The burden of deliberate self-harm on the critical care unit of a peri-urban referral hospital in the Eastern Cape: A 5-year review of 419 patients

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Background. Buffalo City Municipality (BCM) in the Eastern Cape (EC) has the highest susceptibility to deliberate self-harm (DSH) of any South African city. The EC also has a shortage of critical care beds.
Objective. This study reviewed DSH admissions over 5 years to the critical care unit (CCU) of Cecilia Makiwane Hospital (CMH), a large peri-urban hospital in the EC. It also examined the financial burden that DSH exerts on public-sector critical care.
Methods. DSH cases admitted to CMH's CCU between January 2006 and December 2010 were retrospectively reviewed. Patients under 13 years of age were excluded. Age, gender, admission duration, agent used, outcome and toxicology results were recorded. Cost was estimated using the Department of Health 2012 fee schedule.
Results. A total of 419 patients, comprising 17% of total CCU admissions, were included in the study. Cholinesterase inhibitors (CIs) were the most common agents ingested (55%). Compared with non-CI groups, CI patients where admitted for twice as long from admission to discharge ($p<0.0001$), but had a lower mortality rate ($p=0.0344$). No significant difference was found between gender and survival ($p=0.5725$) and between the yearly DSH CCU admission means ($p=0.052$). CI cases cost a minimum of R15 966.29 per admission and DSH CCU cases cost over R1 million per annum.
Conclusion. DSH imposes an appreciable burden on the CCU services in the EC. There is a need to better control the unregulated availability of CIs (and related public education) as well as to improve psychiatric and psychological services in the EC rural areas.

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According to the World Health Organization, nearly 1 million people die by suicide annually, ranking it amongst the top 20 causes of death for all ages globally.[1] By 2020, it is estimated that suicide will contribute more than 2% of the global burden of disease.[2] In South Africa, long-term data for completed suicide, attempted suicide and parasuicide (collectively referred to as deliberate self-harm (DSH)) are limited.[3-6] Reasons for this include poor statistical record keeping on injury and death during the apartheid years, especially for the black population; changes to the Birth and Death Registrations Act of 1992 which allow the omission of the specific manner of death from death certificate records; and until recently, a lack of systematic national data collection.[3]

SA has limited critical care resources.[7] The 2007 National Audit of Critical Care indicated that SA's public sector contains only 36% (1 783 of 4 168) of the country's high care unit (HCU) and intensive care unit (ICU) beds.[7] There is also a maldistribution of these resources, with 86% of all HCU and ICU beds found in the Western Cape, Gauteng and KZN.[7] The Eastern Cape (EC), one of the poorest provinces in the country, has a critical care bed-to-population ratio of 1:37 000, compared with 1:14 000 in the Western Cape.[7]

Within the EC, Buffalo City Municipality (BCM) consists of the towns of East London, King William's Town and Bhisho. Of its population of some 700 000 people, 64% earn less than the household subsistence level of R1 500 per month and 41% are under 20 years of age.[8] Individuals living in BCM have SA's highest probability of committing suicide.[3]

This audit involves all cases of DSH admitted to the critical care facilities of Cecilia Makiwane Hospital (CMH) in BCM over a 5-year period. CMH is a large peri-urban hospital that, with its sister institution Frere Hospital, serves a third of the EC's population of 6 million inhabitants. CMH's critical care unit (CCU) combines 6 IC beds and 6 HC beds in one unit. This is the first SA study exploring the financial burden that DSH cases exert on a limited public-sector critical care service.

Methods

The study was a retrospective review of the 5-year period from 1 January 2006 to 31 December 2010. Approval was obtained from the institutional ethics review body. Patients were recruited to the study if they were admitted to the CCU following DSH and were 13 years of age or older. All admission data were extracted from the CCU admission and discharge files. Age, gender, duration of stay, aetiology, mortality and site of residence were recorded.

The patients' toxicology investigations were reviewed using the local National Health Laboratory Service database. Admission costs were calculated using the facility fees listed in the current costing tables of the SA Department of Health.[9]

Results

During the study period 419 DSH cases where admitted to CMH's critical care facility. Table 1 lists their characteristics.

Cholinesterase inhibitor (CI) toxicity led to 55% of all admissions. Patients poisoned with CIs were unlikely to have taken other agents as well. The second most common group had ingested agents not identified by history, examination or standard laboratory testing.

