



Coming From All Directions: Protecting Girls and Women From the Impact of Substance Use

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ABSTRACT Dentists may assist in protecting their female (and male) patients from unhealthy substance use conditions. Prevalence is so high that daily, nearly every U.S. health care provider sees patients either at risk themselves or experiencing negative effects of substance use by a friend, family member, or co-worker. Health care practice-based interventions employ simple universal standardized screening, brief advice, and occasional referrals to specialists and/or community resources. Youth prevention strategies reduce risk and build protective factors.

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The broad range of substance use conditions include illegal and prescription drug abuse, tobacco and inhalant use, underage and unhealthy drinking, club drugs, and pharmaceutical modulation of illicit drug effects.¹⁻⁴ In women and girls, unhealthy substance use increases risk for breast and other cancers, heart and lung diseases, HIV, hepatitis, osteoporosis, fractures, accidents, gastrointestinal disorders, familial stress and violence, depression, being sexually victimized, criminal activity, early dementia, and death.⁵⁻¹⁰ Women of child-bearing age have greater risks of poor birth outcomes and may bear infants with fetal alcohol/drug effects including clefts, asthma, sudden infant death, neuropsychiatric problems, and lifelong learning deficits.¹¹

Substance use significantly affects health, interpersonal relationships, and personal safety, and is both familial and behavioral in origin. Many female dental patients have experienced varying degrees of harm caused by other substance-abusing individuals. Exposure to someone else's activities resulting from untreated active substance abuse increases risk for anxiety, depression, post-traumatic stress disorder, psychosomatic disorders, being victimized, financial stress, and the diminishing health of family interactions.¹²⁻¹⁵

Prevention and early intervention of unhealthy substance have tremendous potential for reducing health care expenditures and disease burden, as well as improving quality of life for women and men. In a strategic plan to reduce American substance abuse, it is recommended

that all health care settings be adapted to provide patient education and basic screening services.¹⁶ Furthermore, practitioners are encouraged to give supportive, nonconfrontational, brief education when positive responses are elicited and when the patient is perceived to be receptive.

This approach has been shown to be more cost effective than other health screenings that Americans have come to expect, such as mammograms, prostate and colon cancer tests, blood lipids, or prenatal screening for Tay-Sach's disease, or Down syndrome. At this time, federal funds have become available through Medicaid to provide modest reimbursement for brief intervention services, thereby removing an historical barrier for private dental practices.

Teens and Environmental Exposure

One-third of American girls have been offered methamphetamine and/or methylenedioxyamphetamine, MDMA or Ecstasy.¹⁸ Pharmaceuticals are fairly available as well. For example, one-quarter of Eastern Canadian students prescribed methylphenidate for ADHD, were found to either sell or give their medication to fellow students for non-medical (recreational) use.¹⁹ Unsolicited spam e-mails offering Vicodin, benzodiazepines, and other addictive pharmaceuticals arrive daily. Internet drug libraries are full of erroneous and dangerous suggestions for experimenting with previously unheard of drug combinations.¹

The number of emergency room visits related to prescription drug abuse now exceed those for illegal drug abuse.²⁰⁻²¹ More than 1 million U.S. youth age 12 to 17 needing specialty treatment for substance use do not receive it, according to the Substance Abuse and Mental Health Services Administration: U.S. Department of Health and Human Services, although treatment

success rates can exceed those achieved in diabetes, asthma, and hypertension.²² Teenage girls who use substances are particularly endangered both immediately and over the long term. Those who do not use substances, however, may still be endangered by someone else's use. More than 40 percent of Americans of all socioeconomic groups are affected by the substance problems of their friends or family members, but most do not receive counseling services.

Substance use conditions result from complex genetic-environmental interactions and usually begin to manifest

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during adolescence.²³ Research literature is rich with high-quality evidence outlining known determinants of the choice to use substances, type of substances used, at what age use is initiated, and both the risk and protective factors influencing substance use problems.²⁴ Behavioral and environmental risk indicators are primarily the early initiation of alcohol and tobacco use, as well as adverse childhood experiences.

