

# The Prevalence and Detection of Substance Use Disorders among Inpatients Ages 18 to 49: An Opportunity for Prevention<sup>1</sup>

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**Background.** Previous studies have found that substance use disorders are prevalent among inpatients of general medical hospitals. These studies were limited in the validity of their measures, their failure to distinguish between current and lifetime disorders, or their lack of attention to drugs other than alcohol.

**Methods.** The current study used validated diagnostic instruments to measure current and lifetime alcohol and other drug abuse and dependence among patients ages 18 through 49. Additionally, this study assessed the sensitivity and specificity of four substance abuse screening questions. Patients were recruited from the general medical, general surgery, and orthopedics services of a university hospital in Madison, Wisconsin. The sample included 363 patients, or 86.4% of those recruited.

**Results.** The current and lifetime prevalence rates of substance use disorders were 21.8 and 49.6%, respectively. The prevalence rates of current problems were 16.3%, alcohol only; 2.5%, other drugs only; and 3.0%, alcohol and other drugs. Males had nearly a 30% current prevalence of current substance use disorders. The CAGE Questions Adapted to Include Drugs exhibited 70.9% sensitivity and 75.7% specificity.

**Conclusions.** At one hospital, and perhaps at others, an alcohol and drug screening, assessment, and intervention program may have the potential to prevent future health and social problems. © 1998 Academic Press

**Key Words:** alcoholism; substance abuse; hospitals; mass screening.

## INTRODUCTION

Alcohol and other drug problems are major public health problems in the United States [1]. Alcohol and other drugs, excluding nicotine, have been estimated to cause at least 6% of all deaths and much additional morbidity, suffering, and economic loss [2]. Experts have agreed that specialized treatment programs are not the answer for all alcohol and drug problems [3]. Outreach programs are necessary to identify substance abusers and refer them to treatment [3]. In addition, many substance abusers may respond to brief interventions [3,4].

General medical hospitals have been identified as potentially useful settings for screening, identification, intervention, and referral for patients with alcohol and other drug problems [3,5]. Although there are no controlled studies on the utility of hospital programs aimed at these objectives, reports suggest that these programs can be effective [6]. To assess the cost, feasibility, and potential benefit of hospital-based identification and intervention programs, one should know the prevalence of alcohol and drug problems among inpatients. Prevalence information would also be of direct clinical use. Information on prior probability (the likelihood that a patient has an alcohol or drug problem before any clinical assessment is performed) would help clinicians set their levels of clinical suspicion for substance abuse. In addition, information on prevalence would guide the development and interpretation of alcohol and drug screening tests in hospital settings.

Several previous studies have examined the prevalence of alcohol problems among patients in general medical hospitals. The studies have found prevalence rates of 8% [7] to 29% [8]. The studies used different methods of ascertaining alcohol problems. Only one study used expert interview as a measure of substance use disorders [5]. The other studies used, singly or in combination, various diagnostic measures of alcohol problems. Some of the studies used screening tests to measure prevalence, such as the CAGE questions [9] and derivatives of the Michigan Alcoholism Screening

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Test [7,10,11] or both [12,13]. Some studies used physicians' diagnoses as a supplement to other instruments [8,9]. One study supplemented screening tests with determinations of serum  $\gamma$ -glutamyl transferase and mean corpuscular volume of red blood cells [11].

The validity of several of the aforementioned studies may have been compromised by their methods of ascertaining diagnoses. It has been well documented that screening questionnaires and laboratory determinations are limited in their sensitivity and specificity for alcohol problems. Some screening questionnaires are limited further in that they do not differentiate between current and previous disorders. It is also well established that physicians providing routine medical care frequently fail to diagnose existing alcohol problems [13–15]. Another limitation to all of the previously mentioned studies is the lack of focus on drugs other than alcohol.

The current report describes a prevalence study of substance use disorders among inpatients ages 18 through 49 at a university hospital in the midwestern United States. This study is unique among hospital prevalence studies in that it used validated diagnostic interviews to measure the lifetime and current prevalence of alcohol and other drug abuse and dependence.

A secondary purpose of the paper was to assess, for an inpatient population, the validity of a conjoint questionnaire that screens simultaneously for alcohol and other drug problems. In 1992, Brown introduced the concept of conjoint questionnaires that screen simultaneously for abuse of alcohol and other drugs [16]. There are several potential advantages to screening for alcohol and other drug problems conjointly rather than separately, including enhanced brevity and sensitivity [17]. An example of a conjoint questionnaire is the CAGE Questions Adapted to Include Drugs (CAGE–AID). To produce the CAGE–AID, the focus of each item of the CAGE was expanded from alcohol to alcohol and other drugs, as shown in Table 1. To assess the

validity of the CAGE–AID, this study compared responses to the CAGE–AID with a validated diagnostic interview.

## METHODS

### Subjects

For the secondary purpose of the study, it was important to identify sufficient numbers of patients with and without substance use disorders. Initially, patients of all age groups were included in the study. After 170 subjects had participated, an interim analysis revealed an inadequate prevalence of substance abuse or dependence among patients age 50 and older, and most of the patients fell into this age group. Subsequently, patients of this age group were excluded. This report focuses only on individuals between the ages of 18 and 49.

