Dental Professionals’ Guide To Chemical Dependency

A Peer-Reviewed Publication
Written by Lisa Dowst-Mayo, RDH, BSDH, MHA

Abstract
Chemical dependency is a worldwide problem and a major public health concern in the United States. To adjust for the magnitude of this crisis, The Diagnostic and Statistical Manual (DSM)-V has expanded the definition of chemical dependency. Chemical dependency causes a multitude of physiological and neurological effects in a patient, which has the potential to alter a dental professional’s treatment plan. With high relapse rates in this population, dental providers will likely encounter those in active and long-term treatment modalities for patients with chemical dependency problems.

Educational Objectives
At the conclusion of this course, the dental health professional will be able to:
1. Define chemical dependency.
2. Recognize the signs and symptoms of chemical dependency.
3. Be familiar with the etiology of chemical dependency.
4. Understand the diagnosis and treatment modalities for patients with chemical dependency.
5. Safely render dental treatment to patients with chemical dependency problems.

Author Profile
Lisa Dowst-Mayo, RDH, BSDH, MHA, graduated magna cum laude from both Ohio University with her MHA degree and the Culinary School of Dental Hygiene at Baylor College of Dentistry with a BSDH. She has held numerous leadership roles in the tripartite of the American/Texas/Dallas Dental Hygiene Associations. She is currently the dental hygiene program director at Concord College in San Antonio, Texas, where she also teaches pharmacology, special needs, and clinical sciences. She has published numerous articles and written peer-reviewed continuing education courses on a broad range of topics for RDH, Dental Economics, Dimensions of Dental Hygiene, Canadian Dental Journal, and Access.

Author Disclosure
The author has no affiliations with any company that would have a gained interest in the material published in this course. There was no corporate sponsor in the making of this course, and the author is not employed by a company that would stand to profit off the publication of this course. All research is presented in an unbiased manner.
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Abstract
Chemical dependency is a worldwide problem and a major public health concern in the United States. To adjust for the magnitude of this crisis, The Diagnostic and Statistical Manual (DSM)-V has expanded the definition of chemical dependency. Chemical dependency causes a multitude of physiological and neurological effects in a patient, which has the potential to alter a dental professional’s treatment plan. With high relapse rates in this population, dental providers will likely encounter those in active and long-term treatment and management. This course will explore chemical dependency in the United States and focus on its etiology, diagnosis, treatment, and dental considerations.

Introduction
Chemical dependency is a major public health concern in the United States and causes adverse effects to individuals abusing substances, their families, and the economy. The economic burden of chemical dependency in America is vast, affecting individual health, public safety, crime, productivity, and governance. Health-care costs are related to mortality, morbidity, hospitalizations, and prevention. Research has shown that investment in treatment is more cost effective for a society compared with the cost of untreated abuse. For every dollar the U.S. invests in chemical dependency treatment, a four to twelve dollar return is seen through reduced crime and health-care costs.

Globally, drug abuse ranks nineteenth in causes of mortality, with alcohol third, and tobacco second. Drugs of abuse also have an impact on safe driving. According to the International Narcotics Control Board, “Cannabis is the most prevalent drug detected in drivers and causes a 9.5-fold greater risk of driving accidents. Cocaine increases the risk 2-10 times, amphetamines increase the risk 5-30 times, and alcohol in combination with drugs increases the risk of being seriously injured or killed while driving by a factor of 20-200.”

In 2011, lost productivity related to chemical dependency cost the United States 120 billion dollars or 0.9 percent of the gross domestic product. Therefore, it is imperative that healthcare professionals work with government officials to attend to this societal public health menace, improve the quality of life, and provide economic relief.

Chemical Dependency Defined
Chemical dependency and substance abuse are medical terms used to describe an abuse or addiction to a substance that causes significant problems or alterations to one’s life. According to Johns Hopkins Medicine, substance dependence “is the medical term used to describe abuse of drugs or alcohol that continues even when significant problems related to their use have developed,” such as strained relationships, work complications, unemployment, or criminal activity. Chemical dependency is a chronic relapsing disorder for which relapse prevention is a primary focus of treatment.

