Substance use disorder in adolescents: Epidemiology, clinical features, assessment, and diagnosis

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INTRODUCTION

Substance use is pervasive and endemic among adolescents. By the time adolescents become adults in the United States, almost half will have tried an illicit drug, and over 80 percent will have used alcohol [1]. Most use by adolescents will attenuate over time, but many suffer negative health and social consequences [2]. Some adolescents advance to levels of use and consequences that meet criteria for substance use disorders (SUDs) and are at high risk for its continuation in adulthood.

The general approach to the assessment and treatment of adolescents with SUDs is similar in some respects to adults; however, developmental considerations require an approach tailored to the cognitive, social, and legal status of adolescents.

The epidemiology, pathogenesis, clinical features, screening, and diagnosis of substance use and SUD in adolescents are reviewed here. Treatment for SUD in adolescents is described separately, as is tobacco prevention and cessation management in adolescents. (See "Substance use disorder in adolescents: Psychosocial management" and "Prevention of smoking and vaping initiation in children and adolescents" and "Management of smoking and vaping cessation in adolescents".)

EPIDEMIOLOGY

Substance use is pervasive and endemic among adolescents in the United States, European countries, and other countries (table 1).

Alcohol use — The prevalence of alcohol use varies. For example:

- According to a European School Survey Project on Alcohol and Other Drugs, 34 percent of female and 36 percent of male European students reported heavy episodic drinking [3].
- In the National Survey on Drug Use and Health (NSDUH), 3.8 percent of persons in the United States age 12 to 17 years reported past month binge drinking [4].
- Estimates of binge monthly alcohol use and heavy monthly alcohol use in the past month among youth age 12 to 20 years old were 1.6 percent and 8.3 percent respectively [4].

Binge drinking, defined as three to five or more drinks per occasion [5], is associated with 4300 deaths among underage youth each year, as well as school, social, and physical problems in adolescents [6].

Risk factors — Risk factors for problematic drinking and binge drinking in adolescents overlap broadly with risk factors for the use of other recreational drugs (see 'Risk factors' below). One prospective cohort study found that parental supply of sips or whole drinks of alcohol to adolescents was associated with increased odds of binge drinking (odds ratio 1.85, 99.5% CI 1.17-2.91) and alcohol-related harms (odds ratio 1.70, 99.5% CI 1.20-2.42) [7].

Solitary drinking, compared with only social drinking, is also a risk factor for alcohol-related problems in adolescents and young adults. A meta-analysis of 21 studies showed increased risk of alcohol use disorder and academic, legal, interpersonal, emotional, and physical health problems among adolescents who reported solitary drinking [8].

Drug use

- Substantial proportions of youth surveyed had tried illicit drugs at least once in their lifetime in the countries that follow [1,4,9,10]:
  - Australia – Greater than 40 percent
  - Canada – 60 percent
  - Europe – 19 percent of boys, 14 percent of girls
  - United States – Greater than 40 percent
    - 16.6 percent of 8th graders
    - 41.0 percent of 12th graders

- 6.3 percent of 12th graders in the United States reported smoking marijuana daily, and one in seven reported having been a daily marijuana smoker at some time for at least a month [1]. 13.6 percent of high school adolescents reported marijuana use in the past month.

- According to a survey project, the rate of cannabis use among European youth age 12 to 17 in the past month was 13 percent [9].

Substance use disorders — A study of a nationally representative sample of United States adolescents in the National Comorbidity Study estimated the lifetime prevalence of any substance use disorder to be 11.4 percent [11]. According to the NSDUH study, 8.5 percent of adolescents age 12 to 17 had an SUD [4].

- **Illicit drugs** – Epidemiologic studies in the United States estimated a lifetime prevalence of SUDs for illicit drugs in adolescents to be between 4.0 and 8.9 percent [12]. Studies of the lifetime prevalence of SUD for illicit drugs in select age groups in the United States include:

  - 3.4 percent prevalence of SUD for illicit drugs in youth age 13 to 14 years [12]
  - 16.5 percent prevalence of SUD for illicit drugs in youth age 17 to 18 years [12]

- **Alcohol** – Epidemiologic studies in the United States estimated that the lifetime prevalence of alcohol use disorders is between 3.4 and 6.4 percent in adolescents as a whole [13]. Findings in selected subgroups included [12]:

  - 1.3 percent in adolescents age 13 to 14
  - 15.1 percent of adolescents age 17 to 18

Risk factors — Multiple studies have found associations between early age of first alcohol or other substance use and the development of substance dependence [14]. Other risk factors for the development of substance use and SUDs include the individual, peer, family, and community characteristics below [15-18]. Most adolescents with early onset of substance use (eg, before age 13 to 14) or who develop SUDs usually have multiple risk factors.

