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Emergency Medical Service responses as latent social capital toward Deliberate Self-Harm, Suicidality and Suicide

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ABSTRACT

Escalation in Deliberate Self-Harm (DSH) is indicative of a rise in poor mental health and/or a failure of social and health services. The phenomenon of DSH exacerbates mental illness sequela, while being an essential indicator of suicide risk. Globally, about 800 000 people commit suicide yearly, averaging almost one suicide every 40 s. Based on a Retrospective Cross-Sectional Study, the aim sought to establish the scope of the DSH, suicidality and suicide case-load from a Western Cape Emergency Medical Services (EMS) prehospital perspective. A census of 3 years of EMS Incident Management Records (IMR) from a large rural district with seven local municipalities was undertaken using a novel data collection instrument. The 2976 (N) mental health-related incidents that met the inclusion criteria (from 413 712 cases) suggest a presentation rate of 7 per 1000 EMS calls. Sixty percent ($n = 1776$) were regarded to have deliberately self-harmed, attempted suicide or committed suicide. Overdose/deliberate self-poisoning accounted for 52% ($n = 1550$) of all the DSH caseload of the study. Attempted suicide accounted for 2.7% ($n = 83$) and Suicide for 3.4% ($n = 102$) of the suicidality case-load from the study, respectively. Suicide averaged 2.8 suicides per month in the Garden Route District over the 3-year period. Men were five times more likely to commit suicide than women, commonly using strangulation, while women mostly ingested household detergents and poison, and overdosed on chronic medication. Understandably, the EMS needs to assess its own capability to respond, treat, and transport health-care users with DSH and suicidality. This study demonstrates the EMS 'every-day' exposure to DSH, suicidality and suicide case-load. It represents a critical first step in the problem-space definition upon which a determination of the need for EMS responses can be based, to interrupt suicidality by removing methods of harm and strengthening the mental health economy through social capital investment.

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Introduction

Globally, approximately 800 000 people commit suicide yearly, averaging one person every 40 seconds (Ani et al., 2017; Klonsky et al., 2016; Kootbodien et al., 2020). Mental health problems are projected to be the leading cause of global morbidity and mortality by 2030, whilst suggesting depression to be the greatest cause of disease burden globally (Mental Health Foundation, 2016; World Health Organization, 2011). Notably, men are more likely to commit suicide than women, while women are more likely to suffer from depression and Deliberate Self-Harm (DSH) (Klonsky et al., 2016; Klonsky, 2011). Poor mental health and DSH can exacerbate depression (Arkins et al., 2013; Keyes, 2014) with suicidality a probable outcome. DSH is an intentional act of creating physical injury to oneself believed to be the causation of personal distress, usually with no intention to die (Lauw et al., 2015). Individuals who DSH do not initially have suicidal thoughts; however, DSH can provoke suicidal ideation and behaviours. Once DSH has become 'unreleasing' it can lead to suicidality, with intent to die becoming an outcome over time. DSH is one of the leading causes and indicators of suicide, found to be present in many attempted suicide and suicide history (Arkins et al., 2013; Centre for Suicide Prevention, 2017; Klonsky et al., 2016; Lauw et al., 2015; Samari et al., 2020). Suicide and attempted suicides are a burden to society and the economy (Klonsky et al., 2016). The global lifetime prevalence of suicidal ideation and attempted suicides is 9.2% and 2.7%, respectively. Suicide rates are highest amongst adults 70 years and older, however an alarming number of suicides occur between the ages of 15–29 years, the second leading cause of death for this age group (Klonsky et al., 2016). Depression, DSH, suicidal ideation and suicide attempts are distinct phenomena that produce explanations and predictors towards eventual suicide (Arkins et al., 2013; Centre for Suicide Prevention, 2017; Klonsky et al., 2016).

