

DOI: 10.21767/2471-853X.100078

The Contributions of 4 Narcotic Analgesics to Accidental Drug Overdose Deaths in One County in Florida from 1998 to 2017

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Received date: August 01, 2018; **Accepted date:** August 29, 2018; **Published date:** September 05, 2018**Citation:** Vogel HW (2018) The Contributions of 4 Narcotic Analgesics to Accidental Drug Overdose Deaths in One County in Florida from 1998 to 2017. J Drug Abuse Vol.4 No.3.

Abstract

A survey of 756 accidental drug intoxication cases over a period from 1998 to 2017 showed that most deaths were the result of poly drug abuse (50-80%). Ethanol (2-7%), cocaine (2-8%), methadone (0-10%), morphine/codeine (1-3%), heroin (0-3%) and fentanyl (1-23%) were the next most frequent causes. Oxycodone, hydrocodone, oxymorphone and hydromorphone were then evaluated as being either causative or only contributory to such deaths. Being causative or the sole cause of death, the drugs ranked very low like oxycodone (<1-2%), hydrocodone (0%), oxymorphone (0%) and hydromorphone (0-1%) and when mentioned were often found together with ethanol or cocaine. In contrast, they were often mentioned as contributory factors like oxycodone (14-64%), hydrocodone (9-13%), oxymorphone (0-21%) and hydromorphone (2-11%) but their contributions to such deaths are unclear and perhaps minimal since they were mostly found together with a fair number of other drugs. This study seems to suggest that the role of these drugs in accidental overdose cases is much less than generally assumed and that the overwhelming majority of these 4 narcotics detected in toxicological screens do not or do only contribute in combination with other drugs to the fatal outcomes. This might imply that physicians can prescribe these drugs to their pain patients with confidence in that most patients will use the drugs as directed and the chance of overdose deaths is minimal if it exists at all.

Keywords: Oxycodone hydrocodone; Oxymorphone hydromorphone; Intoxication; Drug abuse; Accidental drug deaths.

Introduction

Legal and illegal opioids continue to contribute greatly to the current accidental drug overdose death epidemic in the United States. It has been estimated that about 46 people die of substance or drug overdoses every day and that up to 40% of all U.S. opioid overdose deaths in 2016 involved a prescription opioid. However, many of the existing studies are somewhat dated, have been performed only for short time intervals, focused mainly on drugs like morphine, heroin or fentanyl

and/or often compiled individuals prescription drugs together into a general classification of "opioids" or "opioid prescription drugs". If these drugs are mentioned, they are usually not separated in solely causing the deaths or only being a contributory factor in combination with other drugs [1-9]. Thus, the exact contributions of some specific narcotic analgesics like oxycodone, hydrocodone, oxymorphone and hydromorphone to accidental overdose deaths during a longer time interval are still uncertain. To obtain a better understanding of the involvement of these four drugs in such accidental deaths, this paper examined 756 intoxication cases in one county in Florida over the period from 1998 to 2017 separating their contributions into being either the main cause or being only contributory with other drugs to the reported drug over dose deaths.

Methods

This study used the public accidental drug overdose death or drug intoxication records from the Medical Examiner of Collier County, FL, during the time interval of 1998 to 2017. These reports among other list the causes of death as well as major drugs found in the toxicological screens of the diseased. If a drug levels was high, then this or these drugs would be listed as causes of death. If they were low and thought not to have made a significant contribution to the fatal outcome, then they were only listed as drugs found during the toxicological screens. The author accepted in the vast majority of all cases the conclusions made by the Medical Examiner and Toxicologist. In a very few cases, the author used the term poly drug use if the medical examiner listed 2 or more drugs as cause of death and when they had a narrow margin of safety. However, all drugs in the screens were evaluated as shown. The author paid particular attention to the presence of oxycodone, hydrocodone, oxymorphone and hydromorphone and their citations as being the cause of death or as a contributory drug found in the toxicological screens.

Results

During the period from 1998 to 2017, the drug overdose victims were mostly white and men outnumbered women about 2-3 fold and were mostly over 30 years old again outnumbering

younger individuals about 2-4 fold. Deaths started to rise in 2003 and remained relatively high up to now (Table1).

