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## Course Objectives

The goal of this program is to provide nurses with information about methamphetamine, including short- and long-term effects, high-risk groups, and treatment strategies. After studying the information presented here, you will be able to —

- Discuss the physiological effects of methamphetamine intoxication and abuse.
- Identify the long-term psychological consequences of methamphetamine abuse.
- Explain treatment strategies for methamphetamine abuse and addiction.

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If you think that methamphetamine (MA) is produced only south of the border or in seedy areas in the U.S., or used just by hardcore drug users, you're sorely mistaken. MA abuse is a growing global health problem, with countries such as Australia and Japan reporting a serious health threat to teens and young adults.<sup>1,2</sup>

According to the World Health Organization, between 1998 and 2001, 185 million people worldwide used illegal drugs, and 33.4 million (18%) of them abused amphetamines.<sup>3</sup> MA is a derivative of amphetamine, a synthetic drug that exerts stimulatory effects on the central nervous and cardiovascular systems. In 2004 in the U.S., 1.4 million people 12 or older (0.6% of the population) had used MA in the previous year, with 600,000 (0.2%-0.3%) having used the drug in the previous month.<sup>4</sup>

Though abuse of MA in the U.S. was heaviest in the West and Southwest during the past decade, primarily in California and Arizona, MA abuse appears to be spreading to other areas of the country, including rural and urban communities of the South and Midwest.<sup>5</sup> Treatment admissions for primary MA abuse were alarmingly high in Hawaii (57% of all drug treatment admissions, excluding those for alcohol abuse), followed by San Diego (45%), Arizona (38%), and Los Angeles (27%).<sup>4</sup> Other areas of the country with relatively high rates for MA admissions are Minneapolis/St. Paul (20%), Denver (18%), Atlanta (11%), and St. Louis (7%).<sup>5</sup> These statistics are often tragically associated with sudden death due to the toxic effects of the drug. Deaths from amphetamines and MA in 2003 totaled 122 in Phoenix, 119 in San Diego, 67 in Honolulu, and 28 in Minneapolis/St. Paul.<sup>5</sup> Other consequences associated with chronic use of this drug are long-term cognitive impairment as a result of neural injury, psychotic behavior, and rages accompanied by extremely violent behaviors.<sup>6</sup>

Nurses should be well-informed about methamphetamine abuse because patients abusing the drug may require immediate and long-term care for its acute and chronic effects.

## 'Binge and crash'

MA is an addictive stimulant drug that releases high levels of the neurotransmitter dopamine into the brain, thereby enhancing mood and affecting behavior.<sup>7</sup> It's produced in many illicit forms and can be smoked, snorted, orally ingested, or injected. Immediately after smoking or injecting the drug intravenously, the user experiences an intense rush, or "flash," that usually lasts only a few minutes and is described as extremely pleasurable.<sup>6</sup>

Snorting or oral ingestion produces euphoria, a high that is not as intense as a flash but may continue for as long as half a day. Snorting produces effects in three to five minutes, oral ingestion in 15 to 20 minutes.<sup>6</sup> As with similar stimulants, MA is often used in a "binge and crash" pattern. Both the flash and the high are related to the release of very high levels of dopamine into areas of the brain that regulate feelings of pleasure. Since tolerance for MA develops rapidly, users try to maintain the high by binging on the drug. During the 1980s, "ice," a smoked form of MA, came into use. Ice usually appears as clear to whitish crystals that range in size from rice kernels to golf balls. This form of MA is very pure and is most often produced by slowly recrystallizing powder MA with a solvent, such as methanol, ethanol, or acetone.<sup>8</sup> It is smoked in a glass pipe like crack cocaine.<sup>6</sup> The smoke is odorless, leaving a residue that can be resmoked and that produces effects that may continue for 24 hours. Besides ice, common street names for MA are speed, meth, chalk, crystal, crank, fire, glass, tina, and lemon drops.<sup>7</sup>