Substance abuse encompasses the abuse of illegal substances such as heroin, cocaine, methamphetamine, and hallucinogens, or the abuse of legal substances such as alcohol, nicotine, anabolic steroids, caffeine, or prescription medications. Prescription medications most commonly abused are opioids and anxiolytics. Marijuana is a Schedule I drug and federally illegal; however, as of this time, eight states and the District of Columbia have legalized its recreational use.

Caffeine dependence is a recognized condition and is entitled Caffeine Use Disorder in the DSM-V. Caffeine is the most widely abused drug in the world, with more than 90 percent of American adults dependent on its effects. Sodas contain approximately 35 mg of caffeine per 12-oz can. One cup of coffee contains 95-200 mg of caffeine. Energy drinks contain many ingredients including artificial sweeteners, “energy blends” (taurine, ginseng, guarana), sugar (54-110 g), and caffeine (70-320 mg). According to the Mayo Clinic, adults should consider cutting back their daily caffeine intake if they drink more than 500 mg/day.

Lawmakers are concerned about the youthful marketing of energy drinks in America and the adverse effects of energy drink consumption in adolescents. In 2012, adolescents saw 165 ads for energy drinks, with 30 million ads on Facebook and six million ads on YouTube. This is double the exposure as compared to 2008. Various public health surveys report 18 to 35 percent of American middle and high school students consume energy drinks. The American Academy of Pediatrics does not recommend that children or adolescents consume energy drinks, and the American Medical Association has adopted a policy to support banning the marketing of energy drinks to anyone under the age of 18.

Signs and Symptoms
Chemical dependency can cause long-lasting neurological effects. It can increase a person’s risk for seizures, strokes, cardiac arrest, and intracerebral hemorrhage. Persons with substance abuse problems are also at higher risk for infections such as HIV, endocarditis, tuberculosis, hepatitis, herpes, sexually transmitted diseases, and skin infections such as cellulitis, impetigo, or abscesses at injection sites. Common signs of chemical dependency are presented in Table 1.

The inability to control impulses is common in persons with chemical dependency. Comorbidities such as addictions to sex, gambling, eating, and internet gaming are common.
This population demographic is at a particularly high risk for illicit drug abuse. Twen
ty-five percent of the United States population suffers from mental illness, with one out of every 10 Americans taking a prescription medication for depression. If a health-care professional sees the signs and symptoms listed in Table 1 in a patient, chemical dependency should be suspected, and the provider should open a dialogue with the patient using appropriate questions.

Table 1. Signs of Chemical Dependence

| Tolerance to, or need for, increased amounts of the drug to get an effect | Withdrawal symptoms that occur when decreasing or stopping use of the drug; difficulty cutting back or quitting use of the drug | Spending a lot of time to get, use, and recover from the effects of using drugs | Withdrawal from social and recreational activities | Continued use of the drug while aware of the physical, psychological, and family or social problems that the drug use is causing | Continually wanting or unsuccessfully trying to cut down or control use of drugs or alcohol | Cravings, or strong desires, to use drugs or alcohol | Engaging in risky behaviors such as sexual, financial, or driving under the influence |

Medical and dental state boards have adopted various chemical dependency programs for providers that assist in the recovery process and protect the individual’s ability to maintain licensure. In a 2015 large sample survey supported by the Mayo Clinic, it was found that over 20 percent of American physicians met the diagnostic criteria for alcohol abuse or dependence. Abuse rates of prescription and illicit drugs in this population were low. These providers were shown to have an increased risk for suicide, medical error, poor quality of life, depression, and lower career satisfaction. Most prevalence studies do not show that medical professionals are at a higher risk for chemical dependency than the general public, and nurses tend to have similar rates of substance abuse as physicians.

Etiology

There are numerous documented etiological theories related to a person’s susceptibility for the disease of chemical dependency. The five most common etiologies reported in the literature are genetics, environmental stressors (economic, finances, stress), societal pressures (peer, lifestyle, culture, social rewards, family), individual personality characteristics, and psychiatric disorders. It is documented that children of alcoholic parents are more vulnerable to develop alcoholism themselves. There are two identified genes associated with alcoholism, GABRA2 and CHRM2. Researchers have also found evidence of susceptible loci for alcohol dependence on chromosomes 1, 2, and 7, and a possible protective locus on chromosome 4.