A Brain Disease

It has been almost a decade since Allan Leshner's landmark article, "Addiction is a Brain Disease, and It Matters." Like Alzheimer's, Parkinson's, depression, schizophrenia, Tourette's syndrome, epilepsy, and autism, substance use

disorders originate in the brain. The main location is the midbrain and the primary neurotransmitter system involves dopamine. The midbrain is the motivational and reward center and has evolved to provide a pleasurable sense of satisfaction for achievements related to survival, such as success, happy relationships, and the acquisition of food and shelter.

Substances with the potential to induce craving, compulsive use, and dependence are defined as those which increase dopaminergic neurotransmission in the midbrain. The cell bodies of dopamine-producing neurons are located in the nucleus accumbens with axonal projections to the ventral tegmental area. Increased dopamine in the ventral tegmental area results in a cascade of events associated with pleasurable emotional states. As repeated substance use increases in susceptible patients, behaviors may begin to turn away from some of life's normal activities and toward drug-seeking activities. Irreversible changes have been characterized in midbrain neurons with late-stage substance dependence. More than a decade ago, researchers, using PET scans of the male and female living brain, discovered significant sex differences, shedding light on gender-specific susceptibility to various mental health conditions.²⁵ This, and additional lines of evidence, are explaining why the female brain and reproductive organs incur greater damage at lower doses of alcohol and other drugs.²⁶

At puberty, 110 new brain chemicals emerge and brain development continues until age 25. Research is rapidly advancing the understanding of adolescent brain activity as related to the risks for substance abuse. Results using a variety of brain function tests, such as EEG, imaging techniques such as positron emission tomography, PET, scans and functional MRI (magnetic resonance

imaging, have been successful at pinpointing key locations in understanding risk and protective activities.^{28,29} Retrospective research has clearly established that teens with early onset drinking are more likely to have subtle or overt deficits in cognitive brain function.^{28,30-33}

Susceptibility

Alcohol and drug use disorders run in families with 40 percent to 60 percent of the variance of risk explained by genetic influences alone.²⁸ People with positive family history of substance use conditions tend to marry into like families, thereby concentrating genetic risk in subsequent generations. Among teens with one or both parents engaging in unhealthy drinking and/or drug abuse, boys are more likely to develop substance problems and girls are more likely to have depressive symptoms and manifest suicidality.^{15,34}

At this time, intensive animal and human research effort is directed at identification of the major and minor genetic loci that place certain families at greater risk. It is known that multiple genes are involved, which explains the broad variety of manifestations of substance use disorders. This is in contrast to single gene disorders such as Huntington's disease or Alpha-1-anti-trypsin deficiency, that manifest very little phenotypic variability. Other multiple gene disorders include diseases like periodontitis and some cancers. Although it is the purpose of this article to provide a comprehensive discussion of genetic research, a few illustrative examples follow.

Some genes are protective. For example, in the Han Chinese population, individuals homozygous for both the ADH1B*2/*2 (alcohol dehydrogenase) allele and the ALDH2*2 (aldehyde dehydrogenase) alleles have very low rates of alcohol problems.³⁵ Other genes

TABLE 1

Brain-region and Behavioral Outcomes of Adverse Childhood Experiences

Susceptible Brain Region	Age of ACE*	Behavioral Outcome
Corpus callosum	9-10	Poor mathematical ability Susceptible to PTSD Language delay Poor coordination
Hippocampus	3-5 and 11-13	Emotional reactivity Poor verbal and spatial memory Impaired language development
Frontal cortex	15-16	Poor judgment

increase risk. For example, the muscarinic acetylcholine M2 receptor gene (CHRM2) was identified in at least two separate affected ancestral lines. Using a case control, structured association study design including healthy control subjects (86 percent European-Americans; 14 percent African-Americans), the CHMR2 gene was identified as a predisposing loci to alcohol-dependence, drug dependence, and major depressive syndrome.³⁶

In the "Collaborative Study on the Genetics of Alcoholism" cohort, CHRM2

was found to predict co-morbid drug dependence among a large group of alcohol-dependent research subjects.³⁷ In simple terms, the researchers found no association to the CHRM2 gene among the 433 subjects dependent solely on alcohol and no other drugs, but a high association among the 477 alcohol-dependent subjects with a co-occurring drug dependency.