There's growing evidence that MA is being administered more frequently by the IV route. Injecting the drug increases the risk for engaging in behaviors (sexual and nonsexual) that expose the user to HIV, hepatitis, and other infectious diseases.<sup>9</sup> MA is not usually sold on the streets like many other illicit drugs. Users report that they obtain their supplies of MA from friends and other users. It's typically a more private sale, arranged by networking with those who produce the drug. It is often sold by special invitation at all-night warehouse parties, or raves.<sup>9</sup>

## Hidden labs

MA comes from two major sources: clandestine super labs and user labs. The super labs are located in Mexico and in California and are spreading to other states. These labs are known to produce 10 to 20 pounds of MA from each cooking cycle. Of the 132 super labs seized in 2003, 127 were in California. The pure form of MA produced by these labs accounts for most of the MA used in the U.S.<sup>10</sup> Mexican drug-trafficking organizations control and distribute most of the drugs from these labs. With the spread of use to other regions, particularly rural communities, it is believed that these super labs are infiltrating these areas.<sup>10</sup>

The smaller labs are located across the U.S. and are usually home-based. They produce MA from ephedrine or pseudoephedrine by the reduction method. In this process, over-the-counter cold and allergy tablets containing ephedrine or pseudoephedrine are placed in a solution of water, alcohol, or other solvent for several hours until the ephedrine or pseudoephedrine separates from the tablet.<sup>10</sup> Then, with common household products and equipment and a recipe from friends or the Internet, meth producers convert the ephedrine or pseudoephedrine into high-quality MA. Since the drug can be made with these easily obtainable and inexpensive materials, there is great variation in the processes and chemicals used. The final product sold as "MA" may not be MA at all, but rather a highly altered chemical mixture with some stimulantlike effects. Uncertainties about the drug's source and the pharmacological agents used in its production make it especially difficult to determine its toxicity and consequences or symptoms in the user. These labs also pose fire and ecologic risks, such as volatile air admissions, to their surroundings.

## **MA and cocaine**

MA is a Schedule 2 stimulant, a drug that has high potential for abuse and that is available only through a prescription that cannot be refilled.<sup>11</sup> It is appropriately used for a limited number of medical conditions, such as narcolepsy, attention deficit disorder, and, short-term, obesity.<sup>6</sup> MA is classified as a psychostimulant as are cocaine and other amphetamines. It's structurally similar to amphetamine and dopamine but very different from cocaine. Smoking MA produces a high that lasts eight to 24 hours; smoking cocaine produces a high that lasts 20 to 30 minutes. Both cocaine and MA affect the dopamine nerve cell, but MA has a much longer duration of action, and a larger percentage of the drug remains unaltered in the body.<sup>6</sup> This results in MA remaining present in the brain much longer with more profound effects. The effects of MA are categorized as acute (short-term) and chronic (long-term).

## **Short-term effects**

The dopamine-induced acute, short-term effects are those that contribute to use and abuse of the drug: euphoria and increased attention, libido, and physical activity accompanied by decreased fatigue and appetite. Toxicity results from bingeing include symptoms of visual hallucinations, aggression/violence, and hyperthermia and increased heart rate, blood pressure, and respirations.<sup>12</sup> Emergency treatment for these complications includes IV haloperidol (Haldol) for agitation; IV labetalol (Normodyne, Trandate) to control blood pressure; and benzodiazepines, such as diazepam (Valium), for seizures.<sup>12</sup> Other measures include cardiac monitoring, IV hydration, and environmental and chemical interventions to reduce hyperthermia if it occurs with the other symptoms.<sup>12</sup>