The A2A receptor gene (ADORA2A) has been associated with caffeine consumption. Variability in the cytochrome P450 CYP1A2, as well as the aryl hydrocarbon receptor gene (AHR), which regulates CYP1A2, has also been associated with cytochrome caffeine consumption. The P450 enzyme systems in the liver are responsible for the metabolism of many substances, and alterations to their function can adversely affect all body systems.

Determining the etiology in an individual is an important step in treatment. Understanding the cause of the chemical dependency problem assists both medical and mental health professionals in developing appropriate treatment and interventions.

Diagnosis and Treatment

Diagnosis of chemical dependency is commonly made by either a physician or mental health specialist. Clinical findings are extremely dependent on both the specific chemical and its

Table 2

<table>
<thead>
<tr>
<th>Substance</th>
<th>2002 percentage of population</th>
<th>2014 percentage of population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any illicit substance</td>
<td>8.3</td>
<td>10.2</td>
</tr>
<tr>
<td>Marijuana</td>
<td>6.2</td>
<td>8.4</td>
</tr>
</tbody>
</table>
| Nonmedical use of psychotherapeu
tic drug | 2.7                           | 2.5                           |
| Alcohol                          | 51.0                          | 52.7                          |

Statistics

Susceptibility to chemical dependency spans across all races, professions, and economic status in America. Substance abuse has a lifetime prevalence in the United States population of 7.7 percent for drug abuse and 17.8 percent for alcohol abuse. In 2014, the Centers for Disease Control and Prevention (CDC) reported that 10.2 percent of the United States population ages 12 and older have used an illegal substance in the last month, and 2.5 percent have used a psychotherapeutic drug. Drug poisoning (overdose) is the number one cause of injury-related death in the United States, accounting for 43,982 deaths annually. The rate for deaths involving heroin overdose has almost tripled since 2010, accounting for 2.7 deaths per 100,000. There is an average of 1.1 million annual emergency room visits for drug poisoning with the highest population group being people ages 20 to 34.

Table 2 provides statistics from the CDC that demonstrate the use of selected substances in the past month among persons ages 12 and older, comparing the years 2002 to 2014. With an increase in drug abuse across all categories, these statistics support a call to action among lawmakers and politicians for improved public health programs.

There are programs and laws in the United States geared toward reducing chemical dependency rates. The Americans with Disabilities Act of 1990 provides employment protections for those with past alcohol and other drug problems. Schools have adopted “zero tolerance” policies. College students with adult drug convictions can be denied federal financial aid to attend college for varying lengths of time.

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frequency of abuse. General findings are weight loss, constant fatigue, red eyes, little concern for hygiene, lab abnormalities, unexpected abnormalities in vital signs, depression, anxiety, and/or difficulty with sleep. Table 3 lists drug-specific clinical findings. Many illicit drugs have oral side effects that are likely to be encountered by dental professionals, so knowledge of these substances is important for comprehensive treatment planning.

Table 3. Drug-Specific Clinical Findings

<table>
<thead>
<tr>
<th>Drug</th>
<th>Clinical findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Opioids (heroin, codeine, oxytocin, hydrocodone)</strong></td>
<td>Pinpoint constricted pupils, bradycardia, hypotension, decreased body temperature, respiration depression, and oral disease.11,12</td>
</tr>
<tr>
<td><strong>Stimulants (cocaine, methamphetamine, nicotine, caffeine)</strong></td>
<td>Dilated pupils, hypertension, increased respiration, tachycardia, Parkinson’s-like characteristics, and oral disease.11,12</td>
</tr>
<tr>
<td><strong>Hallucinogens (lysergic acid diethylamide, marijuana phencyclidine, MDMA)</strong></td>
<td>Hypersalivation, hypertension, tachycardia, muscle rigidity, and oral disease. Reddening of the conjunctivae with marijuana use.11,12</td>
</tr>
<tr>
<td><strong>Alcohol</strong></td>
<td>Jaundice (due to liver damage), diminished immune response, gastrointestinal damage (bleeding lesions, acute gastritis, diarrhea), weight loss, tremors, xerostomia, seizures, nutritional deficiencies (especially B1 thiamine), electrolyte imbalance, cardiovascular diseases, cancer, brain damage, oral disease, diminished reproductive function, fetal alcohol syndrome, spider petechiae on nose, rhinophyma, and rosacea.11,12</td>
</tr>
<tr>
<td><strong>Anxiolytics</strong></td>
<td>Bradycardia, hypotension, respiration depression, drowsiness, and lack of coordination.11,12</td>
</tr>
<tr>
<td><strong>Anabolic steroids</strong></td>
<td>Jaundice (from liver disease), coronary artery disease, stunted growth, muscle strains or ruptures, altered sex drive, prostate enlargement, irreversible breast enlargement, painful erections, shrinkage of the testicles, abnormal sperm production, acne, baldness, stretch marks, and roid-rage.11,12</td>
</tr>
</tbody>
</table>