- **Family risk factors**

  - Parental drug/alcohol use

  - Intrauterine exposure to drugs/alcohol

  - Marital conflict

  - Family dysfunction/disturbed family environment

- Parental favorable attitudes toward alcohol and/or drug use
- Substance use among siblings
- Negative life events
- Poor parenting – Rejection, lack of parental warmth, parent-child conflict, parental hostility/low attachment, harsh discipline, lack of or inconsistent discipline, permissive parenting, inadequate supervision and monitoring, child abuse/maltreatment

- **Individual risk factors**
  - Difficult temperament/inflexibility, depression, withdrawal
  - Irritability
  - Motor, language, and cognitive impairments
  - Early aggressive behavior
  - Poor social skills: impulsive, aggressive, passive, and withdrawn
  - Poor social problem-solving skills
  - Sensation seeking
  - Lack of behavioral self-control
  - Early persistent behavior problems/antisocial behavior
  - Attention deficit hyperactivity disorder (ADHD)
  - Poor impulse control/impulsivity, poor concentration
  - Low self-esteem, perceived incompetence, negative explanatory, and inferential style
  - Poor grades/achievements/school failure, low commitment to school
  - Tobacco use, cannabis use
- **Peer risk factors**
  - Deviant peer group
  - Peer attitudes toward drugs
  - Decrease in social support accompanying entry into a new social context

- Attending college
- Substance-using peers
- Social adversity

- **Community risk factors**

  - Laws and norms favorable toward alcohol and drug use
  - Availability and access to alcohol
  - Urban setting
  - Poverty
  - Community/school violence

Co-occurring disorders — In studies of youth 13 to 18 years of age with a mental disorder, rates of a co-occurring SUD have ranged from 61 to 88 percent [19,20]. In a community-based epidemiologic study that included 10,123 adolescents age 13 to 18 years, three times as many adolescents with a current SUD, compared with those without an SUD, had a current co-occurring mental disorder [21]. Co-occurring mental disorders among adolescent youth (12 to 18 years) with substance use or a substance use disorder include:

- Conduct disorder
- ADHD
- Major depressive disorder
- Bipolar disorder
- Disruptive mood dysregulation disorder
- Posttraumatic stress disorder
- Anxiety disorders
- Schizophrenia

Other relevant findings include:

- Onset of mood disorders, such as bipolar, is often preceded by cannabis use [22].

- Suicide is closely associated with substance use [23,24]. Many psychiatric disorders that are comorbid with SUDs carry an increased risk of suicidal behavior. Substance use may increase the risk for suicidal behavior, as substance intoxication may decrease judgment and increase dysphoria and impulsivity due to direct pharmacologic effects. Substance use may also lead to suicidal behavior by increasing stress and exacerbate co-occurring psychiatric disorders.

- Twenty-five to 50 percent of adolescents with conduct disorder or oppositional defiant disorder have been found to have an SUD [25]. Over half of adolescents with SUDs have been found to have co-occurring conduct disorder and/or oppositional defiant disorder. The two conditions have a reciprocal relationship: Conduct disorder is associated with increased substance use, and substance use worsens conduct disorder.

- Approximately 20 to 27 percent of adolescents with an SUD have comorbid ADHD [26].

Relative to substance use, co-occurring mental disorders may [27]:

- Precede as a risk factor
- Develop as a consequence
- Moderate the severity
- Originate from a common vulnerability as SUDs

PATHOGENESIS

There are strong environmental and genetic risk factors for the development of SUDs. Adoption, twin, and extended-family studies have established the genetic or heritable component of predisposition to tobacco, alcohol, and illicit drug use disorder. Shared environmental influences are relatively stronger at earlier stages of substance involvement (initiation and use) [28,29]. There is considerable overlap in the genetic influences associated with SUDs across drug classes, and shared genetic influences contribute to the commonly observed associations between SUDs and externalizing disorders [29].