Table 1: Demographic Data

BASICS	1998/2002	2003/2005	2006/2008	2009/2011	2012/2014	2015/2017
Deaths	88	111	158	134	123	154
Male	70	74	114	100	81	110
Female	18	37	44	34	42	44
White	87	45	156	131	121	151
Black	1	1	2	3	2	3
<30	44	30	57	25	24	35
>30	44	81	101	109	99	119

The causes of death of the accidental drug overdose cases between 1998 and 2017 were overwhelmingly due to the use of multiple drugs or poly drug abuse. Such deaths ranged from 51 to 80% of all deaths over the years and stayed relatively similar over the years. Individual drugs identified during this time as causes of deaths were ethanol (2-7%), cocaine (2-8%), methadone (0-10%), morphine/codeine (1-3%), heroin (0-3%)

and fentanyl (1-23%). Methadone death started to occur in 2003 peaked in 2006/2008 and then declined. Fentanyl/carfentanyl cases were few until 2015/2017 where they increased sharply. Oxycodone (<1-3%), hydrocodone (0%), oxymorphone (0-<1%) and hydromorphone (0-1%) are rarely mentioned as the sole causes of death and if so they were often associated with another drug like ethanol or cocaine (Table 2).

Table 2: Drug implicated as cause of death (*Morphine and/or codeine; **Fentanyl and carfentanyl)

Causes/Death	1998/2002	2003/2005	2006/2008	2009/2011	2012/2014	2015/2017
Cases	88	111	158	134	123	154
Oxycodone	2 (2%)	0 (0%)	3 (2%)	3 (2%)	0 (0%)	1 (<1%)
Hydrocodone	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Oxymorphone	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	1 (<1%)
Hydromorphone	0 (0%)	0 (0%)	0 (0%)	1 (1%)	0 (0%)	0 (0%)
Polydrug	70 (80%)	84 (76%)	109 (69%)	92 (75%)	86 (70%)	79 (51%)
Alcohol	6 (7%)	2 (2%)	8 (5%)	8 (7%)	8 (7%)	6 (4%)
Cocaine	4 (5%)	8 (7%)	8 (5%)	3 (2%)	9 (8%)	11 (7%)
Methadone	0 (0%)	10 (9%)	16 (10%)	4 (3%)	5 (4%)	5 (3%)
Opiates*	3 (3%)	2 (2%)	2 (1%)	1 (1%)	1 (1%)	2 (1%)
Fentanyl**	1 (1%)	1 (1%)	3 (2%)	7 (6%)	4 (3%)	36 (23%)
Heroin	1 (1%)	0 (0%)	1 (1%)	0 (0%)	0 (0%)	5 (3%)
Other	1 (1%)	4 (4%)	8 (5%)	3 (2%)	10 (8%)	8 (5%)

Drugs not identified as causative but detected in the toxicological screens of all of these cases and which might or might not have contributed significantly to the deaths were ethanol (29-44%), cocaine (20-43%), methadone (8-48%), benzodiazepines (34-80%), morphine/codeine (7-41%) and fentanyl (0-23%). Alcohol, cocaine and benzodiazepine contributions stayed high during all these years. Over time,

methadone contributions declined while those of the fentanyl increased. Oxycodone (15-64%), hydrocodone (9-14%), oxymorphone (0-21%) and hydromorphone (2-11%) were present in such screens but changed over time. Oxycodone was most frequently detected in all years but peaked in 2009/2011. Hydrocodone stayed relatively even over this period. The last 2

drugs increased only after 2009 and 2012. Again, all 4 drugs were only detected in the presence of other drugs (Table 3).

Table 3: Drugs found in toxicological screens (*Mostly alprazolam)