The relapse rates for chemical dependency are over 60 percent for those who have sought patients’ risk for relapse.11,22 A comprehensive review of both inpatient and outpatient alcohol treatment outcome studies found that only one third of patients maintained abstinence from alcohol one year following treatment.22 The United States government is the largest funder of alcohol and drug abuse prevention and treatment research in the world, with the majority of work being conducted through the Department of Health and Human Services.19 However, only one third of that government money is actually allocated to the treatment, education, and research of chemical dependency,19 with two thirds allocated to law enforcement. The American health-care model has always been one of treating disease rather than preventing it23 and if this does not change in the years to come, those seeking treatment for chemical dependency are likely to relapse. Due to the high relapse rates in this population, some chemical dependency treatment programs are looking to alternative modalities such as meditation and yoga as a component of a patient’s total treatment.3

Access to care for chemical dependency treatment is a problem for many Americans face due to the limitations, cost, and lack of insurance and treatment.19 There are community-based services, but they often have long waiting lists.19 Thirteen to 16 million Americans need substance abuse treatment, but only three million receive it each year.19 Social workers commonly see these patients in their practice, but only a small number are properly trained to render appropriate treatment.19 Fifty percent of sentenced inmates in federal prison in 2014 were serving time for drug offenses.24 More prisons are conducting chemical and dependency treatment programs with a substantial number of probationers and parolees also participating in various programs.19

Treatment programs may include both inpatient and/or outpatient and selection can be based on the type of substance being abused.2 Initially, detoxification may be necessary with long-term follow-up management or recovery-oriented systems of care.2 Long-term management includes psychological counseling (to address the issues that contributed to the chemical dependency problem), supportive meetings such as Alcoholics Anonymous, and continued medical supervision.2 Specific treatment may be based on the patient’s age, overall health status, extent of symptoms, extent of dependence, type of substance being abused, tolerance for medications/procedures/therapies, patient expectations for the course of the condition, as well as overall opinions and preferences.2

Many pharmaceutical medications are used in the treatment of chemical dependency. Certain neurotransmitters are involved in drug actions, and medications can lessen withdrawal symptoms, reduce cravings, and promote normal brain function.12,19 Medications used in the direct treatment of chemical dependency include, but are not limited to:

1. Methadone (Diskets, Methadose, Dolophine): Used to treat narcotic drug addiction by suppressing symptoms and drug cravings.12 Drug is an opioid agonist that can help taper patients off of a substance in a step-down fashion.12 This drug will also lessen withdrawal symptoms.11,12
2. LAAM (Levo-alpha-acetylmethadol): Suppresses withdrawal symptoms and drug cravings.11,12
3. Naltrexone (Revia, Vivitrol): Opioid antagonist that can block receptors but does not eliminate drug cravings.11,12
4. Anxiolytics/sedatives such as phenobarbital or diazepam (Valium, Diastat): Used to treat withdrawal symptoms.11,12

Medications specific to alcohol treatment include:

1. Alcohol-sensitizing agents such as disulfiram (Antabuse): Causes adverse reactions when combined with alcohol, such as nausea, vomiting, and hypotension.13 Drug acts as a deterrent.11,12

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2. Anti-craving agents such as naltrexone (Revia): Decreases the desire for alcohol by interfering with neurotransmitter systems that produce pleasurable effects.11,12
3. Acamprosate (Campral): Antagonizes the actions of alcohol and reduces the desire to drink heavy alcohol.11,12 Has been shown to double the likelihood of successful abstinence.11
4. Anticonvulsants such as topiramate (Topamax, Qudexy), carbamazepine (Tegretol, Carbatrol, Equetro), and valproic acid (Depakote, Depakene, Stavzor):11,12 These drugs may be beneficial for cocaine dependence as well.11