As with most behavioral and psychiatric disorders, the interplay between genetic risk, temperamental traits, and the environment may predispose specific youth to early use of substances and persistent substance use. Once exposed to substances, brain reward systems reinforce substance use, resulting in repeated use and lower ability to control substance use. As the adolescent brain has not fully matured, the effects of substances on the reward system predispose to more profound effects of substance use compared with older age at initiation of use.

This research supports an etiologic model of individual differences in substance use, in which initiation and early patterns of use are strongly influenced by social and familial environmental factors, while later levels of use are strongly influenced by genetic factors.

CLINICAL FEATURES

Acute pharmacologic effects of alcohol and/or drug use in adolescents include changes in mood, perception, cognition, and psychomotor performance.

Chronic physical manifestations of substance use are rarely noted during adolescents due to the relative brief duration of their use careers. Polysubstance use by adolescents appears to be a rule rather than the exception.

SUD can be distinguished from substance use by the presence of psychosocial impairment and behaviors related to obtaining, using, or recovering from the substance. For most adolescents who try substances, especially alcohol and marijuana, sporadic or low frequency substance use often does not result in an SUD [2].

SUDs should be considered in an adolescent patient with psychosocial problems and/or impairment, although these could be the result of comorbid conditions or due to risk factors that predispose individuals for the development of SUDs. (See 'Risk factors' above.)

Psychosocial problems caused by substance use in adolescents are typically related to family, peer, legal, work, and/or school factors, or to use in physically hazardous situations. Salient use behaviors connote a substantial level of involvement with substance use (eg, tolerance and/or withdrawal), compulsive use (ie, often taken in larger amounts or over a longer period than intended, or a great deal of time is spent to obtain substance or recover from its effects), use with disregard or minimization of consequences of impairment, and/or use to the exclusion of other important activities or role obligations. Continued use despite recurrent problems related to use is also a common manifestation of SUDs. (See 'DSM-5-TR diagnostic criteria' below.)

The clinical manifestations of SUDs in adolescents differ in several respects from SUDs in adults. This is primarily due to adolescents' earlier stage of development, shorter duration of substance use, and the types of impairment seen [25]. Adults have had a longer duration in which to develop chronic health effects and more opportunities to use substances regularly without the interference of family or school. Adults can purchase alcohol, which adolescents cannot legally do.

Withdrawal symptoms due to alcohol are uncommon in adolescents; however, other problems related to high blood alcohol levels such as "black outs" occasionally occur. Substance intoxication may lead to episodes of aggressive behavior, unplanned sexual behavior with questions of consent, and other maladaptive social behavior manifesting poor judgement.

COURSE

Most adolescents who try alcohol or other drugs do not develop SUDs. As an example, approximately 9 percent of cannabis users have been found to develop cannabis use disorder, a rate that increases among those who start young (to approximately 17 percent) and among daily users (to 25 to 50 percent) [30]. Cannabis use is associated with increased rates of illicit drug use [31]. Other relevant findings include:

- Earlier onset of alcohol use is associated with a more rapid development of dependence and with worse outcomes [32].
- Adolescence is a period of development associated with major risk for developing an SUD; the median onset of an SUD is 15 years old [33].
- Adolescent substance use predicts employment problems, other substance use disorder, and criminal and violent behavior [34].

CLINICAL CONSEQUENCES

Substance use and/or SUDs are associated with a number of negative consequences among youth, including accidents, death, hazardous behaviors, health effects, crime, increased sexual behaviors and unplanned pregnancy, and lower achievement [35-37].

Cannabis, cannabidiol, and synthetic cannabinoids — Cannabis use in adolescence, a time of brain development, is associated with reduced intelligence quotient (IQ), decreased neural connectivity, increased risks of depression, suicidality, and psychosis in young adulthood, and may be associated with cognitive impairment. The use of cannabidiol or synthetic cannabinoids also appear to be associated with mental health disorders [38]. Adolescents (and younger children) should be advised to avoid cannabis consumption.