Sampling occurred on the general medicine, general surgery, orthopedics, and combined medical specialty units of the University of Wisconsin Hospital in Madison, Wisconsin. The combined medical specialty units included patients whose attending physicians were allergists, endocrinologists, and rheumatologists; these physicians supervised the care of patients with a broad spectrum of medical problems, as well as patients with medical problems in the realms of their subspecialties. Data were collected over 2 years beginning in June 1992.

Patients were considered eligible if they could communicate in English, if they exhibited sufficient cognitive ability, and if they did not require isolation for reasons of security, privacy, or contagion. Patients were excluded if they were pregnant because of the potential legal ramifications of admitting to substance use. Interviews were postponed for patients who were asleep, too tired or sick, or busy with medical care procedures. The interviewers identified all potentially eligible patients from census lists on each ward. The lists were reviewed with nurses, who identified those patients who were eligible and able to participate. The prospective subjects were assured that their decisions whether to participate would not affect their medical care. No remuneration was offered. The study was approved by the Human Subjects Committee of the University of Wisconsin Center for Health Sciences.

### Measures

Each interview began with several questions intended to allow the interviewer to establish rapport and to frame the interview as a study on health. These questions focused on general lifestyle, such as diet and exercise. Subsequently, the substance abuse screening items were administered. Finally, the patient re-

**TABLE 1**  
The CAGE and CAGE–AID Questionnaires

| Item | Text   |
|------|--|
| 1    | Have you ever felt you ought to cut down on your drinking <i>or drug use?</i>  |
| 2    | Have people annoyed you by criticizing your drinking <i>or drug use?</i>   |
| 3    | Have you ever felt bad or guilty about your drinking <i>or drug use?</i>   |
| 4    | Have you ever had a drink <i>or used drugs</i> first thing in the morning to steady your nerves or to get rid of a hangover? |

*Note.* The plain text shows the CAGE questions. The italicized text was added to produce the CAGE–AID. For this study, the CAGE–AID was preceded by the following instruction: "When thinking about drug use, include illegal drug use and the use of prescription drugs other than as prescribed."

sponded to a structured diagnostic interview, which served as the criterion measure for substance abuse. The results of the structured interviews are the focus of this report.

For the first half of the study, the Diagnostic Interview Schedule-Revised [18] was used as the criterion measure for substance abuse. When the Composite International Diagnostic Interview-Substance Abuse Module (CIDI-SAM) [19-22] became available, this instrument was used because of the greater consistency in its scoring algorithms for alcohol and other drugs. Both measures were based on the DSM-III-R criteria for substance use disorders [23]. These measures were used because they exhibit excellent test-retest and interrater reliability, they agree well with expert interviews, and they are designed for administration by trained nonclinicians [18-22]. Comparisons between the prevalence figures obtained from each instrument yielded no significant differences.

### Analysis

Data were initially entered into a DBase database on a microcomputer. They were transferred to a SAS file on a Sun Sparcstation. SAS was used to score the questionnaires and perform other analyses. Statistical adjustment for demographic differences between the actual sample and the intended sample was accomplished by summing the products of the prevalence rates for particular demographic subgroups of the actual sample and the proportional sizes of the demographic subgroups of the intended sample.

## RESULTS

### Participation and Demographics

During the study period, there were a total of 10,033 patients admitted to the hospital, including 3,905 who were admitted to the eligible services. Of these, 1,341 patients met the age criterion for eligibility. Of these 1,341 patients, 351 were ineligible, including 148 who were too sick, 82 who had inadequate mental status, 56 who had been transferred to different units, 17 who could not be approached because of security reasons, 15 who could not speak for medical reasons, 10 who actually belonged to different services, 10 who had special privacy needs, 7 whose infectious diseases required strict isolation, 5 who could not speak English, and 1 who was pregnant. Nine hundred ninety patients were targeted to be recruited for this study. Five hundred seventy patients were not recruited because they were sleeping, they had visitors, or they were scheduled for surgery, procedures, or therapies when the interviewers were available. Of the 420 subjects who were recruited, 44 or 10.5% declined, including 2 patients who

declined because of physical discomfort that they could not complete interviews that they had started. Three hundred seventy-four patients participated. Initially, the data were collected directly via entry into a laptop computer. However, after a disk failure resulted in the loss of data for 11 subjects, data were collected on paper. Data are available for 363 patients, or 86.4% of the 420 subjects who were recruited.

Table 2 shows the demographic attributes of the participants, the patients who were recruited but declined, other patients who met the age criterion but were not recruited, and all patients who were hospitalized during the time frame of the study. The participants and the patients who were recruited but declined were similar with regard to age ( $\chi^2 = 8.80$ ;  $df = 5$ ;  $P = 0.117$ ), marital status (married vs single vs other,  $\chi^2 = 0.595$ ;  $df = 2$ ;  $P = 0.743$ ), insurance status ( $\chi^2 = 7.40$ ;  $df = 3$ ;  $P = 0.060$ ), gender ( $\chi^2 = 1.38$ ;  $df = 1$ ;  $P = 0.241$ ), and race ( $\chi^2 = 1.69$ ;  $df = 2$ ;  $P = 0.431$ ).

