC EDs.

S Afr Med J 2007; 97: 1276-1280.

Emergency medicine (EM) is an emerging specialty in South Africa, having recently been recognised by the Health Professions Council. While there are exciting developments with regard to registrar training, College examinations and EM systems such as triage,[1-3] little is known about the patients presenting to our emergency departments (EDs). In order to plan accurately for service delivery it is essential to have an understanding of the workload and acuity mix of our EDs.

Previous internal estimates of ED workload in Cape Town[4-6] have identified serious problems relating to data collection, particularly where paper registers are kept. Such limitations mean that planning for service delivery in these units has been difficult, as accurate workload data, including acuity and temporal distributions, have been missing.

Within the Cape Town metropole area, 24-hour EDs operate at 9 community health centres (CHCs). These CHCs provide the first line of emergency care for the majority of the city's population; if inpatient or specialist care is required these units refer to district, regional or tertiary hospitals in pre-arranged drainage patterns. All of these higher-level facilities also offer 24-hour ED care.

The aim of this study was to assess the workload, acuity and casemix of CHC EDs in the Cape Town metropole and to provide descriptive temporal patterns.

Joint Division of Emergency Medicine, University of Cape Town and Stellenbosch University, W Cape
Lee A Wallis, MD, FRCS, FCEM

School of Public Health, University of Cape Town
Michele Twomey, BSc

Corresponding author: *L A Wallis (capetriage@bvr.co.za)*

Methods

Choice of location

Four of the nine 24-hour CHCs were chosen by convenience sampling. They were felt to be adequately representative of the workload of all nine CHCs. The four clinics were Mitchells Plain (MP), Khayelitsha site B (KHA), Gugulethu (GUG) and Elsies River (ER).

Timing of audit

An 8-week audit period was chosen, commencing on 11 July 2005 and terminating on 2 September. It is accepted that seasonal variations may have affected the actual workload seen.

Establishing workload

For practical reasons the authors could not personally record data on each patient seen at the EDs in the study period. In order to provide 24-hour cover at each of the EDs, 20 enrolled nursing assistants (ENAs) were appointed, with 5 working at each ED. Three data clerks were appointed to undertake data collection and data entry. ENAs collected a standardised, piloted data collection sheet for every patient presenting within the 2-month audit period. All staff received extensive and ongoing training in data collection and entry.

Determining acuity

The Cape Triage Score (CTS) was launched across the Western Cape on 1 January 2006.[1,2] There are three versions of the CTS, for adults (>12 years/>150 cm), infants (<3 years/<95 cm), and children. The CTS allows prioritisation of ED patients into five categories, namely: (*i*) red (immediate care); (*ii*) orange (very urgent care); (*iii*) yellow (urgent care); (*iv*) green (routine care); and (*v*) blue (dead).

The CTS was chosen as the measurement instrument of choice for the acuity of the patients presenting at the EDs. Patients were considered to be emergencies if they were triaged red or orange; those triaged yellow were termed urgent; a green triage code represented patients who were routine cases; and blue represented those who were obviously dead on arrival. Additional data were collected relating to the level of onward referral to higher care.

Data analysis

Only descriptive statistics are presented.

Results

Data were collected for 54 days at 3 CHCs, and for 47 days at Elsies River.

Missing data

A total of 15 681 patients were triaged and had paperwork completed; 606 were seen in the ED and had forms raised, but had no triage information recorded. Accordingly, no analysis was undertaken on these patients.

Total workload

In addition to the 16 287 discussed, 105 patients were triaged blue (dead on arrival (DoA)); the total throughput of the 4 EDs was 16 392. Unless indicated, all further results relate to the 15 681 live patients for whom triage data were available.

The total attendance figures are presented in Table I (the term 'paediatric' refers to both infants and children by CTS criteria[1]).

Table I. Total attendance at all sites (*N*)

CHC	Adult	Paediatric	Total
KHA	2 891	708	3 599
GUG	2 863	1 108	3 971
MP	3 697	1 159	4 856
ER	2 446	809	3 255
Total	11 897	3 784	15 681

CHC = community health centre; KHA = Khayelitsha site B; GUG = Gugulethu; MP = Mitchells Plain; ER = Elsies River.

The mean total daily attendance at all 4 EDs was 300 patients (314 including DoA and missing data).

Daily attendance

The mean daily attendances across all sites for each day of the week are shown in Fig. 1.