Table 2 lists the top 5 agents used by admitted DSH patients. CI toxicity was caused by patients ingesting organophosphates

Table 1. Characteristics of DSH patients admitted to critical care

	Total case number (*N*)	Mean age (years)	Mean admission duration (h)	Mortality (%)
Male	196	31.31 (95% CI ±1.9)	85.62 (95% CI ±12.96)	8.67
Female	223	27.91 (95% CI ±1.18)	73.78 (95% CI ±606.86)	6.76
Total	419	29.50 (95% CI ±1.3)	79.32 (95% CI ±8.9)	7.64

Table 2. The top 5 DSH agents necessitating admission to critical care

Agent	Frequency	Overlap with other aetiologies (%)	Mean age (years)	Mean admission duration (h)	Mortality (%)
Cholinesterase inhibitors	232	2	30.4 (95% CI ±1.9)	102.45 (95% CI ±12.45)	5.45
Unknown agents	75	4	28.9 (95% CI ±2.8)	54.22 (95% CI ±15.96)	11.94
Paracetamol	45	40	27.3 (95% CI ±3.9)	50.72 (95% CI ±24.92)	7.14
Tricyclic antidepressants	35	57	30.1 (95% CI ±4.6)	43.51 (95% CI ±12.20)	6.06
Corrosive substances	15	20	28.1 (95% CI ±4.7)	60.48 (95% CI ±22.95)	15.38

or carbamates. These agents are commonly used as regulated agricultural insecticides, and cause cholinergic excess by inhibiting cholinesterase function. As direct assay of these two agents is not available at CMH, a surrogate marker (decreased serum cholinesterase levels) was used to verify clinical diagnosis. All patients with CI intoxication received aggressive standardised atropinisation therapy.

The mean admission duration was 79.32 hours (95% CI ±8.9 hours). Compared with those poisoned with other agents, patients ingesting CIs were admitted in the CCU for more than twice as long (102.45 hours, 95% CI ±12.5 hours*f*, v. 50.63 hours, 95% CI ±7.8 hours, $p<0.0001$). Only one trauma-related DSH case, a survivor of a self-inflicted hanging, was admitted to the CCU during the 5-year review period.

The overall percentage mortality was 7.64%. Mortality was significantly lower in the CI group compared with the other groups (5.20% v. 10.70%, $p=0.0344$) There were no statistically significant differences in survival between men and women ($p=0.5725$).

The annual burden of DSH cases per year at the CCU is shown in Fig. 1. DSH admissions to critical care peaked in summer and dipped during winter (Fig. 2). Although admissions appear to be decreasing, since a peak incidence in 2006 (Table 3), analysis of variance (ANOVA) testing revealed no statistically significant difference in the yearly means ($p=0.052$).

Facility costs for DSH admissions to critical care are presented in Table 3. Because the CCU at CMH combines its intensive care and high care units, it proved impossible to retrospectively determine when patients were moved from the ICU to the HCU facility, or vice versa. Therefore an averaged costing model was created to achieve a minimum average cost for each critical care admission. The daily rate of R4 831 was calculated by averaging the ICU (R6 634/day) and HCU (R3 028/day) facility costs. On the basis of clinical observation, most CI admissions spent the majority of their critical care time in the ICU and not in the lower-cost HCU.

Discussion

In 2008, DSH in SA accounted for 10% of non-natural deaths, of which the majority of patients were under 29 years of age.[10]

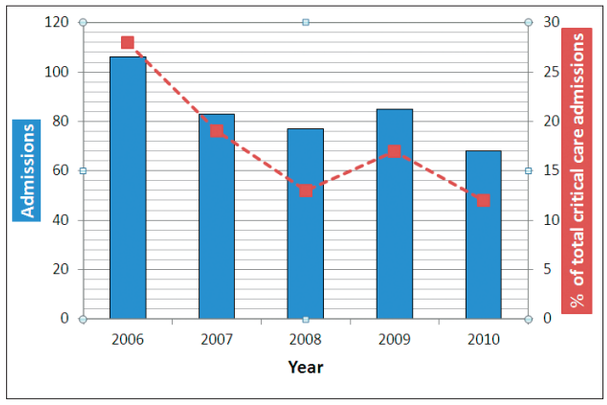

Fig. 1. Yearly DSH critical care admissions.