The participants and the other potentially eligible patients were similar with regard to gender ( $\chi^2 = 0.71$ ;  $df = 1$ ;  $P = 0.399$ ), age ( $\chi^2 = 6.42$ ;  $df = 5$ ;  $P = 0.267$ ), and marital status ( $\chi^2 = 4.08$ ;  $df = 4$ ;  $P = 0.395$ ). However, the participants included more Medicare and public assistance recipients ( $\chi^2 = 13.07$ ;  $df = 3$ ;  $P = 0.004$ ), more whites, and fewer individuals who were neither white nor African-American ( $\chi^2 = 19.78$ ;  $df = 2$ ;  $P < 0.0001$ ).

Compared with all other patients admitted to the hospital during the study time frame, the participants consisted of more males ( $\chi^2 = 6.13$ ;  $df = 1$ ;  $P = 0.013$ ), more whites, and fewer nonwhite, non-African-Americans ( $\chi^2 = 7.60$ ;  $df = 2$ ;  $P = 0.022$ ). However, these two groups were similar with regard to age ( $\chi^2 = 7.81$ ;  $df = 5$ ;  $P = 0.167$ ), marital status ( $\chi^2 = 5.67$ ;  $df = 4$ ;  $P = 0.225$ ), and insurance status ( $\chi^2 = 7.03$ ;  $df = 3$ ;  $P = 0.071$ ).

### Prevalence of Lifetime Disorders

Table 3 shows the prevalence of various lifetime substance use disorders. About one-fourth (25.1%) had a lifetime history of alcohol abuse but not dependence. An additional 21.8% had a history of alcohol dependence. A total of 46.8% had a lifetime history of alcohol abuse or dependence.

A lifetime history of a disorder related to drugs other than alcohol was reported by 15.4%, 10.2% had been dependent on at least one drug other than alcohol, and 5.2% had never been dependent on a drug other than alcohol, but had abused at least one drug other than alcohol. Marijuana was the most commonly problematic substance (9.4%), followed by cocaine (6.6%), opioids including heroin (4.1%), stimulants (3.3%), sedatives and tranquilizers (2.5%), and inhalants (0.6%).

Nearly half (49.6%) of the subjects had at least one lifetime substance use disorder. Slightly more than

**TABLE 2**  
Demographic Comparison of Participants, Nonparticipants, and Decliners

| Demographic attributes | Participants<br>( <i>N</i> = 363) | Patients who were<br>recruited and declined<br>( <i>N</i> = 44) | Patients hospitalized on the<br>eligible services in the study's<br>time frame, excluding<br>the participants ( <i>N</i> = 3,542) | All patients hospitalized<br>on all services in the study's<br>timeframe, excluding the<br>participants ( <i>N</i> = 9,670) |
|------------------------|-----------------------------------|---|---|---|
| Gender                 |                                   |   |   |   |
| Female                 | 38.6                              | 47.7  | 40.9  | 45.1  |
| Male                   | 61.4                              | 52.3  | 59.1  | 54.9  |
| Age group              |                                   |   |   |   |
| 18 to 24               | 19.0                              | 15.9  | 20.0  | 17.6  |
| 25 to 29               | 14.9                              | 20.5  | 13.4  | 13.4  |
| 30 to 34               | 13.2                              | 20.5  | 16.5  | 16.8  |
| 35 to 39               | 20.9                              | 29.6  | 17.7  | 18.4  |
| 40 to 44               | 19.3                              | 11.4  | 17.6  | 17.8  |
| 45 to 49               | 12.7                              | 2.3   | 14.9  | 16.1  |
| Race                   |                                   |   |   |   |
| Black                  | 5.0                               | 9.1   | 5.6   | 5.9   |
| White                  | 90.6                              | 88.6  | 82.4  | 85.9  |
| Other                  | 4.4                               | 2.3   | 12.0  | 8.2   |
| Marital status         |                                   |   |   |   |
| Single                 | 50.7                              | 56.8  | 50.9  | 46.6  |
| Married                | 38.6                              | 34.1  | 40.4  | 43.5  |
| Divorced               | 6.9                               | 9.1   | 6.4   | 7.3   |
| Separated              | 2.8                               | 0.0   | 1.6   | 1.8   |
| Widowed                | 1.1                               | 0.0   | 0.6   | 0.7   |
| Insurance status       |                                   |   |   |   |
| Private                | 60.9                              | 52.3  | 65.6  | 60.6  |
| Medicare               | 8.3                               | 20.5  | 5.8   | 11.7  |
| Public assistance      | 19.3                              | 20.5  | 13.9  | 15.4  |
| Other                  | 11.6                              | 6.8   | 14.7  | 12.3  |

half of these individuals, or 25.3% of the total, had a history of dependence on at least one substance; the remainder suffered only from abuse of one or more substance. More than one-third (36.4%) had lifetime disorders involving only one substance and 13.2% had disorders involving two or more substances.

