Health Advisory:
Heroin Overdose Deaths in Missouri

February 21, 2012

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SUBJECT: **Heroin Overdose Deaths in Missouri**

In recent years Missouri has seen a significant increase in the numbers of reported deaths from heroin overdose. This Health Advisory describes the epidemiology of heroin-associated deaths in the state. It provides information on heroin and its effects on the body, and on issues associated with heroin overdose. Recommendations are listed for reducing the occurrence of fatal and non-fatal overdoses with this drug.

The Epidemiology of Heroin-Associated Deaths in Missouri

Vital statistics data from the Missouri Department of Health and Senior Services (DHSS) indicate that the number of deaths in Missouri residents due to heroin overdose has increased significantly within the last 4 years (from 69 cases in 2007 to 167 in 2009, and 190 in 2010). The provisional number of deaths for 2011 increased further to 244. The St. Louis region is a "hot spot" for heroin-associated death in Missouri: from 2007 to date, 90% of total statewide deaths have been reported from the St. Louis metropolitan area (St Louis City, and the counties of St. Louis, St. Charles, Jefferson, Franklin, and Lincoln). Over 53% of all heroin-associated deaths statewide are between 15 and 35 years of age, while this age group represents only 27% of the population (2009 estimate). The 25-34 year age group is the most affected: 34% of all cases, while it represents only about 13% of the population. There are four times more males than females among heroin victims statewide. For 2007-2009, the African-American death rate was 2.7 per 100,000 population (crude rate), while for Caucasians, the rate was 1.9 per 100,000. In the St. Louis region, the death rate is highest in St Louis City, where it is 5.3 times higher than the state average, followed by Franklin county (2.8 times), St Louis county (2.3 times), and Jefferson county (2.1 times).

Heroin and It Physiologic Effects

Heroin (diacetylmorphine) is a highly addictive semisynthetic opioid that is derived from morphine. When used intravenously, it is 3-5 times more potent than its parent compound, and is able to modulate pain perception and cause euphoria. In its pure form, heroin is a white powder with a bitter taste. Because of impurities and additives, street heroin may appear in various hues and colors, ranging from white to dark brown, to a black, tarry substance.

The onset of action, peak effects, and duration of action vary with the different methods of use. Patients experience heroin's effect within 1-2 minutes when injected intravenously. Heroin's peak therapeutic and toxic effects are generally reached within 10 minutes when injected intravenously, within 30 minutes when snorted, and within 90 minutes when injected subcutaneously. Analgesic effects generally last 3-5 hours.

Intravenously injected heroin creates a "rush", or a sensation of intense pleasure that begins within one minute of the injection and lasts from one to a few minutes. This "rush" is followed by a period of sedation that lasts about an hour. The half-life of heroin is 15-30 minutes.

Heroin Overdose

Heroin poisoning occurs when an individual accidentally or intentionally overdoses on the drug, or when an ingested heroin packet ruptures in the GI tract.

Coma, respiratory depression, and miosis are the hallmarks of opioid overdose. Symptoms generally develop within 10 minutes of intravenous heroin injection. The diagnosis of heroin poisoning should be suspected in all comatose patients, especially in the presence of respiratory depression and miosis. Nonfatal overdose has been associated with pulmonary conditions, muscular complications such as rhabdomyolysis, renal failure, cardiovascular complications, and anoxia-induced cognitive impairment.

The overwhelming majority of overdoses, both fatal and nonfatal, involve the concomitant consumption of heroin with other drugs. The major drugs associated with an increased risk of fatal and nonfatal heroin overdose are alcohol, benzodiazepines, and tricyclic antidepressants. Alcohol is by far the most common concomitant drug. Rates of major depression are extremely high among heroin users, and the risk of suicide is 14 times that of the general population.

Heroin purity appears to have only a moderate relationship to heroin related fatalities. The risk of overdose is substantially less when the drug is smoked rather than injected. Ninety-nine percent of overdose deaths result from the injection of heroin.