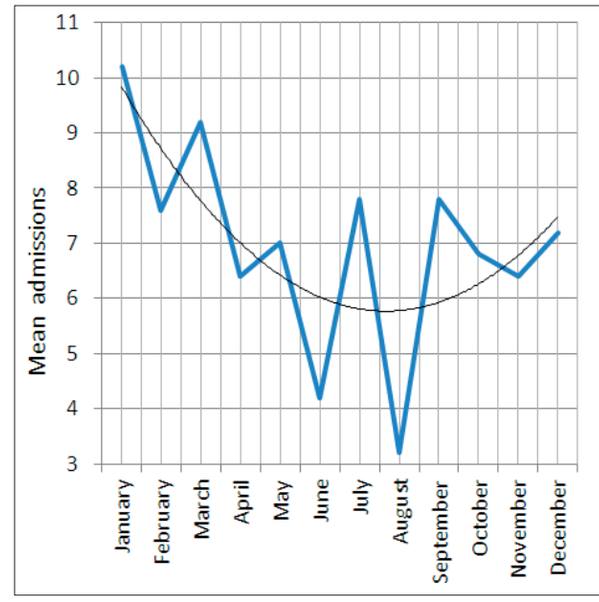

Fig. 2. Seasonal trend of deliberate self -harm cases admitted to critical care.

Table 3. Facility costs for DSH admissions to critical care

	Total case number, *N*	Cumulative cost for all cases	Average cost per admission
Cost complete dataset	419	R6 689 878.22	R15 966.29
Cholinesterase inhibitors	232	R4 784 236.59	R20 621.71
Non-cholinesterase inhibitors	187	R1 905 641.63	R10 190.59

Nationally, fatal DSH rates for males and females are estimated to be 25.3/100 000 and 5.6/100 000 respectively.[11] Non-fatal DSH is estimated to outnumber fatal DSH by up to 20:1.[4]

BCM's residents have the highest probability of fatal DSH compared with other SA cities.[3] Reasons for the high, and growing, number of cases are thought to include widespread unemployment coupled with minimal economic growth over the last decade; poor availability of healthcare and scarce psychiatric services in rural areas; and the heavy burden of HIV.[3,12]

This study reveals that CI toxicity accounts for over half of all DSH admissions to critical care and that these patients remain in the CCU for twice as long as non-CI DSH admissions. This has significant cost implications, especially for a health service struggling with a large burden of infectious disease and trauma.

It is notable that only one trauma-related DSH case was admitted to the CCU during the 5-year review period. Reasons for this scarcity include the typically fatal nature of such cases, as well as the possibility that such cases are admitted to the CCU but are erroneously documented as standard trauma cases.

Although not statistically significant, this study found that the number of DSH admissions to critical care had been slowly decreasing since a peak incidence in 2006 (Fig. 1). Possible reasons include doctors being more judicious about admitting patients to the overburdened CCU; patients not presenting to hospital; and delays in patients procuring transport to hospital, resulting in their either presenting to casualty dead on arrival or dying soon after arrival (the mean duration of transport from hospital to hospital in the Eastern Cape is 6.5 hours – the longest in the country!).[13] There is also anecdotal evidence of a small beneficial effect following intervention by local social workers, which aimed to educate the community at large about the dangers of DSH.

DSH admissions to critical care peaked in the summer months and dipped during the winter months (Fig. 2), a trend that is mirrored worldwide.[14]

National facility costs retrieved from the Department of Health were used to calculate the financial implications of the DSH burden on critical care.[9] The results are likely to be extremely conservative for several reasons. Firstly, difficulties in obtaining accurate estimates of personnel, equipment, diagnostic and therapeutic costs meant these criteria were excluded from the costing. Secondly, as discussed above, the combination of ICU and HCU beds in the CMH CCU meant that only an average ICU/HCU expenditure could be calculated per patient. As local observation suggests that CI toxicity patients (the majority of DSH CCU admissions) spend the majority of their CCU time within intensive care, the true overall minimum admission costs are likely to be much higher than the averaged ICU/HC figures. DSH critical care cases are likely to cost CMH over R1 million annually and, at 20% of total CCU admissions, impose a significant bed occupancy pressure.

It will be difficult to contain costs in the treatment of DSH patients. Proposals for reducing hospital admissions for DSH argue that many inpatients labelled 'suicidal' are hospitalised unnecessarily and are in fact low-lethality risk DSH cases.[15] However, this cannot be applied to critically ill DSH patients.