Because the sample differed significantly from the eligible patients with regard to race and insurance, statistical adjustments were carried out on the prevalence rates. The adjusted figures indicate what the prevalence rates would have been had the sample been demographically identical to the eligible population and had the rates been identical within demographic subgroups of the participants and nonparticipants. The two rightmost columns in Table 2 show that the adjustments produced little change for most rates.

#### *Prevalence of Current Disorders*

Table 4 shows the prevalence rates of current disorders—disorders active within the previous 12 months. Of the subjects, 19.3% had current alcohol disorders, including 10.5% with alcohol dependence and 8.8% with alcohol abuse. Current disorders related to drugs other than alcohol were reported by 5.5% of the subjects, including 2.5% with dependence on at least one drug. Marijuana was the most commonly problematic

substance (2.8%), followed by opioids including heroin (2.5%), cocaine (1.9%), sedatives and tranquilizers (0.6%), stimulants (0.3%), and inhalants (0.3%).

Slightly more than one in five (21.8%) had at least one current substance use disorder, including 11.8% with dependence on at least one substance; 18.5% of subjects had a current disorder involving only one substance—chiefly alcohol—and 3.3% had current disorders involving two or more substances. Figure 1 shows the relative prevalence rates of “pure” alcohol disorders, “pure” drug disorders, and mixed alcohol and other drug disorders.

Statistical adjustment for differences in the racial composition of the sample and the eligible population produced little change in the prevalence rates. Adjustment for differences in insurance status did result in slightly lower estimates of the prevalence rates in most categories.

#### *Demographic Correlates of Disorders*

Table 5 shows the prevalence of lifetime disorders for certain demographic subgroups. The prevalence of any lifetime disorder ( $\chi^2 = 15.78$ ;  $df = 1$ ;  $P < 0.0001$ ) was significantly higher for males than for females. Males had a nearly significantly higher prevalence of drug dependence than females ( $\chi^2 = 3.53$ ;  $df = 1$ ;  $P = 0.06$ ) and a significantly higher prevalence of each of the

**TABLE 3**

Prevalence of Lifetime Substance Use Disorders

| Substance use disorder                    | Raw prevalence (%) | Prevalence adjusted for race (%) | Prevalence adjusted for insurance (%) |
|---|--------------------|----------------------------------|---------------------------------------|
| Alcohol                                   |                    |                                  |                                       |
| Abuse                                     | 25.1               | 25.2                             | 25.6                                  |
| Dependence                                | 21.8               | 21.4                             | 20.8                                  |
| Any diagnosis                             | 46.8               | 46.5                             | 46.3                                  |
| Marijuana                                 |                    |                                  |                                       |
| Abuse                                     | 4.7                | 4.8                              | 4.9                                   |
| Dependence                                | 4.7                | 4.3                              | 4.1                                   |
| Any diagnosis                             | 9.4                | 9.1                              | 9.0                                   |
| Cocaine                                   |                    |                                  |                                       |
| Abuse                                     | 1.7                | 1.5                              | 1.5                                   |
| Dependence                                | 5.0                | 5.1                              | 4.7                                   |
| Any diagnosis                             | 6.6                | 6.6                              | 6.2                                   |
| Stimulants                                |                    |                                  |                                       |
| Abuse                                     | 0.3                | 0.2                              | 0.3                                   |
| Dependence                                | 3.0                | 2.8                              | 2.5                                   |
| Any diagnosis                             | 3.3                | 3.0                              | 2.8                                   |
| Sedative/tranquilizers                    |                    |                                  |                                       |
| Abuse                                     | 1.1                | 1.5                              | 0.9                                   |
| Dependence                                | 1.4                | 1.3                              | 1.3                                   |
| Any diagnosis                             | 2.5                | 2.8                              | 2.3                                   |
| Analgesic/opioids/heroin                  |                    |                                  |                                       |
| Abuse                                     | 1.4                | 1.3                              | 1.3                                   |
| Dependence                                | 2.8                | 3.1                              | 2.3                                   |
| Any diagnosis                             | 4.1                | 4.4                              | 3.6                                   |
| Inhalants                                 |                    |                                  |                                       |
| Abuse                                     | 0.0                | 0.0                              | 0.0                                   |
| Dependence                                | 0.6                | 0.5                              | 0.4                                   |
| Any diagnosis                             | 0.6                | 0.5                              | 0.4                                   |
| One or more drugs, excluding alcohol      |                    |                                  |                                       |
| Abuse but not dependence                  | 5.2                | 5.3                              | 5.4                                   |
| Dependence                                | 10.2               | 9.9                              | 9.1                                   |
| Any diagnosis                             | 15.4               | 15.3                             | 14.5                                  |
| One or more substances, including alcohol |                    |                                  |                                       |
| Abuse but not dependence                  | 24.2               | 24.4                             | 24.8                                  |
| Dependence                                | 25.3               | 24.7                             | 24.1                                  |
| Any diagnosis                             | 49.6               | 49.1                             | 48.9                                  |
| One substance—any diagnosis               | 36.4               | 35.9                             | 36.5                                  |
| Two substances—any diagnosis              | 7.4                | 7.4                              | 7.2                                   |
| Three substances—any diagnosis            | 2.8                | 2.5                              | 2.4                                   |
| Four or more substances—any diagnosis     | 3.0                | 3.3                              | 2.8                                   |

other categories of disorders in Table 4 (for each of four separate analyses:  $\chi^2 \geq 6.59$ ;  $df = 1$ ;  $P \leq 0.01$ ).