In 2016, Southern Africa accounted for 11 000 suicide deaths, approximating the third highest suicide mortality rate for a region (Kootbodien et al., 2020). South Africa records almost 8 000 suicides annually. This is 10% of all unnatural adult deaths and 9.5% of unnatural youth deaths (Benedict et al., 2019). South Africa experiences a quadruple disease burden, maternal, new-born and child health; HIV/AIDS and tuberculosis (TB); non-communicable diseases; and violence and injury, in the context of relentless crime, poverty, trauma and inequality (Burns, 2011). Structural social injustices constructed from Apartheid have undermined the social determinants of health (Ataguba et al., 2015). This creates societal-level socioeconomic risk factors for mental health issues (Burns, 2011), namely the social determinants of mental health (Compton & Shim, 2017). This can exacerbate into DSH, suicidality and suicide. The prehospital EMS practices emergency medicine, a time-sensitive care for health-care users with any illness, injury or emergency through a systems-based approach encompassing all health system components (Christopher et al., 2014; Naidoo, 2017). Emergency care in the prehospital setting has helped to manage, diagnose and treat injury and illness while providing health action to address emergent health conditions (Naidoo, 2017). It needs to be considered that emergency medicine is the only discipline with 'universality' and 'responsivity' at the point of need (Christopher et al., 2014, p. 156; Naidoo, 2017); thus, placing the prehospital EMS in a position to manage and treat DSH case-load. However, there is no evidence

of how DSH and mental health case-load are received by the South African EMS community. Understanding the scope of a health problem and its demand on emergency medical services can influence the health-care system response.

The majority of studies that address DSH, suicidality, suicide and mental health prevalence have a history of poor socio-economic circumstances and poverty (Ani et al., 2017; Benedict et al., 2019; Finkelstein et al., 2015; Kootbodien et al., 2020; Ritchie & Roser, 2018). It was assumed that DSH, suicidality, suicide and mental health cases would be received by the prehospital EMS. The emerging question was as follows: What is the caseload of DSH, suicidality and suicide presenting to a South African EMS health district? The aim of this research was to establish the scope of the DSH, suicidality and suicide case-load from a Western Cape prehospital EMS perspective. Understanding these case-loads could strengthen policy and praxis, to improve EMS inputs and to provide capacity for a safe working environment for Emergency Care Providers.

Methods

Research Design

The Garden Route District, as a rural district with poor socio-economic circumstances (Western Cape Government, 2019) was the study site. The research design was a retrospective cross-sectional study. A census approach to the public Western Cape Government Emergency Medical Service (WCEMS) health-care users Incident Management Records (IMRs) in the Garden Route District, Western Cape (South Africa) from 2017 to 2019 was the source of the data. The inclusion criteria focused on the health-care users presenting with mental health needs and spanned three (3) consecutive years. All IMRs pertaining to accidental poisoning of children under 8 years were excluded. The WCEMS database provided incident types that were used as the basis of the inclusion criteria; namely, Psychiatric/Behavioural Problems, Self-Harm-other, Self-Harm-poisoning, and Inter-facility transfer (IFT)-psychiatric/behavioural problem. These *a priori* categories (incident types) house archival data pertaining to health-care users with probable psychiatric problems, a history of having committed self-harm, overdose, suicide or needed ambulance transfer to a psychiatric facility. The sampling included every EMS IMR pertaining to these incident types in the reporting period. The data source that housed the archival data for the census is a database used by the WCEMS, where all the health-care users who present to the WCEMS are recorded. This data source is controlled by the WCEMS Emergency Communications Centre and is generated by emergency call takers and ambulance dispatchers.

Study population

The Garden Route District is one of the six district municipalities of the Western Cape, and contains seven local municipalities (Western Cape Government, 2019). From the screening of 413 712 EMS IMRs (health-care users/service users), 2976 (N) EMS IMRs (health-care users) met the inclusion criteria, suggesting 7 mental health presentations per 1000 EMS calls. Of the 2976 (N), 1776 (n) health-care users presented with non-fatal and fatal DSH (overdose, self-harm, attempted suicide and suicide).

