

Emergency service use is common in the year before death among drug users who die from an overdose

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Abbreviated title: Emergency service attendance prior to fatal overdose

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Abstract

Aims

This study compares the characteristics of those who were or were not attended by the emergency services in the year before death. It describes the reasons for emergency service attendance and the prevalence of such attendance. It reports the number of days between the last emergency service attendance and death and examines contact with other health and social services and the association of this with emergency service attendance. Finally, it examines the association between frequency of emergency service attendance and frequency of contact with other services.

Methods

A retrospective registry study where all overdose fatalities (n=231) in Oslo, Norway (2006-2008) were identified through the National Cause of Death Registry and linked with data from other health and social services.

Results

Overall, 61% were emergency service attendees and 18% were frequent attendees. Somatic complaints were the most common reason for attendance. Attendees were more known to a number of other services compared to the non-attendees. Furthermore, there was an association between frequency of emergency service attendance and frequency of contact with other services.

Conclusions

Screening for drug use among emergency service attendees may be a way to identify those at risk of overdose death and enable the introduction of additional interventions.

Keywords: Drug-induced deaths, overdose, emergency service

Word count: 2,671

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Introduction

People who inject drugs (PWID) are at risk of premature death (Bargagli et al., 2005; Beijer, Andreasson, Agren, & Fugelstad, 2011; Davstad, Allebeck, Leifman, Stenbacka, & Romelsjo, 2011; May et al., 2015; Weber et al., 2015). One of the leading causes of death in this population is opioid overdose (Degenhardt, Larney, Randall, Burns, & Hall, 2014; Stenbacka, Leifman, & Romelsjo, 2010). There is extensive knowledge about possible risk factors for overdose such as, being outside of drug-treatment, older age, **depression**, length of injecting career and combining opioid injections with alcohol and/or benzodiazepine use (Bartoli et al., 2014; Bohnert, Roeder, & Ilgen, 2011; Clausen, Anchersen, & Waal, 2008; Dilokthornsakul et al., 2016; Jones & McAninch, 2015; Riley et al., 2016; Wichmann, Nielsen, Siersma, & Rasmussen, 2013; Winstanley & Clark, 2015). Despite this knowledge, mortality rates due to overdose remain high in many developed countries (Emcdda, 2015). It is important to identify at-risk populations in the community more effectively and support those identified with appropriate interventions in order to lower the overdose mortality rates.

However, the population at risk is heterogeneous (Gjersing et al., 2013), so it is a challenge to identify and target all those at risk. **Identifying services which are in frequent contact with at risk populations and introducing preventive measures within these services could be one way to reach the target population. Substance use is a frequent reason for emergency departments admissions (Byrne et al., 2003; Calle, Damen, De Paepe, Monsieurs, & Buylaert, 2006; Deutch et al., 2004; Holzer et al., 2012), and one study found that as many as 41% of patients examined in an emergency trauma unit had a positive drug-screening (Buchfuhrer & Radecki, 1996). Ambulance services also play an important role in reducing the number of drug-related**

deaths through acute treatment of drug overdoses (Gjersing & Bretteville-Jensen, 2015; Heyerdahl et al., 2008; Krayeva et al., 2013; Lund et al., 2012; Wampler, Molina, McManus, Laws, & Manifold, 2011). Emergency services are therefore likely to be contexts where individuals at risk could be identified and preventive measures could be introduced.

Furthermore, frequent emergency service attendance has been associated with elevated risk of mortality (Gunnarsdottir & Rafnsson, 2006; Stooze, Dietze, & Jolley, 2009). To identify frequent emergency service attendees who also use drugs could be one way to identify the population at risk.

Frequent emergency service attendance has been associated with frequent contact with other health and social services (Kerr et al., 2005; Raven, Doran, Kostrowski, Gillespie, & Elbel, 2011; Thanacoody, Jay, & Sherval, 2009). Identifying emergency service users who also use other services may help identify those at risk. Further investigation of rates and patterns of health and social service attendance in the time prior to a fatal overdose may help clinicians to understand better what characterizes high-risk individuals and how they can potentially be reached with preventive measures.