There appeared to be differences in the prevalence of various kinds of lifetime substance use disorders by age cohort, marital status, and race. However, the only statistically significant finding was that the married subjects had fewer lifetime drug disorders than the other participants ( $\chi^2 = 3.88$ ;  $df = 1$ ;  $P = 0.049$ ).

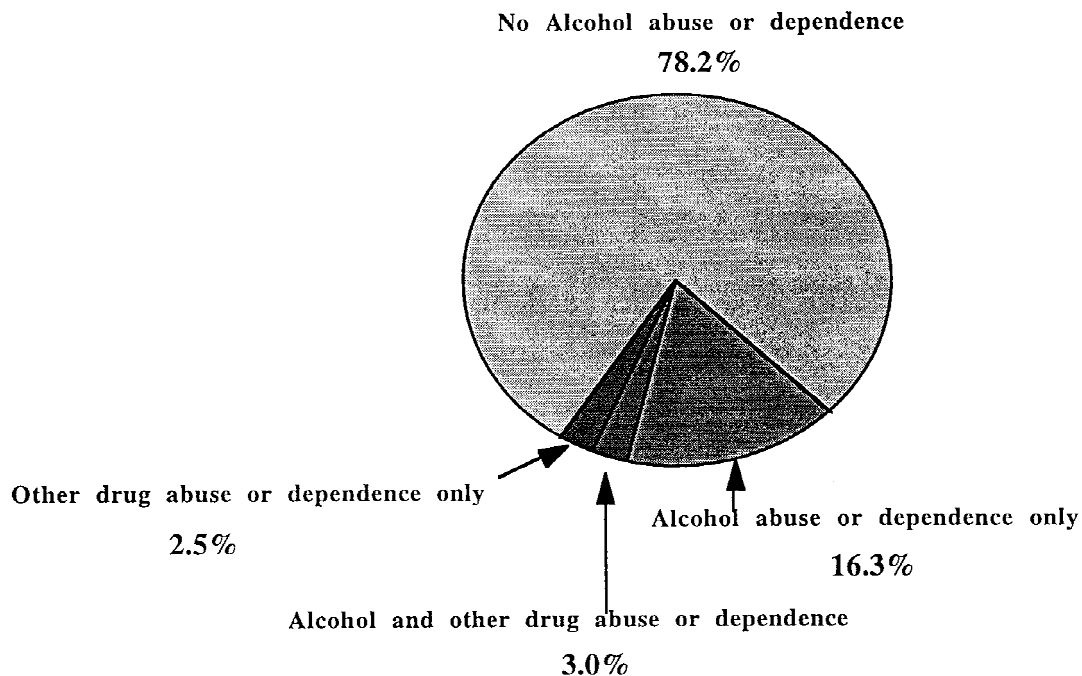
Table 6 shows the prevalence of current disorders for

the same demographic subgroups. Males exhibited a higher prevalence of any current substance use disorder ( $\chi^2 = 18.52$ ;  $df = 1$ ;  $P < 0.0001$ ), current alcohol dependence ( $\chi^2 = 16.85$ ;  $df = 1$ ;  $P < 0.0001$ ), and any current alcohol disorder ( $\chi^2 = 21.58$ ;  $df = 1$ ;  $P < 0.0001$ ). However, between males and females there was little difference in the rates of current drug dependence ( $\chi^2 = 0.14$ ;  $df = 1$ ;  $P = 0.71$ ), any current drug disorder ( $\chi^2 = 0.02$ ;  $df = 1$ ;  $P = 0.89$ ), and current