Data collection and analysis

Data were analysed using 'R' statistical software (R Core Team, 2020). Logistic regression, Pearson's chi-squared test of association and Fisher's exact test were used to identify associations of interest. Logistic regression models allow analysis of the relationship between a binary response variable (e.g. Overdose or No Overdose) and one or more predictor variables, which could be numerical (e.g. Age) or categorical (e.g. Gender). The p -value of a significance test on the model coefficient(s) allows one to infer whether a relationship exists between the response variable and the predictor(s). The magnitude of the effect (if present) is typically expressed in the form of an expected odds ratio. Pearson's chi-square test of association tests for a relationship between two categorical variables (Bolboacă et al., 2011). 'The null hypothesis (H_0) states there is no association between two variables while the alternative hypothesis (H_a) states there is association between two variables' (Bolboacă et al., 2011). Pearson's chi-square p -value on its own can provide evidence that a relationship exists, but provides no nature or direction of the relationship. Fisher's exact test was used in place of Pearson's chi-square test in cases where the expected frequencies were too small for the distributional assumption of the Pearson chi-square test to be accurate (Bolboacă et al., 2011).

Results

Between January 2017 and December 2019, 60% ($n = 1776$) of the sampled health-care users that presented to the WCEMS were for Deliberate Self-Harm (DSH), suicidality and suicide. This was grouped as 'Overdose/Deliberate Self-Poison' ($n = 1550$), 'Cutting Self-Harm' ($n = 41$), 'Attempted Suicide' ($n = 83$) and 'Commit Suicide' ($n = 102$). Associations of interest illuminated DSH case load, and how it manifests in health-care users from this locale. DSH caseload presented in 1776 (n) health-care users, from the census population of 2976 (N).

'Overdose/Deliberate Self-Poison (DSP)'

'Overdose' or 'DSP' presented in 52% ($n = 1550$) of 2976 (N). The mechanism for overdose/poisoning (Table 1) presented as 'unspecified substance', 'poison', 'chronic medication', 'over-the-counter medication', 'multi-medication', 'multi-chronic medication', 'prescription medication' and 'Alcohol and Drugs' (substance abuse).

Table 1. Overdose case-load by type.

Category	Frequency (n)	Relative Frequency (%)
Unspecified substance	1013	65.4%
Poison	214	13.8%
Chronic medication	148	9.5%
Over-the-counter medication	59	3.8%
Multi-medication	39	2.5%
Multi-chronic medication	26	1.7%
Prescription medication	26	1.7%
Alcohol and Drugs	24	1.5%

Table 2. Attempted Suicide case-load by type.

Category	Frequency (n)	Relative Frequency (%)
Strangulation death	51	61.4%
Overdose/DSP	11	13.3%
Unspecified	8	9.6%
Parasuicidal	6	7.2%
Cutting self-harm	5	6%
Jump from moving vehicle	2	2.4%

‘Cutting Self-Harm’

‘Cutting Self-Harm’ (CSH) was present in 1.3% ($n = 41$) of 2976 (N). These mechanisms of CSH were cuts to wrists, neck and throat.

‘Attempted Suicide’

‘Attempted Suicide’ presented in 2.7% ($n = 83$) of 2976 (N). The mechanism for attempted suicide was ‘*Strangulation death*’ (*hanging*), ‘*Overdose/DSP*’, ‘*Unspecified*’, ‘*Parasuicidal*’ (a phenomenon where there is an apparent attempted suicide with no intention of death), ‘*cutting self-harm*’ and ‘*jump from moving vehicle*’ (Table 2).

‘Commit Suicide’

‘Commit Suicide’ presented in 3.4% ($n = 102$) of 2976 (N). This presented 34 suicides a year at almost 3 suicides per month for 3-years (2017–2019). The mechanism for suicide was ‘*Strangulation death*’, ‘*Overdose/DSP*’, ‘*jump from height*’, ‘*Gunshot*’ and ‘*Cutting Self-Harm*’ (Table 3).

Associations of Interest

Age and gender relationships with attempted suicide, suicide and overdose status were analysed to investigate if there were any significant factors in association. A significance level of 0.05 was used throughout. We ran three logistic regression models (Table 4) where age was used as an independent variable and ‘Attempted Suicide’, ‘Suicide’ and ‘Overdose’ were used, respectively, as dependent variables. Age was not a predictor of occurrence of attempted suicide ($p = 0.3095$) or committing suicide ($p = 0.3089$). However, age was found to be a predictor of the occurrence of overdose ($p < 0.001$).