In this study, emergency service attendances among all those who died from an overdose between 2006 and 2008 in Oslo were examined retrospectively through patient records and registries. The specific aims were 1) to compare the characteristics of those who were and were not attended by the emergency services in the year before death, 2) to describe the reasons for emergency service attendance and the prevalence of such attendance, 3) to report the number of days between the last emergency service attendance and death, 4) to examine contact with other health and social services and the association of this with emergency service attendance, and 5) to examine the association between frequency of emergency service attendance and frequency of contact with other health and social services.

Methods

Setting

Oslo is the capital of Norway with approximately 600 000 inhabitants. The city has one public acute care clinic that provides same-day, walk-in appointments to the whole region. The clinic comprises an outpatient acute care clinic providing medical, psychiatric and social service emergency care and it is managed by the municipality of Oslo. In addition, it comprises an outpatient acute surgical care clinic that is a department within Oslo University Hospital. Additionally, the city has a public ambulance service that provides healthcare to all of Oslo and refers patients to the acute care clinic.

Design and sample

This is a retrospective registry study that included all those between 15 and 65 years that died in Oslo from overdose between January 1st, 2006 and December 31st, 2008 (n=231). In 2006, the number of deaths was 88, in 2007 it was 66 and in 2008 it was 77. These deaths represent 1/3 of all registered overdose deaths in Norway during the study period (n=774). More details about design, study setting and sample are described in earlier published papers (Gjersing et al., 2013; Tjagvad, 2016).

Inclusion criteria

Subjects were included according to the classification of the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) for “drug-induced deaths” (EMCDDA, 2009). In this paper these deaths are referred to as overdose deaths. Subjects were initially identified through the National Cause of Death Registry. All individuals in Norway have a unique personal identification number (Social Security number) and for matching purposes, the data received from the National Cause of Death Registry included full name, social security number and date of birth.

Data from National Cause of Death Registry were merged with data from the Institute of Forensic Medicine and data from Norwegian Correctional Services. The data were also merged with data from patient records from other services in Oslo. These services were ambulance services, the public acute care clinic, three hospitals (psychiatric and somatic wards), the community health nursing programme, public and private drug treatment and opioid **maintenance** treatment (OMT), low threshold services (street health clinics, injection room, hospital for substance users, housing services and outreach services) and the public social welfare services.

The study was approved by the Norwegian Regional Ethics Committee. The Higher Prosecuting Authority approved access to autopsy reports.

Definition of an emergency service attendance and frequent service use

An emergency service attendance was defined as an attendance by ambulance services or a visit to the acute care clinics within the year prior to death. Frequent service use was defined in the same way as similar studies as four or more attendances in a year (Byrne et al., 2003; Wajnberg, Hwang, Torres, & Yang, 2012).

Data analysis

All data analyses were completed in stata 14.1. Differences in individual characteristics between those who were and were not attended by the emergency care services were tested using student's t-test for differences in mean and chi square for proportions.

We examined the associations between the use of other health and social services (attended=1 vs. not-attended=0) and emergency services attendances (attended=1 vs. not-attended=0) using bivariate logistic regression analyses. The results reported from this set of bivariate logistic regressions included the prevalence rates and associated odds ratio (OR) and 95% confidence intervals (CI).

Thereafter, we examined the association between frequency of emergency service attendances and the cumulative sum of other health and social services attended in the year before death using linear regression analysis. Finally, we examined the associations between the frequency of emergency service contact and the frequency of use of other health and social services¹ using linear regression analysis. We first reported bivariate associations between the frequency of emergency service attendance and the frequency of use of each other individual service; then we reported the results from a multivariate regression with all the remaining services accounted for simultaneously. In all linear regression models, those with no emergency service attendance were assigned a value of '0' visits.

¹ Note: Frequency of service use data were available for only six out of nine other health and social services: 1) social services, 2) hospitals, 3) community health nursing programmes, 4) the injection room, 5) street health clinics and 6) outreach services.

Results

Among the 231 who died from an overdose in Oslo, Norway between 2006 and 2008, 141 (61%) had been attended by emergency services in the year before they died.