Dental Considerations

The dental health professional should be able to provide education and referrals for patients with a suspected chemical dependency problem. Dental local anesthesia with vasoconstrictors should be used with caution, especially for patients with a known dependency to stimulants.11 Larger doses of local anesthesia may be necessary as they tend to quickly “wear-off” in this population.5 This is due to the increase in liver enzyme systems that are common in people who abuse chemical substances, which alters metabolism.12 These patients will metabolize and break down the vasodilators and vasoconstrictors present in dental local anesthesia faster than what is considered normal.3

Alcohol mouth rinses should be avoided in patients who are in recovery for fear of relapse.13 Complete abstinence from substances is needed for successful long-term recovery.11 For patients with infections or altered immune responses, power instruments (ultrasonics, air polishing, high-speed handpieces) should be used with caution due to the creation of aerosols.11 It is also important for the dental health provider to remember that this population may have impaired healing due to decreased immune functions.11 Patient education should consist of nutritional counseling, abuse risk to overall health status, oral cancer risk, need for routine oral care, and fetal risk factors.11

Conclusion

Chemical dependency is a growing public health concern globally. The economic burden of chemical dependency will continue to grow if nothing is done to change current prevalence and relapse rates. Dental care providers are well positioned in the health-care community to identify chemical dependency problems. Appropriate, timely, and compassionate referrals will increase a patient’s chance for a successful recovery.

References

5. Weinberg Pharm Book.

Author Profile
Lisa Dowst-Mayo, RDH, BSDH, MHA, graduated magna cum laude from both Ohio University with her MHA degree and the Caruth School of Dental Hygiene at Baylor College of Dentistry with a BSDH. She has held numerous leadership roles in the tripartite of the American/Texas/Dallas Dental Hygiene Associations. She is currently the dental hygiene program director at Concorde Career College in San Antonio, Texas, where she also teaches pharmacology, special needs, and clinical sciences. She has published numerous articles and written peer-reviewed continuing education courses on a broad range of topics for RDH, Dental Economics, Dimensions of Dental Hygiene, Canadian Dental Journal, and Access.

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Notes
Questions

1. Globally, which drug is the third leading cause of mortality?
   a. Alcohol
   b. Cocaine
   c. Heroin
   d. Methamphetamine

2. Which medical term is used to describe the abuse of drugs or alcohol that continues even when significant problems related to their use have developed in a patient’s life?
   a. Tolerance
   b. Substance dependence
   c. Impairment
   d. None of the above

3. Which prescription medication drug class is one of the most commonly abused drugs as presented in this course?
   a. Stimulants
   b. Cannabis
   c. Steroids
   d. Opioids

4. Which of the following drugs is the most wide abused drug in the world, with more than 90% of American adults dependent on its effects?
   a. Cocaine
   b. Cannabis
   c. Caffeine
   d. Opioids

5. How many milligrams of caffeine are contained in one cup of coffee?
   a. 25-35
   b. 50-100
   c. 95-200
   d. 200-500

6. What percentage of American middle and high school students consume energy drinks?
   a. 18-35
   b. 35-50
   c. 50-75
   d. 75-90

7. Which of the following conditions is a person who has a chemical dependency problem at increased risk for?
   a. Seizure
   b. Stroke
   c. Cardiac arrest
   d. All of the above

8. What percentage of the American population suffers from a mental illness?
   a. 10%
   b. 25%
   c. 35%
   d. 50%

9. What percent of the United States population ages twelve and older have used an illegal substance in the last month?
   a. 10.2%
   b. 12%
   c. 22%
   d. 32%

10. What is the number one cause of injury-related death in the United States?
    a. Tobacco use
    b. Drug poisoning
    c. Homicide
    d. Vehicular accidents

11. Which of the following has been discussed in the literature as a possible etiological agent for chemical dependency?
    a. Genetics
    b. Environmental stressors
    c. Societal pressures
    d. All of the above

12. The genes GABRA2 and CHRM2 have been associated with which drug?
    a. Alcohol
    b. Cocaine
    c. Heroin
    d. Caffeine