Attendance by time of day

The day was divided into 4-hour sections to provide a reflection of the varying workload at each ED throughout the day. The results are presented as the mean number of new patients presenting to that ED in 4-hourly time blocks throughout the study (Figs 2 and 3).

Mode of presentation

Data on mode of presentation (self presenting (including police), or ambulance) were recorded in only 12 231 cases (78%); 7.4% of these arrived by ambulance.

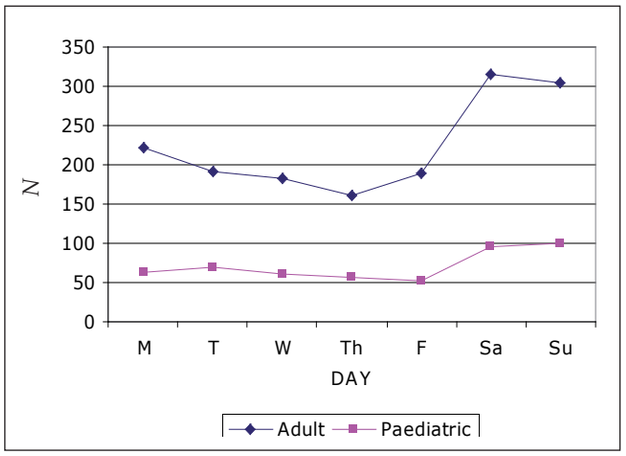

Fig. 1. Mean daily attendance, all emergency departments.

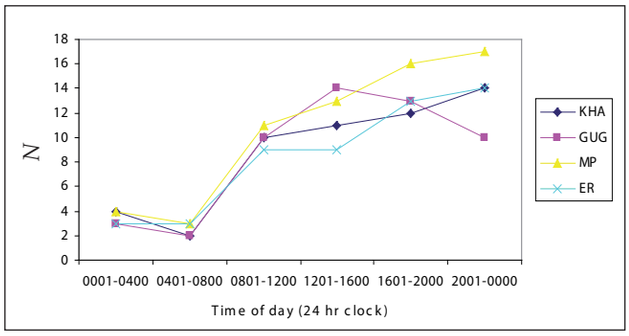

Fig. 2. Mean attendance by 4-hour blocks, all sites – adult.

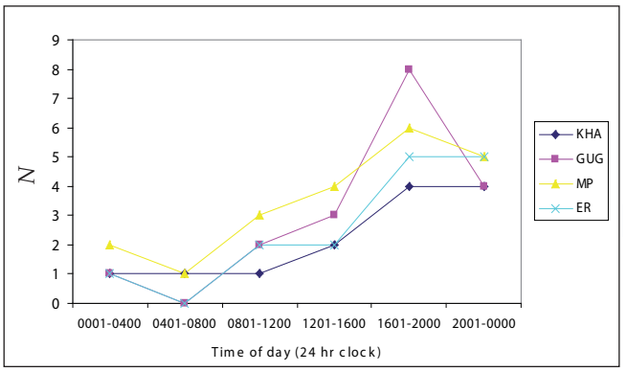

Fig. 3. Mean attendance by 4-hour blocks, all sites – paediatric.

Acuity mix of patient load

The breakdown of patients by triage category is presented in Tables II and III.

Red and orange patients were considered to be emergencies, yellow patients were considered to be urgent, and green patients were considered to be routine. These results are shown in Figs 4 and 5.

Daily attendance by degree of urgency

There was no apparent relationship between the day of the week or the time of day and the urgency (triage category) of presenting cases. The mean attendance of adult and paediatric emergencies is shown to have doubled from morning to midnight, as presented in Fig. 6.

Presenting complaint

For logistical reasons no data were recorded on the final diagnosis of the patient. However, from a combination of the triage history and CTS symptoms, data were analysed for the most common presentations. Trauma was the cause of 4 379 (27.9%) of all presentations, with assaults and motor vehicle accidents (MVAs) being the most common (46% and 22% respectively). In adults, 36.2% were traumatic presentations, while such causes were slightly less common in children and infants.

With regard to medical cases, in adults the commonest presenting complaint was acute shortness of breath (9.2%). Infants presented most frequently with symptoms of gastroenteritis or breathlessness; children had a slight preponderance of breathlessness but all presentations were spread reasonably uniformly in this group.

There was no apparent relationship between the presenting complaint and time of day, with the obvious exception of assaults, which were much more common over weekends and during evening hours.