- Cannabis-related neurocognitive deficits in attention and memory that persist beyond abstinence suggest possible structural brain alterations (eg, changes in gray matter tissue), changes in white matter tract integrity, and abnormalities of neural functioning (eg, increased brain activation) [39]. However, it remains difficult to determine whether reported group differences reflect pre-existing brain differences that may increase the risk for substance use and risk-taking behaviors.
- A meta-analysis found adolescent cannabis use to be associated with increased risks of depression and suicidality in young adulthood [40]. The analysis of 11 prospective longitudinal studies with 23,317 individuals age 18 and younger found increased risks of depression (odds ratio 1.37, 95% CI 1.16-1.62), suicidal ideation (odds ratio 1.50, 95% CI

1.11-2.03), and suicidal attempt (odds ratio 3.46, 95% CI 1.53-7.84) between the age of 18 to 32 years.

In a survey of 6672 adolescents from the United Kingdom, the use of cannabis, cannabidiol, and synthetic cannabinoid were each associated with increased likelihood of the development of probable depressive disorder, probable generalized anxiety disorder, probable conduct disorder, and the presence of auditory hallucinations [38]. Further studies with stronger study designs are suggested.

- A meta-analysis also found 3.9-fold increased risk for the development of psychosis after cannabis use, with a strong relationship reported between cannabis use between age 15 to 18 and eventual emergence of psychosis [41].

The relationship between cannabis use, medical and psychiatric comorbidities, and other adverse health consequences is reviewed separately. (See "Cannabis use and disorder: Epidemiology, pharmacology, comorbidities, and adverse effects".)

SCREENING

Our approach is consistent with the guidelines from the American Academy of Pediatrics Screening which recommends screening for an adolescent's use of alcohol, tobacco, and other drugs annually, typically beginning at age 11 years [42-44]. (See "Screening tests in children and adolescents", section on 'Nicotine, alcohol, and substance use'.)

Screening is a process in which adolescents are identified according to characteristics indicating that they possibly have a problem with substance use. Screening is appropriate for nonclinical settings, such as schools, as well as clinical settings, such as primary care and non-SUD specialty mental health. Screening does not provide information about the severity of an adolescent's substance use or the presence of an SUD. A positive screening result identifies the need for a comprehensive substance use assessment and based on the results, possible need for treatment. Screening is part of the assessment but does not render a diagnosis.

AAP guidelines suggest using the CRAFFT screen to identify problematic substance use. The CRAFFT screen is a brief screening tool that has been validated in the adolescent primary care setting [45-47]. The six CRAFFT screening questions are asked if the adolescent endorses drinking alcohol, smoking marijuana or hashish, vaping tobacco or other products, or using any other substance to get high during the previous 12 months. Two or more positive answers indicate a positive screen:

- **C** – Have you ever ridden in a **Car** driven by someone (including self) who was high, drunk, or had been using drugs?
- **R** – Have you ever used drugs or alcohol to **Relax**?
- **A** – Do you ever use **Alone**?
- **F** – Do you ever **Forget** things that you did while using?
- **F** – Do **Family or Friends** tell you to cut down?
- **T** – Have you ever gotten into **Trouble** when using?

The United States National Institute on Alcohol Abuse and Alcoholism (NIAAA) recommends that clinicians ask children age 9 to 11 and adolescents 11 to 14, two questions about alcohol use [43]:

- "Do you have any friends who drank beer, wine, or any drink containing alcohol in the past year?"
- Followed by: "How about you – in the past year, on how many days have you had more than a few sips of beer, wine, or any drink containing alcohol?"

For the younger youth, less than 14 years of age, any drinking is cause for concern. Older teens, age 14 to 18, should be asked the questions in the reverse order, with higher amounts indicating higher levels of risk:

- "In the past year, on how many days have you had more than a few sips of beer, wine, or any drink containing alcohol?"
- "If your friends drink, how many drinks do they usually drink on an occasion?"

Two other screeners have satisfactory psychometrics and can be used similar to the CRAFFT, especially in primary care offices.

- The Screening to Brief Intervention (S2BI) instrument is an instrument that can be administered digitally and can reveal the frequency of past-year use of tobacco, alcohol, marijuana, and five other classes of substances most commonly used by adolescents [48,49].
- The Brief Screener for Tobacco, Alcohol, and other Drugs uses highly sensitive and specific cutoffs to identify various SUDs among adolescents 12 to 17 years of age: ≥6 days of past-year use for tobacco and >1 day of past-year use for alcohol or marijuana [50].