Although the genetic loci have not yet been mapped for the "low physiologic response" to alcohol, this phenotype has been shown to be a major risk factor

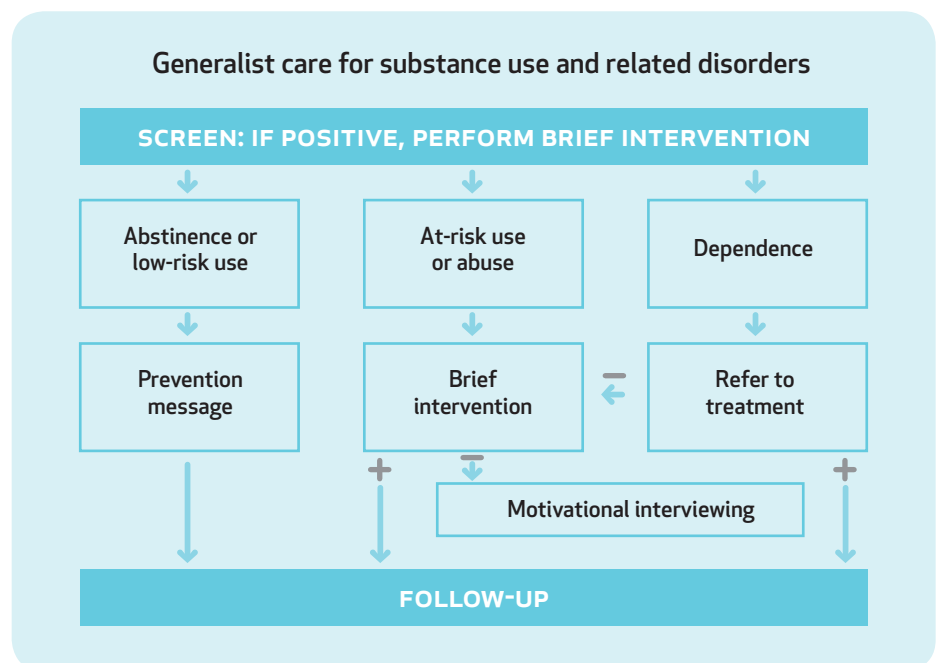


FIGURE 1. Decision tree for SBIRT (screening, brief intervention, referral to treatment). (From "Substance Abuse Screening, Assessment, Intervention, and Referral: A Recipe for Success" by Richard L. Brown, MD, Department of Family Medicine, University of Wisconsin at Madison.)

TABLE 2

Validated, Standardized Substance Use Screening Instruments

Short Title	Full Title of Screening Instrument	# of Questions	Written vs. Interview	Substances and Target Patients
AUDIT	Alcohol Use Disorder	10	Written	Alcohol only
CAGE	Cut-back, Angry, Guilty Eye-opener	4	Interview	Alcohol only
CAGE- AID	CAGE- Adapted to Include Drugs	4	Interview	Alcohol + other drugs
CRAFFT	Car, Relax, Alone, Forget, Friends, Family Trouble	6	Interview	Alcohol + other drugs (validated for adolescents)
S-MAST-G	Short- Michigan Alcoholism Screening Test- Geriatric	10	Written	Alcohol only (validated for ages 55 to 81)
DAST	Drug Abuse Screening Test	28	Written	Drugs only
TWEAK	Tolerance, Worry, Eye-opener, Amnesia, (K)Cut-down	5	Interview	Alcohol only (validated for pregnant women)
SRE	Self-Rating for the Effects of Alcohol	12	Self-administered	Alcohol (validated in men)
Fagerstrom	Fagerstrom Nicotine Tolerance Test	10	Self-administered	Tobacco
CAST	Child of an Alcoholic Screening Test	30	Written	Family members affected
Quantity and Frequency Questions	1) How many days a week do you drink some alcohol? 2) How much do you typically drink when you do? 3) What is the most you've had to drink at one time in the past 3 months? (Definition of one standard drink = 12 oz. 4.2% beer; 5 oz. 12% wine; 1.5 oz. 80-proof spirits.)			Prescription and illicit drugs could be assessed in this manner.

for substance abuse.³⁸ A patient with an inborn ability to tolerate higher doses of alcohol than others of similar weight, age and gender, is at four-fold greater risk for developing alcohol dependence. These patients should exercise extreme caution if they choose to use alcoholic beverages, and should avoid all other addictive substances. Practitioners should exercise special precautions when narcotic pain medications are necessary in such patients.