**TABLE 4**

Prevalence of Current Substance Use Disorders

| Substance use disorder                    | Raw prevalence (%) | Prevalence adjusted for race (%) | Prevalence adjusted for insurance (%) |
|---|--------------------|----------------------------------|---------------------------------------|
| Alcohol                                   |                    |                                  |                                       |
| Abuse                                     | 8.8                | 8.2                              | 9.1                                   |
| Dependence                                | 10.5               | 11.0                             | 9.8                                   |
| Abuse or dependence                       | 19.3               | 19.2                             | 18.9                                  |
| Marijuana                                 |                    |                                  |                                       |
| Abuse                                     | 1.7                | 1.5                              | 1.9                                   |
| Dependence                                | 1.1                | 1.1                              | 0.8                                   |
| Abuse or dependence                       | 2.8                | 2.6                              | 2.7                                   |
| Cocaine                                   |                    |                                  |                                       |
| Abuse                                     | 0.8                | 0.7                              | 0.7                                   |
| Dependence                                | 1.1                | 1.0                              | 1.0                                   |
| Abuse or dependence                       | 1.9                | 1.8                              | 1.7                                   |
| Stimulants                                |                    |                                  |                                       |
| Abuse                                     | 0.0                | 0.0                              | 0.0                                   |
| Dependence                                | 0.3                | 0.2                              | 0.2                                   |
| Abuse or dependence                       | 0.3                | 0.2                              | 0.2                                   |
| Sedative/tranquilizers                    |                    |                                  |                                       |
| Abuse                                     | 0.3                | 0.2                              | 0.2                                   |
| Dependence                                | 0.3                | 0.2                              | 0.2                                   |
| Abuse or dependence                       | 0.6                | 0.5                              | 0.4                                   |
| Analgesic/opioids/heroin                  |                    |                                  |                                       |
| Abuse                                     | 1.4                | 1.3                              | 1.3                                   |
| Dependence                                | 1.1                | 1.6                              | 1.0                                   |
| Abuse or dependence                       | 2.5                | 2.8                              | 2.3                                   |
| Inhalants                                 |                    |                                  |                                       |
| Abuse                                     | 0.0                | 0.0                              | 0.0                                   |
| Dependence                                | 0.3                | 0.2                              | 0.2                                   |
| Abuse or dependence                       | 0.3                | 0.2                              | 0.2                                   |
| One or more drugs, excluding alcohol      |                    |                                  |                                       |
| Abuse but not dependence                  | 3.0                | 2.8                              | 3.0                                   |
| Dependence                                | 2.5                | 2.9                              | 2.1                                   |
| Abuse or dependence                       | 5.5                | 5.6                              | 5.1                                   |
| One or more substances, including alcohol |                    |                                  |                                       |
| Abuse but not dependence                  | 9.9                | 9.2                              | 10.3                                  |
| Dependence                                | 11.8               | 12.4                             | 11.0                                  |
| Any problem                               | 21.8               | 21.6                             | 21.3                                  |
| One substance—any problem                 | 18.5               | 18.1                             | 18.3                                  |
| Two substances—any problem                | 1.9                | 2.3                              | 1.7                                   |
| Three substances—any problem              | 0.6                | 0.5                              | 0.4                                   |
| Four or more substances—any problem       | 0.8                | 0.7                              | 0.8                                   |



**FIG. 1.** Relative prevalence of alcohol, drug, and combined disorders

disorders involving multiple substances ( $\chi^2 = 0.14$ ;  $df = 1$ ;  $P = 0.71$ ).

Among the three age cohorts, there was little difference in the prevalence of any current substance use disorder ( $\chi^2 = 0.057$ ;  $df = 2$ ;  $P = 0.972$ ) and current disorders involving multiple substances ( $\chi^2 = 0.66$ ;  $df = 2$ ;  $P = 0.720$ ). Although patients in their 30s exhibited lower prevalence rates of current alcohol and drug dependence compared with patients in other decades, the differences were not statistically significant. Although there appeared to be some difference in the

prevalence of various kinds of lifetime substance use disorders by age cohort, marital status, race, and insurance status, none of these differences were significant.

The prevalence rates in most categories of current disorders, including total current disorders, were similar for whites and nonwhites. The only exception was current drug dependence, which was more common among nonwhites (Fisher's exact test,  $P = 0.043$ ). Although married subjects appeared to have lower rates of current substance use disorders compared with

**TABLE 5**  
Prevalence of Lifetime Substance Use Disorders for Demographic Subgroups (%)

|                                     | Alcohol dependence | Alcohol abuse or dependence | Any drug dependence | Any drug abuse or dependence | Disorders involving two or more substances | Any substance use disorder |
|-------------------------------------|--------------------|-----------------------------|---------------------|------------------------------|--|----------------------------|
| All                                 | 21.8               | 46.8                        | 10.2                | 15.4                         | 13.2                                       | 49.6                       |
| Males                               | 30.0               | 55.2                        | 12.6                | 19.3                         | 17.0                                       | 57.9                       |
| Females                             | 8.6                | 33.6                        | 6.4                 | 9.3                          | 7.1  | 36.4                       |
| Ages                                |                    |                             |                     |                              |  |                            |
| 18-29                               | 20.3               | 44.7                        | 11.4                | 13.8                         | 13.0                                       | 46.3                       |
| 30-39                               | 19.4               | 44.4                        | 10.5                | 18.6                         | 14.5                                       | 49.2                       |
| 40-49                               | 25.9               | 51.7                        | 8.6                 | 13.8                         | 12.1                                       | 53.5                       |
| White                               | 22.8               | 47.4                        | 10.0                | 15.2                         | 13.1                                       | 49.9                       |
| Nonwhite                            | 11.8               | 41.2                        | 11.8                | 17.7                         | 14.7                                       | 47.1                       |
| Currently married and not separated | 17.9               | 44.3                        | 5.0                 | 10.7                         | 8.6  | 46.4                       |
| Separated or not currently married  | 23.4               | 46.2                        | 14.1                | 19.0                         | 16.9                                       | 49.5                       |
| Private insurance                   | 18.1               | 44.3                        | 5.9                 | 10.9                         | 9.1  | 46.2                       |
| Other or no insurance               | 27.5               | 50.7                        | 16.9                | 22.5                         | 19.7                                       | 54.9                       |