Table 3. Suicides case-load by type.

Category	Frequency (n)	Relative Frequency (%)
Strangulation death	82	82%
Overdose/DSP	11	11%
Jump from height	4	4%
Gunshot	1	1%
Cutting self-harm	1	1%

Table 4. Logistic Regression Models for Adverse Events with Age as Predictor.

Age distribution for:	Explanatory Variable	Estimate	Std. Error	z value	Pr(> z)
<i>Attempted Suicide</i>	(Intercept)	-3.422	0.3198	-10.70	<0.001
	Age	-0.009234	0.009085	-1.016	0.3095
<i>Commit Suicide</i>	(Intercept)	-4.467	0.3882	-11.51	<0.001
	Age	0.01006	0.009888	1.018	0.3089
<i>Overdose</i>	(Intercept)	0.7994	0.1016	7.869	<0.001
	Age	-0.02867	0.002823	-10.16	< 0.001

Table 5. Contingency Tables of Adverse Events by Gender.

Variable	Yes/No	Female	Male	Male/Female OR
<i>Attempted suicide</i>	No	1733	1069	2.053
	Yes	30	38	
<i>Commit Suicide</i>	No	1749	1064	5.046
	Yes	14	43	
<i>Overdose</i>	No	790	776	0.3465
	Yes	973	331	

The log-odds estimate was -0.02867 , suggesting that the probability of an overdose decreases with age. The median ages for these three adverse events were 30, 36 and 29 years old, respectively.

Relationships between gender and the three respective adverse events (attempted suicide, suicide, overdose) were analysed using Fisher's exact test of association. Two gender categories (female and male) were present in the data. Table 5 summarises the three 2×2 contingency tables on which Fisher's exact tests were computed. In all three cases, a statistically significant relationship was identified between gender and the adverse event (attempted suicide: $p = 0.003615$; committed suicide: $p < 0.001$; overdose: $p < 0.001$). For attempted suicide (OR = 2.053) and committing suicide (OR = 5.046), the odds ratio estimates (odds of adverse event for males divided by odds of adverse event for females) were above one, indicating that males are at higher risk than females. For overdose (OR = 0.3465), the odds ratio estimate was below 1, indicating that females' odds of overdosing are nearly three times as high as that of males.

Fisher's Exact Test was used to analyse associations with gender and method of suicide (Table 6). Suicide and attempted suicide were combined to increase the frequencies, thus having a better chance of finding an effect between gender and method of suicide/attempted suicide. A statistically significant association was found between gender and method of suicide or attempted suicide ($p = 0.0002137$). The male-vs-female odds ratio estimate for use of strangulation as compared to overdose or poisoning was far above one (7.733), suggesting that males are far more likely to use strangulation than females in the study site.

Table 6. Contingency Table of Suicide Method by Gender.

Variable	Female	Male	Male/Female OR for Strangulation
Overdose or Poisoning	13	5	7.733
Strangulation	21	64	

Note: p -value = 0.0002137; Alternative hypothesis: two.sided.

Discussion

DSH, suicidality and suicide manifest in the Garden Route District. Data analysis presented DSH, suicidality and suicide case-load at 60% ($n = 1776$) of the IMR (health-care users) from the census. Overdose/DSP provided the highest presentation of 52% ($n = 1550$), attempted suicide presented 2.7% ($n = 83$) and suicide presented in 3.4% ($n = 102$) of the cases from the census. On average, 2.8 suicides took place a month during the study period. Further analysis elucidated that males were more likely to 'commit suicide' than females, using strangulation, while females were more likely to 'overdose'. The probability of an overdose decreased with age, while men were more at risk of attempting suicide.