Adverse Childhood Experiences

Adverse childhood experiences increase the risk for plenty of physical, mental, and behavioral problems such as depression, obesity, early initiation of smoking and drinking, heart, liver or lung disease, suicidality, intimate partner violence, fractures, fetal death, substance use problems, marriage to an alcohol-dependent spouse, and premature death.^{39,40}

While Americans have on average one adverse childhood experience, those experiencing four or more are at significantly greater risk.⁴¹ Adverse childhood experiences include witnessing domestic violence against one's mother, losing a parent (death, abandonment, divorce), being abused or neglected, severe repeated corporal punishment, verbal humiliation, having an active substance-dependent family member, and living with a suicidal, depressed, or otherwise mentally ill person.⁴²

Regardless of genetic makeup, adverse childhood experiences affect brain development, decrease the volume of gray matter, and increase risk for substance use conditions. The frontal cortex, hippocampus and corpus callosum are particularly susceptible during childhood and adolescence, to repeated adverse experiences (TABLE 1). For example, a child experiencing adverse childhood experiences may mani-

fest what is known as "limbic irritability," being quick to anger and slow to recover.

School and Community-based Prevention

Drug abuse curricula and prevention initiatives targeting American youth have been undertaken since the late 19th century. Not until the past few decades have outcomes been measured systematically in order to identify beneficial programs. When outcomes are measured, clear trends are seen in the exemplary programs. Therefore, dentists should shy away from participating in community-based prevention programs that either do not measure outcomes or have shown to make no difference. Programs are rated as either research-validated, model, exemplary or blueprint and are summarized at www.cde.ca.gov/re/lr/wr/scibasedo705.asp.

Project Northland is a good example of an effective program with demonstrable results at preventing adolescent drug use and delaying initiation of alcohol use.⁴³ Designed as a randomized community trial, students in the intervention communities received multicomponent prevention efforts from early adolescence through high school. The comparison control communities had higher rates of alcohol and drug use during the measurement period but received the intervention thereafter.

A recent synthesis review identifies 10 key elements in successful programs^{44,45}:

1. Aimed at modifying psychosocial risk factors known to initiate or maintain youth substance use,
2. Included prevention of tobacco use and underage drinking,
3. Targeted multiple influences and settings,
4. Spanned multiple grades and developmental periods,
5. Developmentally and socioculturally sensitive,
6. Adequate funding,
7. Focused on social skills,
8. Parental component focused on discipline and support,
9. Broad-based involvement in decision making related to the structure of the organization, and
10. Sustainable and organized:
 - a. needs assessment,
 - b. realistic implementation,
 - c. fidelity checks,
 - d. evaluations,
 - e. refinements,
 - f. communication, and
 - g. dissemination of results.

How are social skills and risk factors identified to be targeted in such prevention programs? A recent Los Angeles study is illustrative.⁴⁶ In a well-designed longitudinal study of 2,081 high school students, older teens scoring low on

TABLE 3

Suggested Customized Screening Questions for Adult Dental Patients

Category/Section of the Health History Questionnaire	Item
Following dietary/sugar intake questions:	Do you smoke or chew tobacco?
	How much and for how long?
	Would you like to quit?
	How much* alcohol have you had in the last 24 hours?
	How many drinks do you have per occasion?
Under dental anxiety	Do you need to take a tranquilizer to relax or sleep?
Under hospitalizations	Alcohol/drug treatment?
Under family health history	Anyone in your family have an alcohol/drug problem?

*One standard drink = 12 oz. 4.2% beer; 5 oz. 12% wine; 1.5 oz. 80-proof spirits.