Comparison between emergency service attendees and non-attendees

There were no statistically significant differences in individual characteristics between emergency service attendees and non-attendees, (Table 1). The mean age was similar in both groups (37.2 and 37.4 years). The majority were male and registered as residents in Oslo according to the public population registry. Only a small proportion was released from prison in the six months before death; 5% of the attendees and 4% of the non-attendees. In both groups, 24% were found dead outdoors or in a public building. The majority died from a heroin intoxication in combination with benzodiazepines and/or hypnotics (85% and 89%). The mean number of drugs involved in the overdose was 3.1 in both groups.

Insert Table 1 approximate here

Reasons for emergency service attendances

Among the 141 who attended emergency service, somatic complaints were the most common reason (48%) (Table 2). Injury was the second most common reason (44%), followed by drug and alcohol related reasons (32%). The fourth most common reason for an emergency attendance was “overdose” (26%).

Insert Table 2 approximate here

Time between last attendance and death

The individuals died a median 56 days after their last emergency service attendance. One died on the same day as the emergency attendance. The maximum time between attendance and death was 362 days.

Use of other health and social services and the association of this with emergency service attendance

Table 3 shows that a higher proportion of the emergency service attendees (n=141) had been in contact with social services (55% vs 36%) and been admitted into hospitals (51% vs. 28%) in the year before they died compared to non-attendees (n=90). A slightly higher proportion of the emergency service attendees (6%) had visited the injection room in the year before death compared to the non-attendees (1%). In addition, a higher proportion of the emergency services attendees (19%) had been attended by outreach services in the year before death (3%).

Those who had been in contact with social services or admitted to hospital in the year before death were more than twice as likely than those not in contact to be among the emergency service attendees rather than the non-attendees (OR= 2.2 95% CI= 1.3; 3.9 and OR=2.7 95% CI= 1.5; 4.8, respectively). Furthermore, those who had been in contact with outreach services were seven times more likely than those not in contact to be among the emergency service attendees 6.9 (95% CI= 2.0; 23.4).

Insert Table 3 approximate here

Frequency of emergency service attendance and its association with frequency of attendances to other health and social services

Overall, the mean number of emergency attendances was 4.7 (sd 5.7) with a range between 1 and 39. Of the 141 attendees, 52 (37%) were frequent emergency service attendees (≥ 4 visits). These 52 high frequency attendees were responsible for 496 (75%) of the total 656 emergency attendances recorded.

Using linear regression analysis, a significant association was found between frequency of emergency service attendances and the cumulative total of other health and social services

attended in the year before death. One additional emergency attendance was associated with an addition of 1.2 other services attended (b=1.2 95% CI= 0.9; 1.6).

Furthermore, there was a significant association between the frequency of emergency service attendances and the frequency of use of other health and social services (Table 4). In the bivariate linear regression analyses, one additional emergency attendance was associated with a 0.2 addition in social service visits (b=0.2 95% CI= 0.0; 0.2), an addition of 2.1 visits from the community health nurse (b=2.1 95% CI= 1.0; 3.1), an addition of one visit to the injection room (b=1.0 95% CI= 0.6; 1.4) and an addition of 0.1 attendances by outreach services (0.1 95% CI= 0.1; 0.2). The associations remained similar and statistically significant in the multivariate regression model.

Insert Table 4 approximate here

Discussion

Among the 231 people who died from an overdose in Oslo, Norway between 2006 and 2008, the majority had been attended by emergency services in the year before they died. Somatic complaints were the most common reasons for attendance. In general there were almost two months between the last emergency attendance and death. Those who used emergency services appeared to be well known to a number of other health and social services. Moreover, there was a significant association between frequency of emergency services and frequency of use of other health and social services. Among the 141 emergency service attendees, slightly more than 1/3 were frequent attendees (≥ 4 attendances). These high frequent attendees were responsible for the majority of the total emergency attendances.

In line with previous research (Kerr et al., 2005; Perron et al., 2011; Thanacoody et al., 2009), a large proportion (61%) of those who died from an overdose had used emergency services in the year before they died. This suggests that emergency services reach a large proportion of the population at risk and these are likely to be services where additional interventions could be introduced to reduce the risk of mortality from overdoses.

