



AM:STARs

Adolescent Medicine: State of the Art Reviews

Substance Use and Abuse Among Adolescents

Robert T. Brown, MD

Sheryl Ryan, MD

Editors

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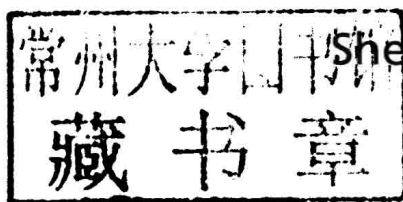
ADOLESCENT MEDICINE: STATE OF THE ART REVIEWS

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Among Adolescents

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Adolescent Medicine: State of the Art Reviews

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SUBSTANCE USE AND ABUSE AMONG ADOLESCENTS

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Foreword

It seems that being an adolescent, which has always been challenging, is getting even tougher. Adolescents already are hardwired to seek novelty and take risks, but now they must navigate an environment crisscrossed with increasingly treacherous avenues for channeling those otherwise desirable traits. One of the most worrisome trends in this context is the growing variety and availability of legal and illegal psychoactive substances. These substances can compromise adolescents' physical, cognitive, and social health and push them onto a path to addiction.

Consequently, neuroscientists and addiction researchers, who have made adolescents the focus of their work, perform a doubly important function in the promotion of public health. Their combined contributions have transformed our understanding of the specific risks that affect this particularly vulnerable population, paving the way for more effective prevention and clinical interventions.

Consider, for example, the cross-sectional imaging study that uncovered the maturational imbalance between the prefrontocortical and limbic regions of the brain during an adolescent's development. That landmark observation helped explain much of a young person's penchant for engaging in risky behaviors, including substance use. This understanding added a critical new dimension to the epidemiologic evidence linking early initiation of substance use to a significantly higher incidence of substance use disorders later in life. Although we do not yet fully understand the roots of this connection, a large body of evidence suggests that the high malleability of neural circuits undergoing experience-dependent maturation at this stage plays a big role. A case in point is the recent study showing nicotine's time-restricted ability to epigenetically sensitize the adolescent rat brain to the behavioral effects of cocaine.

It is data such as these that have prompted the National Institute on Drug Abuse (NIDA) to recognize adolescence as a focal point in its overarching mission. Hence, NIDA has made a commitment to support a robust and multidisciplinary research portfolio geared toward understanding the unique constellation of interacting biologic and environmental factors that shape a young person's substance use trajectory.

The contributions that make up this special issue of *Adolescent Medicine: State of the Art Reviews (AM:STARs)* are particularly exciting because they convey a sense that actionable progress has been made in the field of adolescent substance abuse research in recent years. This issue is also very timely because the challenges facing young people today are more complex and dynamic than ever before. The effects of many such challenges, such as the potential effect of around-the-clock online activity, are largely unpredictable. Others, such as the proliferation of new designer drugs of abuse or the widespread confusion over

nationwide efforts to legalize marijuana use, can be expected to have profoundly negative public health implications.

We hope the articles in this issue of *AM:STARS* will illuminate some of these important debates and spur additional transformative research on how best to protect our young people.

Nora D. Volkow, MD

NIDA Director

National Institute on Drug Abuse

Ruben D. Baler, PhD

Health Scientist

National Institute on Drug Abuse

Preface

Substance Use and Abuse Among Adolescents

Substance abuse continues to be a significant health problem for adolescents and young adults in the United States and elsewhere. Up-to-date information on the many facets of this issue is essential for physicians who care for these young people. This issue of *Adolescent Medicine: State of the Art Reviews (AM:STARS)* provides reviews of and insights into the latest information on the various substances that adolescents use and how they use them. Articles ranging from overviews of current use data to facts about specific substances such as alcohol, marijuana, prescription stimulants, and opioids, use by different cultural groups, and various treatment options give an extensive and authoritative view of this significant adolescent health issue. We hope you find this issue of *AM:STARS* helpful in your care of adolescents and young adults.

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Dedication

Dedicated to John R. Knight, MD and Peter D. Rogers, MD, who have inspired both of us to learn about, care for, and advocate for youth with substance abuse issues.

SUBSTANCE USE AND ABUSE AMONG ADOLESCENTS

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Adolescent Substance Use: The Role of the Medical Home

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Sharon Levy, Janet F. Williams

Substance use is a major public health burden in the United States. Typically, onset occurs during childhood or adolescence. Pediatric and adolescent medicine physicians are uniquely positioned to address substance use in children across the pediatric age range and into young adulthood. Substance use can play a role in every aspect of health and health care, so physicians must be cognizant of the scope of its prevalence and effects when documenting the patient's social, personal, and family medical history; conducting the physical examination; discerning diagnoses; and providing patient and parent advice, anticipatory guidance, care management, referral, and continuity of services.

Neurobiology of Adolescent Substance Use and Addictive Behaviors:

Treatment Implications

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Christopher J. Hammond, Linda C. Mayes, Marc N. Potenza

Psychoactive substance and nonsubstance/behavioral addictions are major public health concerns associated with significant societal cost. Adolescence is a period of dynamic biologic, psychological, and behavioral changes. Adolescence is also associated with an increased risk for substance use and addictive disorders. During adolescence, developmental changes in neural circuitry of reward processing, motivation, cognitive control, and stress may contribute to vulnerability for increased levels of engagement in substance use and nonsubstance addictive behaviors. Current biologic models of adolescent vulnerability for addictions incorporate existing data on allostatic changes in function and structure of

the midbrain dopaminergic system, stress-associated neuroplasticity, and maturational imbalances between cognitive control and reward reactivity. When characterizing adolescent vulnerability, identifying subgroups of adolescents at high risk for addictive behaviors is a major goal of the addiction field. Genetics, epigenetics, and intermediate phenotypes/endophenotypes may assist in characterizing children and adolescents at risk. Improved understanding of the neurobiology of adolescence and addiction vulnerability has the potential to refine screening, enhance prevention and intervention strategies, and inform public policy.