TABLE 4

Low-risk Drinking Limits

Population	Drinks* per Week	Drinks* per Day
Women	< 7	< 3 or 4
Men	< 12-14	< 5
Elderly	7 or less	1 or less
Children	none	none
Pregnant, nursing or attempting to conceive	none	none

*One standard drink = 12 oz. 4.2% beer; 5 oz. 12% wine; 1.5 oz. 80-proof spirits. Source: NIAAA/NIH and WHO.

social self-control were more likely to go on to smoke cigarettes and marijuana, drink alcohol, and use drugs. Therefore, these authors advocate providing skills training to teens to increase social self-control as the basis for future school-based drug prevention interventions.

Although research on gender-specific school-based programs is scant, it is thought to be necessary. Experts hypothesize that teenage girls may benefit most from assertiveness skills, self-esteem building, and education regarding sexuality and health and the avoidance of victimization.⁴⁵

Practice-based Approaches

In addition to asking frequency and amount of alcohol, tobacco, prescrip-

tion medications, and, perhaps, illegal drugs, dentists may select from several well-validated screening questionnaires that have been found effective in recognizing individuals at risk. With minimal training, cost and technical support, most dental practices can implement a feasible screening process over a several month period. **TABLE 2** summarizes the standardized instruments from which a dental practice may choose. The selection should be based upon patient demographics and staff preferences. The best screening procedure is the one that the dentist and staff will routinely and comfortably use. Self-administered and Web-based screening tools are also valuable.³⁸

TABLE 5

Educational and Community Resources

http://ncadi.samhsa.gov	National Clearinghouse for Alcohol and Drug Information
www.asam.org	American Society of Addiction Medicine
http://dasis3.samhsa.gov/	Substance Abuse Treatment Facility Locator
http://naadac.org	National Association for Alcohol and Drug Abuse Counselors
www.aacap.org/cs/root/facts_for_families/children_of_alcoholics	American Academy of Child & Adolescent Psychiatry
www.drugabuse.gov www.nida.nih.gov	National Institute of Drug Abuse
www.cde.ca.gov/ls/yd/re/chksdatacollection.asp	California Healthy Kids Survey Data
www.cde.ca.gov/ls/he/at/sap.asp	California Student Assistance Programs
www.samhsa.gov	Substance Abuse and Mental Health Administration
www.jointogether.org	Join Together (Advancing Effective Alcohol and Drug Policy, Prevention, and Treatment)
www.niaaa.nih.gov/Publications/EducationTrainingMaterials www.hazelden.org	National Institute on Alcoholism and Alcohol Abuse Hazelden treatment centers
www.ada.org (type "substance abuse" in search engine)	American Dental Association
www.perio.org (type "substance abuse" in search engine)	American Academy of Periodontology
www.al-anon.alateen.org	Al-Anon Family Groups
www.alcoholics-anonymous.org	Alcoholics Anonymous
www.na.org	Narcotics Anonymous
www.nicotine-anonymous.org	Nicotine Anonymous
www.nacoa.org	National Association for Children of Alcoholics
www.usdoj.gov/dea/concern/concern.htm	U.S. Drug Enforcement Administration
www.ampainsoc.org	American Pain Society
www.whitehousedrugpolicy.gov	White House Office of National Drug Control Policy
www.attud.org	Association for the Treatment of Tobacco Use and Dependence

(Links accessed Dec. 11, 2007.)

During seven years in private periodontal practice, the author has used a series of simple written questions (TABLE 3) to successfully screen all of her periodontal patients. The questions were imbedded among other standard health history questions. This approach streamlines the verbal follow-up interview. The entire health history document is available by request (TABLE 4).

A plethora of patient educational and treatment resource materials are available, many of which are free of charge. TABLE 5 provides Web links to evidence-based prevention and treatment information.

Conclusions

Substance abuse in the family and within the society as a whole impacts women and girls significantly.⁴⁷ Tremendous advances have been made in understanding the genetic and environmental influences on risk and protective factors in substance abuse. In addition, specialty treatment offers a broad range of behavioral and pharmacological aids in recovery for substance-dependent patients.⁴⁸ However, comprehensive prevention and early intervention requires involvement of major sectors of communities and a broad variety of health care workers.⁴⁹ Dentists are ideally situated to assist in national

efforts to help affected American families access available resources. ■■■■

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