Although specific interview questions with established validity such as the NIAAA screening systems, CRAFFT, or S2BI are often sufficient for screening in the emergency room or primary

care setting [51,52], many clinicians use specific screening instruments such as the Alcohol Use Disorders Identification Test or Drug Abuse Screening Test [53]. Due to high rates of co-occurring SUD in adolescents with mental disorders, a more comprehensive substance use assessment is favored in mental health specialty settings. (See "Substance use disorders: Clinical assessment".)

In addition to interview questions and screening instruments, the identification of specific risk factors can prompt performance of or referral for a comprehensive assessment, even in the absence of an adolescent's report of regular use or consequences. Such risk factors include a past history of substance use, high-risk behaviors, or moderate to severe high-risk status. (See 'Risk factors' above.)

ASSESSMENT

A comprehensive substance use assessment is a thorough process that includes variables or factors contributing to and maintaining substance use disorder, the severity of substance-related problems, and the variety of consequences associated with the adolescent's substance use. (See "Substance use disorders: Clinical assessment".)

The assessment process is used to identify those individuals who meet the diagnostic criteria for an SUD diagnosis, and to determine its severity from the quantity and frequency of use, the substances used, the presence of specific substance use behaviors, the pattern of use, and any consequences of use. The results of a comprehensive assessment will usually identify which individuals require treatment, what level of treatment, and other problems, as well as strengths of the adolescent that may be helpful during treatment.

A comprehensive evaluation requires assessment of many domains of functioning in the adolescent's life. These domains include [54]:

- Substance use behaviors and disorders
- Psychiatric and behavioral problems
- School and occupational functioning
- Family functioning
- Peer relations and social competency
- Exposure to trauma, maltreatment or abuse
- Sexual and gender identity
- Leisure/recreation

Toxicology — Toxicologic tests or drug screens of bodily fluids (usually urine but also saliva) and of hair samples detect the presence of specific substances. The basic drug screen used consistently across the United States tests for amphetamines, cocaine, cannabis, opioids, and phencyclidine. Many drug screens used outside the United States omit phencyclidine but include tests for benzodiazepines and a wider range of opioids. Individual tests are available for other drugs, including alcohol. (See "Testing for drugs of abuse (DOAs)".)

A formal substance use examination by an addictions specialist or psychiatrist should include such testing. Continuing care for an adolescent with an SUD with a goal of maintaining abstinence should include intermittent random urine screening. Primary care clinicians do not routinely use drug screens but may, particularly when the clinician is part of a more comprehensive treatment team and has consent from the adolescent.

Urine screening optimally includes proper collection techniques, evaluation of positive results, and specific plan(s) of action should the specimen be positive or negative. There are mixed views regarding whether sample collection from an adolescent should be monitored. Prior to testing, the clinician should establish rules regarding the confidentiality of the results.

A positive specimen indicates only the presence of specific drug(s) and not necessarily the presence of an SUD or a specific pattern of use. Because of the limited time a drug will remain in the urine and possible adulteration, a negative urine screen does not definitively indicate that the adolescent does not use drugs.

DIAGNOSIS

The American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision (DSM-5-TR) conceptualizes the prior constructs of substance use and substance dependence as a single entity substance use disorder [55]:

A specifier indicates severity (See 'Severity' below.)

DSM-5-TR diagnostic criteria — DSM-5-TR diagnostic criteria for SUD are described below [55].

A problematic pattern of use leading to clinically significant impairment or distress is manifested by two or more of the following within a 12-month period:

- 1. Often taken in larger amounts or over a longer period than was intended.
- 2. A persistent desire or unsuccessful efforts to cut down or control use.

- 3. A great deal of time is spent in activities necessary to obtain, use, or recover from the substance's effects.
- 4. Craving or a strong desire or urge to use the substance.
- 5. Recurrent use resulting in a failure to fulfill major role obligations at work, school, or home.
- 6. Continued use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by its effects.
- 7. Important social, occupational, or recreational activities are given up or reduced because of use.
- 8. Recurrent use in situations in which it is physically hazardous.
- 9. Continued use despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the substance.
- 10. Tolerance.
- 11. Withdrawal.