## **Long-term effects**

With chronic use, tolerance for MA develops quickly, leading the abuser to intensify the effects by taking higher doses of the drug, taking it more frequently, or changing the method of drug intake.<sup>6</sup> In some cases, abusers forgo eating and sleeping while indulging in a form of bingeing known as "a run," injecting as much as a gram of the drug every two to three hours over several days until the drug is gone or the user is too cognitively impaired to continue.<sup>6</sup> Although there are no physical manifestations of withdrawal when MA use is stopped, numerous symptoms occur when chronic use is terminated, such as depression, anxiety, fatigue, paranoia, aggression, and an intense craving for the drug.<sup>6</sup>

Compounding these symptoms are the toxic effects on the brain. Recent studies have determined that as much as 50% of dopamine-producing cells can be damaged after prolonged use of relatively low doses of MA.<sup>6</sup> Extensive damage to serotonin-containing nerve cells may also occur. It's unknown whether these changes in the brain are related to the psychosis seen in some long-term MA abusers.<sup>6</sup> Some studies indicate that the frontal cortices and subcortical areas of the brain are most vulnerable to the effects of MA since these regions are associated with the dopaminergic system.<sup>13</sup> Damage to these areas is manifested by impairment in mental flexibility, problem-solving, management of information, response inhibition (intentional prevention of a behavior that is under way), and abstract thinking.<sup>14</sup>

Researchers have also discovered that long-term MA abuse is associated with a reduction in dopamine transporters after two months' abstinence from MA and that this damage continues to be manifested in impaired motor skills and memory.<sup>15</sup> MA abusers who were retested after nine months of abstinence showed substantial recovery from damage to the dopamine neurotransmitters but not from impairments in motor skills and memory.<sup>15</sup> Further research has indicated persistent abnormalities in regional cerebral blood flow in MA abusers abstinent for six to 10 months.<sup>16</sup> This explains why cognition, memory, word recognition, and mood take a long time to recover after cessation of use.

Other chronic effects include cardiovascular conditions, such as myocardial infarction, left ventricular hypertrophy, and myocarditis; delayed stroke; weight loss; lead poisoning; and permanent dental damage called "meth mouth."<sup>1,6,17,18</sup> The cardiovascular changes are due to damaged blood vessels and inflammation of the heart lining while the delayed stroke is associated with narrowing and inflammation of the right posterior cerebral artery.<sup>1,6</sup> Lead poisoning has been reported in MA abusers since lead acetate is used in the production of the drug.<sup>6</sup> Meth mouth is characterized as decay that starts at the gum line and progresses throughout the mouth.<sup>17</sup> Further damage is caused by xerostomia (dry mouth), bruxism (grinding of the teeth), and muscle trismus (tightening of the jaw).<sup>8</sup>

## **Mother and fetus**

MA use during pregnancy is believed to put both the mother and fetus at risk. MA increases maternal blood pressure and heart rate, which may result in premature delivery or spontaneous abortion.<sup>19</sup> The drug also constricts blood flow through the placenta, which results in reduced oxygenation and nutritional supply to the developing fetus.<sup>19</sup> MA passes through the placenta, causing elevated blood pressure in the developing fetus with the potential for prenatal strokes and damage to the heart and other major organs. One study found that 48% of the infants born to MA-abusing mothers were admitted to the NICU.<sup>20</sup> Developmental risks to infants include learning disabilities and developmental delays. Though more research is needed, one study reported that 33% of the children born to MA-abusing women had some physical or cognitive disabilities.<sup>10</sup>

## **Who's at risk?**

Studies between 2002 and 2004 indicate that MA use was highest among young adults aged 18 to 25, at 1.6% of that population. The next highest rate of abuse was among youths aged 12 to 17, at 0.7%. Among adults 26 and older, 0.4% abused MA.<sup>4</sup> Among all people 12 or older, the rate of past-year use was higher among males (0.7%) than females (0.5%).<sup>4</sup>

The highest rates of past-year MA use were among Native Hawaiians or other Pacific Islanders (2.2%), American Indians or Alaska Natives (1.7%), and people reporting two or more races (1.9%). Past-year MA use among whites (0.7%) and Hispanics (0.5%) was higher than among African Americans (0.1%) or Asians (0.2%).<sup>4</sup> In most areas, people admitted for MA treatment tended to be white. But some cities, such as Los Angeles, reported increasing numbers of Hispanics seeking services in 2004.<sup>21</sup> New York and Chicago have documented an increase in the use of the drug among young gay white men.<sup>21</sup> Use among this population is cause for concern with the potential for the transmission of HIV.