Table II. Presentation by triage category (%), all sites – adult

	Triage category			
CHC	Red	Orange	Yellow	Green
KHA	3.7	30.2	34.6	31.2
GUG	5.2	30.7	34.3	28.0
MP	2.0	34.5	37.0	24.6
ER	5.6	28.2	30.4	37.3

CHC = community health centre; KHA = Khayelitsha site B; GUG = Gugulethu; MP = Mitchells Plain; ER = Elsies River.

Table III. Presentation by triage category (%), all sites – paediatric

	Triage category			
CHC	Red	Orange	Yellow	Green
KHA	9.7	22.9	25.8	30.1
GUG	8.6	24.8	27.4	29.4
MP	9.2	27.5	26.9	27.0
ER	3.1	17.7	15.3	40.3

CHC = community health centre; KHA = Khayelitsha site B; GUG = Gugulethu; MP = Mitchells Plain; ER = Elsies River.

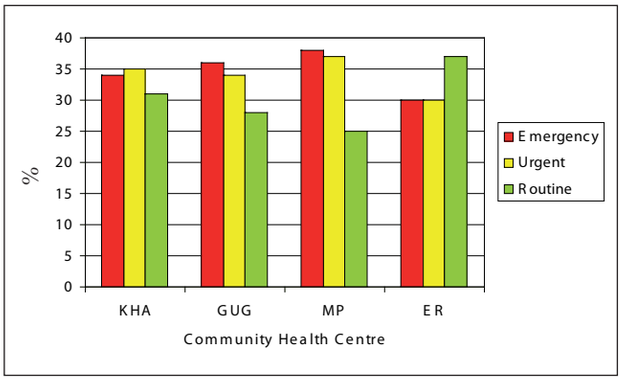

Fig. 4. Degree of urgency, all sites (%) – adult.

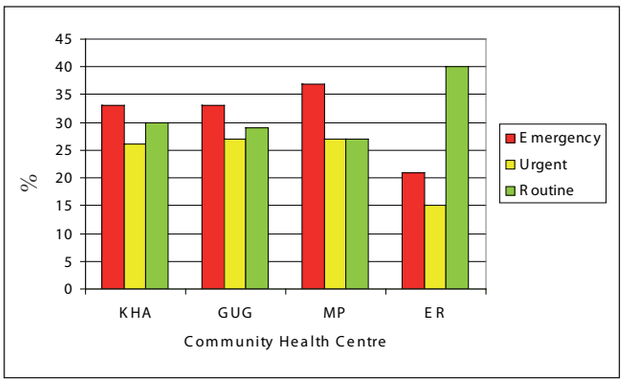

Fig. 5. Degree of urgency, all sites (%) – paediatric.

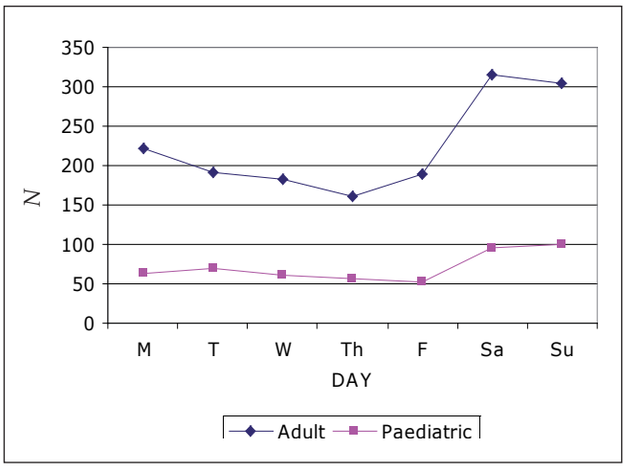

Fig. 6. Mean attendance of emergencies by 4-hour blocks, all sites.

Disposal

Disposal data were available on 14 253 patients (90.9%). Disposal was categorised as discharge (home), referral to a higher level of care (refer) or death in the ED (died). These data are given in Table IV.

These data were subanalysed for the number of adult and paediatric patients in each triage category referred to a higher level of care, and the number of cases due to trauma in each triage category referred to a higher level of care. There was a significant reduction in the number of patients referred on as their degree of urgency decreased from red to orange, through to green.

For adults, a mean of 19% of reds were referred on; this was 9.4% for orange patients, with a significant difference of 10% (95% CI 6.2 - 13.8%). From orange to yellow the referred patients were reduced by 2% (95% CI 1.1 - 3.5%), and from yellow to green they were reduced by 4% (95% CI 2.8 - 4.8%).