Applying these criteria to adolescents requires consideration of the developmental context. As an example, adolescents with alcohol use disorder commonly exhibit tolerance (ie, requiring increasing amounts of a substance to achieve the same effect), but less frequently show withdrawal or other symptoms of physiologic dependence [55]. Many adolescents with cannabis and opioid use disorders manifest withdrawal symptoms [55].

Preoccupation with use is often demonstrated by giving up previously important activities, increasing the time spent in activities related to substance use, and using more frequently or for longer amounts of time than planned. An adolescent may use despite the continued existence or worsening of problems caused by substance use. In applying criteria on consequences and behaviors associated with use, it is important to include alcohol-related blackouts, craving, and impulsive sexual behavior.

Severity — The severity of an SUD at the time of diagnosis can be specified as a subtype based on the number of DSM-5-TR criteria present:

- Mild – Two to three criteria
- Moderate – Four to five criteria
- Severe – Six or more criteria

SUMMARY

- **Epidemiology** – Substance use is pervasive and endemic among adolescents in the United States and many other countries. By the time adolescents become adults in the United States, almost half will have tried an illicit drug, and over 80 percent will have used alcohol. (See 'Epidemiology' above.)

- **Co-occurring disorders** – Epidemiologic studies in the United States have found a significant prevalence of substance use disorders (SUDs) among adolescents, along with substantial rates of co-occurring mental disorders. (See 'Substance use disorders' above and 'Co-occurring disorders' above.)

- **Risk factors** – Risk factors for the development of substance use and SUDs include individual, peer, family, and community characteristics. Adolescents with early onset of substance use/SUD (eg, prior to age 17 to 18 years) usually have multiple risk factors. (See 'Risk factors' above.)

- **Pathogenesis** – Research supports an etiologic model of individual differences in substance use, in which initiation and early patterns of use are strongly influenced by social and familial environmental factors, while later levels of use are strongly influenced by genetic factors. (See 'Pathogenesis' above.)

- **Clinical manifestations** – Acute pharmacologic effects of alcohol and/or drug use in adolescents include changes in mood, perception, cognition, and psychomotor performance. Chronic physical and psychiatric manifestations of substance use are rare. Substance intoxication may lead to black-outs, aggressive behavior, unplanned sexual behavior, and other behaviors associated with poor judgement. (See 'Clinical Features' above.)

  SUD can be distinguished from substance use by the presence of psychosocial impairment and behaviors related to obtaining, using, or recovering from the substance. Most adolescents who try alcohol or other drugs do not develop SUDs. (See 'Clinical Features' above.)

- **Consequences** – Substance use and/or SUDs are associated with a number of negative consequences among youth, including accidents, death, health effects, crime, unplanned pregnancy, and lower achievement. (See 'Clinical consequences' above.)

- **Cannabis, cannabidiol, and synthetic cannabinoids** – Cannabis use in adolescence, a time of brain development, is associated with reduced intelligence quotient (IQ), decreased neural connectivity, increased risks of depression, suicidality, and psychosis in young adulthood, and may be associated with cognitive impairment. Cannabidiol and synthetic cannabis each appear to be associated with possible mental health disorders. We advise adolescents (and younger children) to avoid cannabis consumption. (See 'Cannabis, cannabidiol, and synthetic cannabinoids' above.)

- **Screening** – Our approach is consistent with the American Academy of Pediatrics (AAP) in the United States that recommends screening adolescents' use of alcohol, tobacco, and other drugs annually, typically beginning at age 11 years. Guidelines for screening adolescents are described in detail separately. (See 'Screening' above and "Screening tests in children and adolescents", section on 'Nicotine, alcohol, and substance use'.)

- **Assessment** – A comprehensive substance use assessment evaluates consumption, substance use behaviors, psychiatric and behavioral problems, school and occupational functioning, family functioning, social competency and peer relations, and leisure/recreation. Toxicology testing is typically part of a comprehensive assessment by an addictions specialist or psychiatrist, and random drug tests are a part of treatment with a goal of abstinence. (See 'Assessment' above.)

- **Diagnosis** – The diagnostic criteria for substance use disorder includes two or more of the listed criteria within a 12-month period. Severity is indicated by a modifier code.

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