**TABLE 6**  
Prevalence of Current Substance Use Disorders for Demographic Subgroups (%)

|                                     | Alcohol dependence | Alcohol abuse or dependence | Any drug dependence | Any drug abuse or dependence | Disorders involving two or more substances | Any substance use disorder |
|-------------------------------------|--------------------|-----------------------------|---------------------|------------------------------|--|----------------------------|
| All                                 | 10.5               | 19.3                        | 2.5                 | 5.5                          | 3.3  | 21.8                       |
| Males                               | 15.7               | 26.9                        | 2.2                 | 5.4                          | 3.6  | 29.2                       |
| Females                             | 2.1                | 7.1                         | 2.9                 | 5.7                          | 2.9  | 10.0                       |
| Ages                                |                    |                             |                     |                              |  |                            |
| 18–29                               | 13.0               | 20.3                        | 1.6                 | 3.3                          | 2.4  | 21.1                       |
| 30–39                               | 6.5                | 17.7                        | 3.2                 | 6.5                          | 3.2  | 21.8                       |
| 40–49                               | 12.1               | 19.8                        | 2.6                 | 6.9                          | 4.3  | 22.4                       |
| White                               | 10.6               | 19.5                        | 1.8                 | 5.2                          | 3.3  | 21.6                       |
| Nonwhite                            | 8.8                | 17.7                        | 8.8                 | 8.8                          | 2.9  | 23.5                       |
| Currently married and not separated | 7.9                | 16.4                        | 1.4                 | 4.3                          | 2.1  | 18.6                       |
| Separated or not currently married  | 12.5               | 20.7                        | 3.8                 | 7.1                          | 4.4  | 23.9                       |
| Private insurance                   | 8.6                | 18.6                        | 1.4                 | 4.5                          | 2.3  | 20.8                       |
| Other or no insurance               | 13.4               | 20.4                        | 4.2                 | 7.0                          | 4.9  | 23.2                       |

other subjects, and privately insured subjects appeared to have lower rates than other subjects, none of the differences in rates were statistically significant.

#### Validity of the CAGE–AID

Table 7 shows the sensitivity and specificity of each of the four CAGE–AID questions, alone and in various combinations. Chi-square analyses of each of the two-by-two tables comparing responses to individual items with the DSM-III-R diagnosis as determined by the CIDI–SAM produced *P* values of less than 0.0001. Similar analyses were conducted for each combination of items, with one positive response taken as a positive screen. The best results were obtained with item pairs 1 and 3 and 1 and 4, and with the triad of items 1, 2, and 4.

A logistic regression was performed with each of the four CAGE–AID items as the independent variables and the presence or absence of a current substance use disorder as the dependent variable. The *P* value of the regression coefficient for the third item, on guilt, was insignificant (*P* = 0.269); therefore, this item was discarded. The *P* values for the regression coefficients of

items 1, 2, and 4 were 0.0162, 0.0010, and 0.0004, respectively. Further analysis not described herein showed that regarding one or more positive responses to the CAGE–AID as a positive screen is the best strategy, because other strategies result in inadequate sensitivity.

#### DISCUSSION

This study is unique in its use of validated, structured, diagnostic interview instruments to assess for lifetime and current alcohol and drug disorders among inpatients of a general hospital. The primary results were a 49.6% lifetime prevalence of substance use disorders and a 21.8% prevalence of current disorders among randomly selected samples of inpatients on particular medical services. Of the patients, 16.3% had only a current alcohol disorder, 2.5% had a current disorder involving one or more drugs but not alcohol, and 3.0% had a current disorder involving alcohol and at least one other drug.

Older cohorts had slightly higher rates of lifetime disorders. This finding may be due partially to their substance use during the 1960s and 1970s and partially to their longer duration of exposure to risk. There

**TABLE 7**  
Item Analysis of the CAGE–AID Questions

| Item(s) | True positives | False positives | False negatives | True negatives | Sensitivity | Specificity |
|---------|----------------|-----------------|-----------------|----------------|-------------|-------------|
| 1       | 48             | 61              | 31              | 223            | 0.608       | 0.785       |
| 2       | 37             | 25              | 42              | 259            | 0.468       | 0.912       |
| 3       | 40             | 45              | 39              | 239            | 0.506       | 0.842       |
| 4       | 27             | 52              | 14              | 270            | 0.342       | 0.851       |
| 1, 3    | 52             | 69              | 27              | 215            | 0.658       | 0.757       |
| 1, 4    | 54             | 65              | 25              | 219            | 0.684       | 0.721       |
| 1, 2, 4 | 56             | 69              | 23              | 215            | 0.709       | 0.757       |

were only minor differences in lifetime prevalence rates across groups of race, marital status, and insurance coverage, though these groups, as well as certain age cohorts, did exhibit some differences in their substances of abuse.