“The New Cigs on the Block”: An Update on Conventional and Novel Tobacco Products

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Deepa Camenga

Although cigarette smoking is the predominant form of tobacco use in the United States, adolescents are increasingly using alternative tobacco products such as cigars, smokeless tobacco products (eg, chewing tobacco, snus, and dissolvables), hookah (ie, waterpipes), and electronic cigarettes. This article provides an update on cigarette smoking in adolescents and reviews the epidemiology of noncigarette tobacco use in youth, existing evidence on the health effects of noncigarette tobacco use, and clinical and policy implications.

Young People and Alcohol Use: Contextualizing and Responding to the Challenge of Problematic Drinking

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Stewart Stubbs, David Bennett

In the western world, regular alcohol use in young people is trending down, risky binge drinking is trending up, and young women’s drinking is matching that of young men. Young people’s drinking, with all of its health and behavioral correlates, continues to challenge health professionals, health educators, and policymakers worldwide, not only because of the potential harm to the individual young person, both immediately and well into future life, but also because of the frustrating barriers to effective prevention and intervention often experienced. Fortunately, as we gain better insights into the contexts and cultural influences that predicate drinking trends in adolescents and young adults, our efforts to contain the damage through a range of contextual responses hold some promise. From both Australian and international perspectives, this review explores our contemporary understanding of what drinking means to young people, what shapes, sustains, and reinforces their drinking behavior, and current

thinking about the breadth of responses and approaches available to address problematic drinking during adolescence and early adulthood.

Marijuana

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Seth Ammerman

Marijuana is one of the drugs most commonly used by adolescents. Medical marijuana is now legal in 20 states and the District of Columbia, and recreational use of marijuana by adults is now legal in Colorado and Washington State. Physicians are likely to be consulted by both adolescents and their parents regarding the possible benefits and risks of marijuana use. This article reviews definitions related to the marijuana plant and its components; epidemiology of current use patterns among adolescents; potential side effects; adolescent brain development and marijuana use; medical and recreational marijuana; marijuana delivery methods; medical marijuana and potential effects on adolescent use of recreational marijuana; comparisons between marijuana, alcohol, and tobacco; social justice issues; driving under the influence; adolescent use of medical marijuana; parental guidance; and counseling the adolescent patient.

Nonmedical Use of Prescription Stimulants by Adolescents

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Alain Joffe

A small but significant proportion of adolescents report the use of prescription stimulants without a physician's direction or the use of prescription stimulants in ways or dosages not intended by the prescribing physician. Compared to adolescents not reporting such use, those misusing prescription stimulants are more likely to display evidence of undiagnosed mood disorders or attention-deficit/hyperactivity disorder (ADHD) and have higher rates of other substance abuse. Physicians who prescribe ADHD medications should do so only after performing a comprehensive assessment, including screening for substance abuse and other comorbidities. Careful monitoring of refill requests may identify youth who are inadequately treated or diverting their medication. Misuse of these medications might be reduced by public health campaigns for adolescents and parents emphasizing that the use of prescription stimulants without a physician's direction can pose health risks.

Responding to the Prescription Opioid Epidemic: Practical Information for Pediatricians

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Martha J. Wunsch, Pamela K. Gonzalez

Nonmedical use of prescription drugs remains a serious concern among adolescents. Prescription opioids are most frequently used, but stimulants and sedative-hypnotics also are involved. Medications often are received or stolen from family or peers, but many youth initiate nonmedical use from their own prescription leftovers. Nonmedical use contributes to drug poisonings and deaths. More commonly, nonmedical use is associated with alcohol and other drug use, and younger age at initiation of nonmedical use is linked with higher likelihood of developing substance use disorder. This article reviews the background and scope of the problem and offers the adolescent medicine physician some simple approaches to prevention and safer prescribing practices in this vulnerable group.

Performance-Enhancing Substances

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Cora Collette Breuner

A performance-enhancing substance is any substance used by a person to perform better on the field, on the stage, or in the classroom. Use of performance-enhancing substances in children and adolescents is increasing, and this is a definite health concern. The increase is likely caused by a rise in popularity of team sports, easy availability of performance-enhancing substances via the Internet, focus on thinness or muscular bodies, parental and coach pressure, and a propensity for adolescents to engage in risk-taking behaviors. In this article, performance-enhancing substances available to adolescents are discussed, including steroids, steroid precursors, growth hormone, supplements, stimulants, and beta-blockers.

Screening and Brief Intervention for Alcohol and Other Abuse

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Sion Kim Harris, Jennifer Louis-Jacques, John R. Knight

Adolescent screening and brief intervention (SBI) in general medical settings have the potential to greatly enhance our ability to prevent, identify, and treat substance abuse and its associated harms. Widespread implementation of SBI within such settings depends on the availability of practical and effective tools. This review describes recent developments in evidence-informed clinical practice guidelines that are designed to promote delivery of SBI through provision of structured algorithms and