A more effective model for decreasing DSH activity in the EC would be to address the root causes of the despair these patients feel. These problems are multi-factorial and linked to high unemployment and poverty. In the EC, psychological and psychiatric services are mostly clustered around the 3 major cities of Port Elizabeth, East London and Mthatha. Given the poorly functioning referral system, and a primary clinic environment burdened with infectious diseases, patients with psychological or psychiatric problems and vulnerability to DSH risk being turned away, inadequately managed, or lost in the system.

Additionally, there is need for investigation into the production and distribution of organophosphate and carbamate agents, typically sold by street vendors as unregulated combination 'cockroach, rat and insect killer' powders in unmarked bags. DSH patients usually ingest these after mixing them with water. As this study was retrospective, it was not possible to determine whether poisoning in some patients was accidental. In this regard, there are anecdotal reports of criminal use of organophosphates and carbamates to poison meat, which is then used to kill watchdogs during robberies,[16,17] and of unscrupulous home brewers allegedly adding them to traditional beer (*umqombothi*) to add 'punch'.

Limitations

This study is limited by its retrospective nature. During data collection it was found that 4 weeks of information was missing from the critical care admission and discharge files (15 March 2006 - 31 March 2006 and 5 April 2008 - 31 April 2008) as pages had been torn out.

In addition, it was found that the time of discharge from critical care was not stated for 129 patients. In these cases it was decided to allocate a set discharge time of midday, which corresponds to the time after the medical rounds and is the usual time that patients are discharged from CMH's CCU.

Conclusion

DSH imposes an appreciable burden on the Eastern Cape's limited critical care service. As the majority of admissions are due to CI toxicity, there is urgent need for the control of unregulated organophosphate and carbamate distribution, as well as for public health education on the dangers of ingesting these substances. Lastly, there is need for improved psychiatric and psychological services in the rural areas of the Eastern Cape.

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Comparison of HTLV-associated myelopathy (HAM) in HIV-positive and HIV-negative patients at a tertiary South African hospital

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Background. HTLV-1 associated myelopathy (HAM), or tropical spastic paraparesis, is caused by a retrovirus, the human T-cell lymphotropic virus (HTLV). Although patients with HAM and HIV infection have been described, to our knowledge no direct comparison has been made between patients who are HIV positive and suffering from HAM (HHAM) v. those who are HIV negative and suffering from HAM.
Aim. We aimed to compare clinical and radiological findings in HIV-positive and -negative patients with HAM.
Methods. Adult patients who presented to the Neurology Unit at the Steve Biko Academic Hospital from May 2005 to June 2012 with a progressive myelopathy and HTLV seropositivity were retrospectively identified and their clinical and radiological data were collected and reviewed.
Results. 21 patients with HAM were identified, of whom 9 were HIV-positive and 11 HIV-negative. One patient, whose HIV status had not been established, was not included in the study. Although the trend did not reach statistical significance, co-infected patients tended to present at an earlier age (HHAM 6/9 (66%) <40 years old; HAM 2/11 (18%) <40 years old) and presented to hospital earlier (HHAM 6/9 (66%) < 3 years symptomatic; HAM 7/11 (63%) > 3 years symptomatic). Cord atrophy occurred in 7/8 dually infected patients and 8/10 HIV-negative patients.
Conclusion. Although the study is limited by the small number of patients, co-infected patients tended to have a younger age of onset and to present to hospital sooner, and thoracic cord atrophy was very common.

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Human T-cell lymphotropic virus type-1 (HTLV-1) is a type C retrovirus endemic to tropical areas. Most infected people are asymptomatic carriers, but an estimated 0.25% - 2% of carriers develop a progressive myelopathy, known as HTLV-associated myelopathy (HAM) or tropical spastic paraparesis (TSP).[1,2] HTLV-2 is more common among intravenous drug abusers, and may present with a clinical picture similar to HAM.[2]

During the last two decades, the HIV pandemic has influenced the spectrum of neurological disorders markedly – up to 40% of patients with HIV infection clinically show neurological disorders,[3] and neuropathological abnormalities are even more common. Co-infections of HIV and HTLV-1 have been described[4,5] and in South Africa a high prevalence of HAM has been found in KwaZulu-Natal,[5] with up to 36% of patients showing HIV co-infection. A study from Brazil reported on patients with HIV and HAM[4] but did not directly compare patients with and without HIV infection.