Drugs/deaths	1998/2002	2003/2005	2006/2008	2009/2011	2012/2014	2015/2017
Cases	88	111	158	134	123	154
Oxycodone	15 (17%)	17 (15%)	38 (24%)	78 (64%)	29 (24%)	44 (28%)
Hydrocodone	11 (12%)	10 (9%)	15 (10%)	15 (12%)	17 (14%)	15 (10%)
Oxymorphone	0 (0%)	0 (0%)	2 (1%)	12 (10%)	12 (10%)	31 (21%)
Hydromorphone	2 (1%)	6 (5%)	7 (5%)	3 (2%)	15 (12%)	17 (11%)
Alcohol	27 (31%)	33 (30%)	45 (29%)	47 (39%)	42 (34%)	68 (44%)
Cocaine	38 (43%)	36 (32%)	45 (29%)	29 (24%)	24 (20%)	60 (39%)
Methadone	27 (31%)	49 (44%)	75 (48%)	39 (32%)	20 (16%)	13 (8%)
Benzodiazepines*	35 (40%)	48 (43%)	62 (40%)	97 (80%)	52 (42%)	53 (34%)
Opiates	18 (20%)	24 (22%)	22 (14%)	8 (7%)	20 (16%)	63 (41%)
Heroin	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	13 (8%)
Fentanyl	0 (0%)	7 (6%)	9 (6%)	4 (3%)	6 (5%)	36 (23%)
Antidepressants	14 (16%)	11 (9%)	29 (19%)	30 (25%)	29 (24%)	40 (26%)

Discussion

Collier County is a relatively wealthy county in Florida with a predominant white, seasonal and older population. Accidental drug overdose deaths occurred mostly in older (above 30) and male abusers. This is in agreement with national data [10,11]. The vast majority of causes of death during this time period were due to poly drug abuse. This also is in agreement with data from other studies [2-5]. The drugs abused varied greatly and the number taken by different individuals ranged from 3 to 12. This is an indication that the victims did not focus on one particular drug but used whatever they felt would satisfy their individual needs best or whatever was available at a particular time [12]. This was followed by the excessive use of ethanol, cocaine, methadone, morphine/codeine and fentanyl. The detection of methadone could indicate that these individuals might have been in therapy for drug addiction and the detection of fentanyl suggests most likely illegal purchases since fentanyl is now often used as an adulterant on the street market. The four narcotic analgesics were then differentiated as being causative of the death or only being contributory with uncertain toxicological significance when detected in the toxicological screens. As sole causes of death they ranked very low and only 9 deaths were contributed to oxycodone, 0 to hydrocodone, 1 to oxymorphone and 1 hydromorphone or a total of 11 cases out of 756 deaths. Furthermore, when cited as causative they were often associated with alcohol and cocaine making the cause of death somewhat uncertain. In contrast, the numbers of these drugs in the contributory category were much higher. However, when detected, they were always found in combination with varying numbers of other drugs. This finding makes their contributions to the fatal outcomes quite uncertain and would decrease their contributions to such deaths significantly.

Oxycodone was found in 221, hydrocodone in 83, oxymorphone in 57 and hydromorphone in 50 cases for a total of 441 cases. These figures indicate that only about 2% of all detected opioid drugs in those accidental overdose cases were judged to be the sole cause of death. This is similar to the rest of Florida where in 2016 only 27 deaths were recorded being solely due to oxycodone or 15 solely due to hydrocodone alone [13]. However, when listed as contributory to these deaths, they were found to be present in 1283 and 596 cases or again about 2% of the abused drugs were actually responsible for the ensuing death. This would change the general opinion of the involvement of these drugs in accidental drug overdose deaths and would revise, for instance, the conclusion of the 2016 USA Survey of Drug Use and Health which reported that "42 249 people died of overdosing on opioids" in this year. Applying the 2% rule, only about 844 cases would have been actually caused by opioid drugs directly while the majority of detected narcotics might or might not have contributed in conjunction with other drug to these fatalities. This indeed does not warrant labelling these drugs as causing the opioid death epidemic. The frequent detection of these four drugs in conjunction with a large number of other drugs might also indicate that they if used alone would not have met the abuser's needs and desires and their effects had to be enhanced with the use of other drugs.

Of interest might also be that the toxicological screens detected frequently the presence of antidepressant drugs (10-34%). This fact in combination with the high number of benzodiazepines found might indicate that many of the victims might have suffered from anxiety and depression which finally drove them to the use of the deadly overdose or drug combinations. In contrast, few barbiturates or antipsychotic drugs were noticed.

Strangely, the toxicological screens of about 45 cases showed the presence of diphenhydramine. This drug has some mild hallucinatory effects in higher doses but doses above 1500 mg could prove fatal. Thus, the presence of this OTC drug could have contributed significantly to the death of some of the abusers [14-15].

Acknowledgement

The author would like to thank Dr. R. Clearfield for valuable suggestions and Ms. E. Nunez for providing the toxicological findings of accidental drug related deaths from Collier County, Florida.

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