## **Treatment**

The protracted depression and severe craving that accompanies abstinence complicate treatment for MA. The high risk of relapse is related to the strength of the craving. So far, no medications have been found useful in supporting abstinence. Some researchers have used imipramine (Tofranil, Impril) and bupropion (Wellbutrin, Zyban), both antidepressants, to improve treatment adherence and reduce the drug craving.<sup>22,23</sup> Those receiving imipramine remained in treatment longer yet showed no decrease in depression or craving while those receiving bupropion demonstrated reduced craving.<sup>23</sup> Cognitive-behavioral therapy that includes skills to refuse MA despite peer pressure, more effective coping strategies, problem-solving skills, and relapse planning has shown some promise.<sup>2</sup> Those who completed this treatment reported improvement in somatic symptoms, anxiety, social dysfunction, depression, and amphetamine refusal skills.<sup>2</sup> Further treatment research is focusing on the Matrix Model, examining its elements of termination of drug use, patient education about issues critical to addiction and relapse, education for family members, information about self-help programs, and weekly drug-urine monitoring.<sup>24</sup> Intensive outpatient treatment programs are the most effective way to deliver these components.

## **What nurses need to know**

HIV and hepatitis B and C transmission are likely consequences of MA abuse, particularly among people who inject the drug and share drug paraphernalia. Almost one-third of the Americans infected with HIV reported injection drug use was a primary risk factor.<sup>6</sup> Nurses need to provide information about risks related to transmission of the disease and offer counseling on HIV testing and STDs. Physical assessment should incorporate the range of signs and symptoms for current drug use, including alterations in skin integrity, oral health, hydration (electrolytes), and nutrition (signs of malnutrition and weight loss).<sup>25</sup> Skin inspection should focus on the local injection sites as well as infections in other areas. A brief mental status exam is important to determine cognitive function since MA is known to cause deficits in this area. Depending on the degree and nature of the impairment (for example, memory and attention deficits), patient education strategies will need to be modified.<sup>16</sup> Health care providers may have to review important patient education points with patients a number of times to ensure that they retain the information. Drug education is more effective when the following harm-reduction strategies are included: methods for safer sex, disease prevention related to HIV transmission, nutrition and dental care, and access to community treatment resources and self-help support programs.

The number of clandestine labs seized in California and Arizona declined from 1999 to 2004, but incidents are increasing in the Midwestern states (Illinois, Michigan, Missouri, and Ohio), with some rural communities reporting significant increases.<sup>10,26</sup> One rural community addressed the problem of MA abuse by holding meetings that included drug treatment personnel, local law enforcement agencies, and medical providers.<sup>26</sup> Community education focused, in part, on experiential accounts by MA abusers and their struggles to free themselves from drug addiction. Community and home health nurses should know the signs that may indicate a home-based MA lab: unusual strong odors (like ether, ammonia, acetone, or other chemicals); residences with blacked-out windows; considerable traffic — people coming and going at unusual times, particularly increasing at night; excessive trash including large amounts of antifreeze containers, fuel cans, drain cleaner, and chemically stained coffee filters; and an unusual number of clear glass containers in the home.<sup>26</sup>

MA abuse is a growing health problem affecting areas once believed to be safe from drug dealers and abusers. Those at highest risk for abuse, 18- to 25-year-olds, are usually just beginning or completing college, starting a career, or planning a family; consequences of drug abuse on this age group can be devastating and long-term — changing lives forever. Nurses are in a position to provide both individual and community-based educational programs about the dangers associated with the use and abuse of MA.

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