Similar trends were noted for paediatric patients – a mean of 18% of reds were referred onwards and 11% of orange patients, with a significant difference of 7% (95% CI 1.9 - 11.5%). From orange to yellow a significant reduction of 6% (95% CI 3.9 - 8.9%) was observed, and no significant difference was observed between referred yellows and referred greens. The results (excluding deaths) are illustrated in Figs 7 and 8.

While the missing data cannot be commented on, a mean of 9.5% of patients who arrived by ambulance received a secondary transfer to a higher level of care (ranging from 6% in KHA to 11.6% in MP).

Discussion

To the best of our knowledge this is the first accurate description of the workload, acuity and casemix of South African EDs. No attempt has been made to analyse the workload of EDs at higher levels of care, which had previously been undertaken with limitations.[4,5]

Missing data

No further attempt has been made to analyse the missing data. It is accepted that the results of these patients may alter the figures presented, but only 606 patients of a total of 16 392 (3.7%) had incomplete data, and the effect of these patients is therefore expected to be minimal.

Table IV. Disposal data, all sites (*N*, %)

	Home		Refer		Died	
CHC	*N*	%	*N*	%	*N*	%
KHA	3 222	89.5	162	4.5	40	1.1
GUG	2 980	75.0	360	9.1	43	1.1
MP	3 893	80.2	423	8.7	18	0.4
ER	2 952	90.7	143	4.4	17	0.5
Total	13 047	91.5	1 088	6.9	118	0.8

CHC = community health centre; KHA = Khayelitsha site B; GUG = Gugulethu; MP = Mitchells Plain; ER = Elsies River.

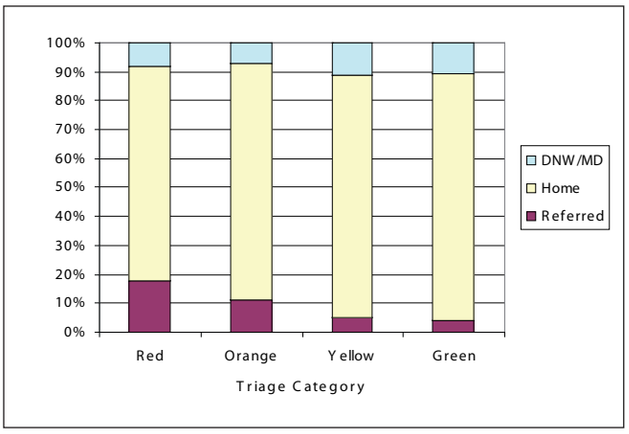

Fig. 7. Disposal of adult patients (%) (DNW = did not wait; MD = missing data).

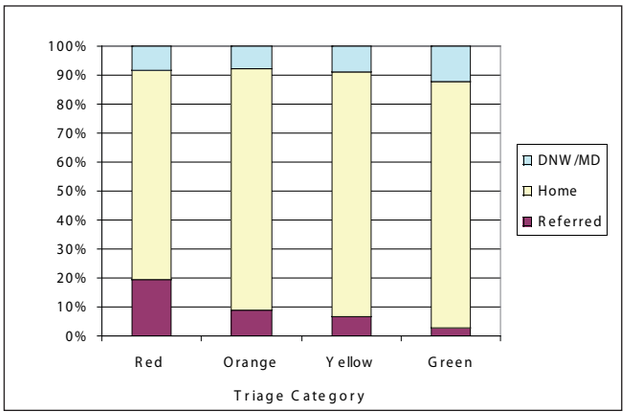

Fig. 8. Disposal of paediatric patients (%) (DNW = did not wait; MD = missing data).

Temporal attendance patterns

There were clear trends in the daily rate of attendance at all units, with peaks on weekends and Mondays (although there was no trend in the degree of urgency by day of the week). There was a clear peak of all attendees outside of normal office hours. Both sets of results are consistent with previous data[4] and have a significant staffing implication. Between 3 and 4 patients presented each hour from 08h00 to 16h00, with no detectable variability in the urgency of the presentation. Night-time attendance peaked at between 4 and 6 patients per hour (through to midnight); from midnight a steady trickle of 1 to 3 patients per hour continued through the night. The mean attendance of red and orange (emergency) patients gradually increased from morning through to midnight for both adult and paediatric patients. Medical and nursing staffing should

therefore follow the same trends.