A non-fatal overdose is associated with increased risk from a subsequent overdose (O'Driscoll et al., 2001; Stoope et al., 2009). This study included only those who had died from an overdose. Although 16% of these individuals were attended by emergency services for a non-fatal overdose in the year before death this was not the most common reason for attendance. Instead, the most common reason for emergency service attendance was somatic reasons. This suggests that it is not sufficient to identify only those attended for an overdose or obviously “drug-related diagnoses” in order to reach the population at risk because diagnoses other than overdose appear to be the main reasons for use of emergency services. If emergency services are to introduce preventive measures towards those at risk of overdose, these individuals need to be identified by other means than “drug-related” current diagnosis.

High frequency use of emergency services, regardless of diagnosis, has been associated with an elevated mortality risk (Binswanger et al., 2008). In previous studies, the proportion of frequent attendees ranges from 1.5 to 8% (Knowlton et al., 2013; Kushel, Perry, Bangsberg, Clark, & Moss, 2002; Wajnberg et al., 2012), which is much less than the 23% of frequent attendees from our study population (n=231). However, previous studies have mainly recruited their participants through emergency services and not in a population of only deceased individuals. This may be why our study had a higher proportion of frequent attendees compared to previous reports. Identifying frequent attendees may therefore be one way to reach at least some of those at risk of a fatal overdose.

Those who used emergency services appeared to be well known to a number of other services. Furthermore, frequency of emergency attendances was associated with the frequency of use of other health and social services. Many studies have found a similar association (Byrne et al., 2003; Doupe et al., 2012; Moe et al., 2015). These findings suggest that the emergency attendees have a high level of co-morbidity and are likely to be in need of treatment from several different services. These individuals are, therefore, likely to be seen regularly by a number of service providers but limited communication and coordination between services may prevent frequent service users' being identified as high-risk individuals.

Strengths and limitations

One of the strengths of our study is that it comprises all overdose fatalities in the largest city in Norway between 2006 and 2008. The availability of registries based on social security numbers in Norway is fairly unique. The study gives extensive information about emergency service use in the year before overdose death, as well as information about use of other health and social services. The lack of a comparison group is a limitation, and it is not possible to establish formal predicative factors for a fatal overdose or service use. Furthermore, some attendances and visits are likely to be unreported in patient records because of factors such as

time constraints or staff who forget to make notes. Thus, the number of service attendances reported in this study is probably a conservative estimate. In addition, not all hospitals in Oslo were included in the data collected so the number of hospitalisations is likely to be underestimated.

Conclusion

The findings suggest that those at risk of fatal overdose attend emergency services for a range of complaints that are not necessarily directly drug-related. This study has also shown that identifying only those attended for an overdose or those who are frequent emergency service attendees is not sufficient to reach the population at risk of fatal overdose. **We therefore suggest that screening for risk behaviours such as multiple drug use, injecting, and previous non-fatal overdoses should be standard care for emergency service attendees, regardless of current diagnosis.** Furthermore, distribution of take-home naloxone is associated with reduced overdose risk (Strang et al., 2008) and should therefore be considered for opioid users. Most importantly, swift referrals and easy access to drug treatment services such as OMT is also likely to reduce the number of fatal overdoses (Clausen et al., 2008). Further research should focus on collaboration between the different services that are in regular contact with drug users and should explore ways of optimizing a comprehensive and well-coordinated approach towards this vulnerable group.

Conflict of interest

The authors report no conflict of interest

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Table 1: Individual characteristics of those who were and were not attended by the emergency care services in the year before death in a population who died from an overdose in Oslo, Norway between 2006 and 2008

	Emergency service attendees (n=141)	Non-attendees (n=90)
Mean age (sd)	37.2 (10.8)	37.4 (9.6)
Male	111 (79%)	69 (77%)
City residents ^a	99 (70%)	59 (66%)
Released from prison in the 6 months before death	13 (9%)	5 (6%)
Found dead outdoors or in a public building	34 (24%)	22 (24%)
Heroin main intoxicant	91 (65%)	61 (68%)
combined with benzodiazepines/hypnotics ^b	120 (85%)	80 (89%)
combined with ethanol	7 (5%)	4 (4%)
Mean no. of drugs in toxicology reports (sd)	3.1 (1.2)	3.1 (1.3)

^a Individuals registered in the public population registry as Oslo residents

^b flunitrazepam, diazepam, nitrazepam, alprazolam, oxazepam, klonazepam, fenazepam, alimemazin, prometazin, zolpidem, zopiclone

Notes: Differences in individual characteristics between those who were and were not attended by the emergency care services were tested using student's t-test for differences in mean numbers and chi square for proportions. None of the differences were statistically significant.