The most common scenarios for a significant heroin overdose are the use of a higher dose, the injection of a highly concentrated street sample in the unsuspecting user, or the use of heroin after a prolonged period of abstinence. Intentional, or suicidal, overdoses are rare. The most widely accepted explanation for death due to heroin is the result of a quantity or quality of heroin in excess of the person's current tolerance to the drug.

Usually, males are overrepresented among fatal overdoses. The mean age of overdose fatalities is in the late 20s to early 30s. Contrary to popular misconception, it is not younger, inexperienced heroin users that are at greatest risk of overdose death, rather it is long-term, dependent heroin users who are at greatest risk. After a decade or more of heroin use, many long-term users reduce their use, but they may increase use of other drugs and substances, such as alcohol, to compensate for reduced heroin use. The combination of reduced tolerance and the use of other drugs makes this group more susceptible to overdose. The issue of reduced tolerance is directly relevant to incarcerated heroin users and to heroin users recently released from prison. While many heroin users continue to inject while in prison, such use is typically sporadic, so tolerance to the drug will be substantially reduced; the odds of a fatal overdose occurring in the 2 weeks post-release were 34 times those in times spent outside custody.

Heroin users who overdose are rarely in drug treatment at the time of their deaths. Enrollment in treatment has been demonstrated to substantially reduce the risk of both fatal and nonfatal overdose. Since 1996, an increasing number of community-based overdose prevention programs also provide the opioid antagonist naloxone hydrochloride, the treatment of choice to reverse potentially fatal respiratory depression caused by overdose of heroin. Emerging evidence indicates that providing opioid overdose education and naloxone to persons who use opioid drugs can help reduce overdose mortality. In addition, laypersons who might be present at an opioid overdose (e.g., family members, friends, service providers) can also be provided education, including how to respond to overdoses and how to administer naloxone should an overdose occur. These individuals would also be provided with naloxone which they could administer in an overdose situation.

It has been shown that overdose is strongly related to previous overdose experience. Given that approximately 1 in 20 overdoses result in death, cumulative risk of death increases with each successive overdose. Heroin users experience, on average, a loss of 18 years of potential life, largely due to overdose. About 1-3 % of heroin users die each year, many from heroin overdose. More than half of heroin users experience at least one nonfatal overdose, and 20-40% report an overdose in the past year.

Epidemiological studies also indicate that other people, mostly other drug users, happen to be present in the majority of both fatal and nonfatal overdoses, and that instantaneous death from heroin is uncommon. Most overdose events (66%) occurred in the home, and 85% occurred in the company of others. Thus, there is time for people who are present at the scene to intervene in the majority of heroin overdose deaths. However, responses to overdoses are poor: in the majority of cases, no intervention occurs prior to death. Calling an ambulance is rarely the first action taken, or it happens only after considerable delay, increasing the risk of death or anoxia. The most common reason given for delaying seeking help is the fear of police involvement.

Recommendations

- Heroin overdose is a preventable cause of death. The evidence-based interventions to address heroin overdose include treatment, education, and reduction of risk factors.

- State and local agencies should consider partnering with public and private entities to improve the availability of heroin abuse treatment services. Enrollment in heroin abuse treatment programs substantially reduces the risk of both lethal and non-lethal overdose.

- Awareness campaigns educating heroin users about the risks of multiple drug use may help reduce the frequency of heroin overdose.

- Education on the increased risk of overdosing when resuming heroin use after a period of abstinence is essential, especially for older users and those about to be released from prison.

- Heroin users, and their friends and relatives, should be taught simple cardiopulmonary resuscitation skills to keep comatose users alive until help arrives. These groups of people should be encouraged to call an ambulance immediately when overdose occurs. Their understandable fears of police involvement need to be addressed.

Additional Reference

CDC. Community-Based Opioid Overdose Prevention Programs Providing Naloxone – United States, 2010. *MMWR* 2012;61(6):101-5.