Acuity mix of patient load

The vast majority of patients – across all sites and all age groups – were in the orange or yellow triage categories. A mean of 5.3% were triaged red (827 patients), ranging from 3.1% at ER to 6.1% at GUG. Combining red and orange patients as emergencies led to a mean of between 30% and 45% of adult patients being defined in this manner. While there were fewer children and infants classified as emergencies, the lowest proportion in a single ED was 25% – still a significant workload (with a higher proportion triaged red than in adults). Similar patterns were seen with urgent patients, accounting for between 21% and 44% across all sites and ages. A corresponding pattern was seen in the routine patients, with a mean of close to 30% being classified in this group. There was an apparent increase in routine patients at ER CHC, but no attempts were made to analyse this as the purpose of this article was to provide descriptive data.

These findings illustrate that the typical workload of a CHC ED is fairly equally divided among emergency, urgent and delayed cases. The majority of all patients presented without an ambulance. Any local strategies implemented to alter the way patients are brought to CHCs would therefore have no impact since most patients self-present.

Disposal

Sixteen per cent of patients had missing disposal data: there is no reason to suppose that this group would have different characteristics from those with information available, but further comment cannot be made. Only 0.3% of patients died in the study period. Although there was a very low rate of DoAs, the authors believe that many were actually resuscitated and red on initial presentation, but noted as DoA. There is, however, no evidence to substantiate this. If this unsupported assumption is correct, this would give a death rate of up to 1%.

As expected, referrals occurred most frequently in red patients, reducing significantly as acuity decreased. It is accepted that any triage tool will have green patients requiring referral on to hospital. In this study 3% of adult patients and 4% of paediatric patients in the green category required onward referral, including cases where the ED staff were unable to confirm the diagnosis (e.g. deep-vein thrombosis), and those areas where specialist input was required (e.g. paediatric fractures).

The recorded referral rate of 6.9% is significantly reduced from that of 15% found by Frankish.[4] The reasons for this are unclear. However, the vast majority of patients in all acuity groups are dealt with at the point of first presentation, viz. the CHC ED. This has a significant implication for staffing and equipping these units.

Implications

This study suggests that the total workload of all 9 CHC EDs in the Cape Metropole is around 300 000 per year. There were clear, predictable peaks of patient attendance, which should be matched by staffing levels. As emergencies formed around one-third of the casemix, staff must be well trained in emergency medicine. Each unit had a significant paediatric caseload, with between one-fifth and one-third of these patients requiring emergency care. This has a further implication for the training needs of CHC staff, in addition to the requirements for dedicated paediatric equipment.

While the hard work and dedication of the staff who run these EDs cannot be faulted, we have concerns as to whether the level of care that can be provided is that which best serves the needs of the patients.

Conclusion

We have demonstrated that a significant proportion of the workload of CHC EDs in Cape Town is emergency or urgent in nature, presents outside of normal office hours, involves a large paediatric casemix, and typically self-presents. These data will help health planners to provide appropriate resources to match patient needs.

The authors are indebted to the doctors of the Metropolitan District Health Services of the Provincial Government of the Western Cape for their support in this project, and the dedicated staff of the CHC EDs without whose tireless input this work would not have been conceivable.

This study was funded by the Metropolitan District Health Services of the Provincial Government of the Western Cape. Both authors are employees of the Provincial Government of the Western Cape.

References

1. Gottschalk S, Wood D, Devries S, Wallis LA. A triage system for the Cape Town area: proposal from the Cape Triage Group. *Emerg Med* J 2006; 23: 149-153.
2. Wallis LA, Gottschalk S, Wood D, Devries S, Balfour C. A triage system for the Cape Town area: proposal from the Cape Triage Group. *S Afr Med J* 2006; 96: 30-32.
3. Balfour C. Emergency medicine – a new era in South African medicine. *S Afr Med J* 2006; 96: 47-48.
4. Frankish J. *Report on Trauma and Emergency Services in the Western Cape Health Department: 2000 - 2002*. Cape Town: Provincial Government of the Western Cape, 2003.
5. Cummings P. *Appraisal of the Organisation and Management of Emergency Department Services in the Western Cape*. Cape Town: Provincial Government of the Western Cape, 2004.
6. Daviaud E, Railoun A. *Rapid Review of Five After-hours Services in the CHSO-Metro Region*. Cape Town: Provincial Government of the Western Cape, 2002.

Accepted 4 May 2007.