The overdose/DSP data set interestingly showed similar values to studies done in rural areas of Uganda, Zimbabwe, Sri Lanka, Kenya, Nigeria and Ethiopia where poisoning (pesticide) was a common DSP agent (Gunnell et al., 2007; Karunaratne et al., 2019; Malangu, 2008; Senarathna et al., 2008; World Health Organization, 2014). Studies done in Paarl (Western Cape) and Northern Kwa-Zulu Natal in South Africa also presented similar findings with females the biggest victims of overdose and DSP (Ani et al., 2017; Laubscher & Van Rooyen, 2007). Surviving DSP is not uncommon, however after the first episode the risk of long-term suicide could be extensive (Benedict et al., 2019; Finkelstein et al., 2015). Noteworthy are the attempted suicide and suicide rates from the study. At an average of 2.8 suicides per month over 3 years, the presence of attempted suicides and overdose in the data analysis suggests that suicide may be imminent. Individuals who have made prior attempts at suicide have a higher likelihood of death by suicide, compared to individuals who have not attempted suicide (World Health Organization, 2014). Suicide by strangulation or hanging as a common suicide mechanism is reified by this study. Suicidal hanging is one of the most common causes for suicide globally due to its lethality, with 70% of the suicidal hanging attempts ending in fatality (Klonsky et al., 2016; Rahman et al., 2017). Associations were found between gender types and suicide in this study, where men presented as more likely to commit suicide. Globally, men have been found to commit suicide twice as often as women (Ritchie et al., 2015). South Africa records almost 8 000 suicides annually (Benedict et al., 2019) with method varying by opportunity (availability and access), cultural, religious and social norms and socioeconomic variances (Kootbodien et al., 2020).

The analysis provided similar results to global suicide norms and other local studies on suicide (Kootbodien et al., 2020), but surprisingly no clinical guidelines are used to quality assure the management and treatment of DSH, suicidality and suicide case-load from a prehospital perspective. Care for mental illness is governed by the Mental Health Care Act 17 of 2002, however no EMS policy is in place to govern responses (Lund et al., 2011). In South Africa mental health services are integrated at primary health-care level, whereby clinics and EMS ambulance services (WCEMS) interact with mental health-care users before hospital intervention is initiated. However, a shortage of trained professionals, stigma, lack of knowledge and no policy (Jacob & Coetzee, 2018) creates barriers for the management and treatment of this marginalised group. With an average of 2.8 suicides a month, a myriad of overdose/DSP and presence of suicidality in the Garden Route District, the public EMS (WCEMS) has to manage, treat and transport DSH, suicidality and suicide case-load, dealing with the consequences of such cases. This puts

the EMS at the forefront of such case-load and provides implications for practice. The EMS needs to be aware of an increase in this case-load while taking on a risk assessment, to improve on capacity to manage, treat and transport these health-care users. This latent capacity may contribute to social capital investment in the mental health economy (Fleming, 2007). The fact that Emergency Care providers provide care in people's lives and work, uniquely positions them to interrupt suicidality and DSH in the future by deliberately limiting access to methods of harm (Florentine & Crane, 2010).

Conclusion

Prior to this study, prehospital DSH, suicidality and suicide case-load were undocumented; however, a problem space has been identified, creating a need to act. The EMS operates in the public health sector and harbors the latent ability to promote human rights and could enhance mental health-care accountability (Waldron, 2014) in the health sector. For this, it is recommended that the WCEMS create policies to quality assure these health-care interactions with a deliberate attempt to avoid stigmatisation. An assessment of practitioner clinical capacity and competency needs to be evaluated amongst EC providers and to establish management practice standards of DSH, suicidality and suicide case-load. It is also significant to realise that health-care users with poor mental health at the point of suicidality can pose a risk to themselves, communities and care providers. Thus, scene safety needs to be considered for practitioners as well as assessing the risk of direct and vicarious traumatization of care providers. This study demonstrates the EMS exposure to DSH, suicidality and suicide case-load. It represents a critical first step in the problem-space definition, upon which a determination of need for EMS responses can be based, social capital contributions by EMS levered and suicidality and DSH interrupted.

Limitations of the study

The inherent limitations of retrospective data apply. Emergency call takers are not trained medical personal and do not have comprehensive medical protocol to guide their capacity on the subject. It is also worth noting that the culture and vernacular of the health-care users presents challenges in reporting.

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