13. The A2A receptor gene (ADOR A2A) has been associated with which drug?
    a. Alcohol
    b. Cocaine
    c. Heroin
    d. Caffeine

14. What is the relapse rate for chemical dependency?
    a. 10%
    b. 20%
    c. 60%
    d. 90%

15. Which drug presents with the clinical findings of pinpoint constricted pupils, bradycardia, hypotension, decreased body temperature, and respiration depression?
    a. Opioids
    b. Stimulants
    c. Hallucinogens
    d. Alcohol

16. Which drug presents with the clinical findings of dilated pupils, hypertension, increased respiration, tachycardia, and Parkinson’s-like characteristics?
    a. Opioids
    b. Stimulants
    c. Hallucinogens
    d. Alcohol

17. Which drug can cause reddening of the conjunctivae?
    a. Opioids
    b. Alcohol
    c. Marijuana
    d. Heroin

18. Which drug can cause fetal alcohol syndrome?
    a. Opioids
    b. Stimulants
    c. Hallucinogens
    d. Alcohol

19. A person who abuses alcohol is likely to be deficient in which vitamin?
    a. Vitamin A
    b. Vitamin B1
    c. Vitamin C
    d. Vitamin D

20. Which drug can present with the clinical findings of muscle strains or rupatures, altered sex drive, prostate enlargement, irreversible breast enlargement, painful erections, shrinkage of the testicles, and abnormal sperm production?
    a. Steroids
    b. Alcohol
    c. Heroin
    d. Opioids

21. Which branch of the federal government is responsible for the prevention of and research for chemical dependency?
    a. FDA
    b. DEA
    c. EPA
    d. Department of Health and Human Services

22. What percentage of government funds allocated for alcohol and drug abuse goes toward prevention and treatment research versus funds allocated for law enforcement of drug abuse?
    a. 1/3
    b. 1/2
    c. 2/3
    d. 1/4

23. How many Americans receive substance abuse treatment each year?
    a. 100,000
    b. 3 million
    c. 15 million
    d. 30 million

24. In 2014, what percentage of sentenced inmates in federal prison were serving time for drug offenses?
    a. 10%
    b. 15%
    c. 25%
    d. 50%
25. Which of the following is/are considered part of the long-term management of chemical dependency?
   a. Psychological counseling
   b. Supportive meetings
   c. Medical supervision
   d. All of the above

26. Which of the following medications is an opioid agonist used to taper patients off of a substance in a step-down fashion?
   a. Methadone
   b. Levo-alpha-acetyl-methadol
   c. Naltrexone
   d. Topamax

27. Which medication is used in the treatment of alcohol dependency?
   a. Disulfiram (Antabuse)
   b. Methadone
   c. Levo-alpha-acetyl-methadol
   d. Phenobarbital

28. Which of the following should be used with caution when providing dental care to patients with a chemical dependency problem?
   a. Dental local anesthesia with vasoconstrictors
   b. Alcohol mouth rinses
   c. Both a & b
   d. None of the above

29. For patients with infections or altered immune responses, why is the use of power instruments in dentistry possibly contraindicated?
   a. Creation of aerosols
   b. These patients always need premedication
   c. These patients have problems with blood clotting
   d. They are never contraindicated

30. Dental providers should educate patients with a chemical dependency problem on which of the following?
   a. Nutritional counseling
   b. Abuse risk to overall health status
   c. Oral cancer risk
   d. All of the above
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1. Were the individual course objectives met?
   Objective #1: Yes No  Objective #2: Yes No  Objective #3: Yes No
   Please evaluate this course by responding to the following statements, using a scale of Excellent = 5 to Poor = 0.
   2. To what extent were the course objectives accomplished overall?
   3. Please rate your personal mastery of the course objectives
   4. How would you rate the objectives and educational methods?
   5. How do you rate the author’s grasp of the topic?
   6. Please rate the instructor’s effectiveness.
   7. Was the overall administration of the course effective?
   8. Please rate the usefulness and clinical applicability of this course.
   9. Please rate the usefulness of the supplemental webliography.
   10. Do you feel that the references were adequate?
   11. Would you participate in a similar program on a different topic?  Yes  No
   12. If any of the continuing education questions were unclear or ambiguous, please list them.
   13. Was there any subject matter you found confusing? Please describe.
   14. How long did it take you to complete this course?
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