Table 2. Classification of reasons for emergency service attendances and the prevalence of such attendances.

Category ^a	Diagnosis in patient records included into the categories for reasons for attendances	Individuals with attendance n=141 (100%)
Overdose		36 (26%)
Drug and alcohol related	All types of intoxications due to substance use, including alcohol intoxication, chronic alcohol abuse, and acute alcohol abuse. Mental and behavioural disorders due to psychoactive substance use, and prescription drug abuse and drug abuse	45 (32%)
Psychiatry	Depressive episodes and symptoms, anxiety, paranoid schizophrenia and post traumatic stress disorder, all types of psychosis that were not drug related, and episodes diagnosed as psychiatric disorder or psychiatric assessment	31 (22%)
Somatic complaints	All infections, gastro-intestinal diseases, neurological diseases, pain (including head, back, shoulder, abdominal), chronic obstructive pulmonary disease, HIV, hepatitis C, diabetes, dizziness, wound care, cardiac disorders, fever and similar conditions that could be defined as somatic causes. Prescription renewal, transportation and home visits	68 (48%)
Injury	Assaults, fall, fractures, sprains, injury from car accidents and other bodily trauma.	62 (44%)
Unconscious		17 (12%)
Brought in by the police		5 (4%)
Left before consultation		10 (7%)
Social emergency services	Acute/sudden homelessness, lack of food, clothes or money, general advice	22 (16%)

^aThe categories are not exclusive. An individual could have more than one type of attendance

Table 3. Attendance to other types of health and social services, and emergency services in the year before death. Shown are the prevalence rates, as well as the corresponding associations between attendance to other type of services and attendance to emergency services.

Type of service attended	Emergency service attended		OR (95% CI) ^a
	Yes n=141 (100%)	No n=90 (100%)	
Social service attendance (yes=1)	78 (55%)	32 (36%)	2.2 (1.3; 3.9)*
Hospital admission (yes=1)	72 (51%)	25 (28%)	2.7 (1.5; 4.8) *
Community health nurse attendance (yes=1)	24 (17%)	9 (10%)	1.8 (0.8; 4.2)
Public and/or private drug treatment (yes=1)	36 (26%)	14 (16%)	1.9 (0.9; 3.7)
Opioid maintenance treatment (yes=1)	17 (12%)	12 (13%)	0.9 (0.4; 2.0)
Low threshold service attendance (yes=1)			
Injection room	9 (6%)	1 (1%)	6.1 (0.8; 48.7)
Street health clinics	20 (14%)	8 (9%)	1.7 (0.7; 4.0)
Housing services	22 (16%)	8 (9%)	1.9 (0.8; 4.5)
Outreach services	27 (19%)	3 (3%)	6.9 (2.0; 23.4)*

*p< 0.01

^aExamined using bivariate logistic regression analyses

Table 4. The associations between the frequency of emergency service attendances and frequency of use of other health and social services (n=231)^a

Frequency of	Bivariate b (95% CI)	Multivariate b (95% CI)
Social service visits	0.2 (0.1; 0.2)**	0.1 (0.0; 0.1)*
Hospitalizations	0.1 (-0.0; 0.1)	0.0 (-0.0; 0.1)
Visits from the community health nurse	2.1 (1.0; 3.1)**	1.9 (0.9; 2.8)**
Visits to the injection room	1.0 (0.6; 1.4)**	0.9 (0.5; 1.3)**
Visits to the street health clinics p=0.053	0.1 (-0.0; 0.2)	0.1 (-0.0; 0.2)
Outreach service attendance	0.1 (0.1; 0.2)**	0.1 (0.; 0.1)*

*p<0.05 **p<0.001

^aExamined using linear regression analysis

Notes: Maximum no. of services was nine, but total number of attendances was only available for six of the services.