Current substance use disorders were clearly more prevalent among males, as has been found in previous studies of inpatients [5,7,12] and the general U.S. population [24]. Ten percent of the females and nearly 30% of the males had a current substance use disorder. The excess of substance use disorders among males was attributable to alcohol disorders, as current disorders involving other drugs were equally prevalent among males and females. Marital status was not significantly associated with current substance use disorders. Age and racial groups exhibited differences in their substances of abuse but similar prevalence rates of substance use disorders in general. If the hospital studied wished to target a particular demographic group for screening, a program that targets males would be especially cost effective. However, the 10% prevalence of current disorders among women would also seem sufficient to justify screening. At least at this hospital, age group (within the age range studied), race, marital status, and insurance status should not be considered in any attempt to optimize screening efforts.

There are some potential limitations in interpreting the results. The sole use of self-report measures to assess for alcohol and drug disorders may raise the question of validity. However, self-report has repeatedly been found to be the most accurate source of clinical information on substance use disorders [25–30]. The validity of self-report was likely to be particularly strong in this study, because the interviewers were selected for their ability to establish rapport and respond supportively to all responses, they were trained to administer the instruments reliably, and the subjects were assured that their responses would not be made available to any clinical personnel.

Another potential limitation is the possibility of a selection phenomenon, in that the demographic composition of the sample was significantly different from that of the eligible population. Specifically, the sample contained more whites, fewer patients who were neither white nor African-American, and more patients with public insurance. At least some of the difference in sampling may have been due to the exclusion of patients who did not speak English well enough to participate.

Many prospective subjects were not interviewed for reasons related to discomfort, illness, and involvement with medical procedures. Recent trends in U.S. hospitals have included shorter stays, increased intensity of diagnostic and procedural services, and increased severity of illness. These trends have added to the difficulty in primary data collection from hospitalized pa-

tients. It is unclear whether not interviewing prospective subjects for reasons of discomfort, illness, or involvement with medical procedures resulted in biased measurements of the prevalence of substance use disorders.

Some selection may have occurred from sampling only from selected services within the hospital. The lack of patients from various subspecialty services may have contributed to a lack of representation. Sampling was intentionally avoided for patients in critical care units, because many of these patients were expected to be too ill to cooperate. To the extent that patients admitted to critical care units were transferred to the medical, surgical, and orthopedic units, the study may have included patients who were admitted with severe medical problems. However, patients with severe trauma and severe illnesses may have been underrepresented in the sample, particularly if they died before being transferred to noncritical care units. Thus, the demographic similarities between the sample and the larger inpatient populations may have obscured some selection biases.

The study suggests that there is a slightly greater than one-in-five prevalence of current substance use disorders among general medical, general surgical, and orthopedic inpatients ages 18 through 49 at the study site. In comparison, the prevalence of current substance use disorders among Americans ages 15 to 54 is 11.3% [24]. The prevalence of alcohol disorders may be somewhat higher in Wisconsin, since Wisconsin ranks higher in alcohol consumption than most other states [31,32]. This study found a 19.3% prevalence of current alcohol disorders. Although the results of this study are not directly comparable with rates from a national probability sample, hospitalization of an 18- to 49-year-old individual in a general medical, general surgical, or orthopedic unit seems to be associated with a higher than usual risk for substance use disorders.

The prevalence rates among general hospital inpatients ages 18 to 49 suggest that hospitals could be a useful site for a secondary prevention program for alcohol and drug problems, particularly for males. One component of this program would be screening—use of brief questionnaires to identify those individuals at risk for current problems. Overall, this study found that the CAGE–AID was 70.9% sensitive and 75.7% specific for substance use disorders. Those patients who screen positive would undergo an assessment—an interview by an expert clinician aimed to establish whether there is truly a current alcohol or drug problem or risk for such a problem. Patients found to have an alcohol problem or to exhibit risky use could receive a brief intervention. Such interventions, consisting of feedback and education on harm or risks of drinking, recommendations about changes in drinking behaviors, negotiation about changes, confirmation of an agreement, and follow-up, perhaps by phone, have

been shown to decrease drinking, liver function tests, hospital days, and absenteeism from work [3,4]. Alcohol-dependent patients could be referred for formal treatment, which is known to be effective [3]. For those dependent drinkers who refuse treatment, brief interventions could be tried [33].

Less research is available regarding the effectiveness of such programs for drug problems. In the current study, patients with disorders involving only drugs other than alcohol represented approximately 11% of the patients who had any substance use disorder. An additional 14% of these patients exhibited problems with alcohol and other drugs. Thus, up to 25% of the patients with substance use disorders at the hospital studied might be identified more readily by a screening protocol that focuses on problems with other drugs as well as alcohol. There is a suggestion that conjoint screening for alcohol and drugs can be effective [34], and studies on such screening are continuing. Although some commonly applied treatments for drug dependence are known to be effective [35], further research is needed on the effectiveness of brief interventions for drug problems.

There may be some important advantages to carrying out a screening and intervention program in general hospitals. One advantage is that a high prevalence of alcohol and drug problems results in a lower chance of false-positive screening results and more efficiency than could occur in clinical populations with lower prevalence. Another advantage is that screening in general hospitals may identify individuals with alcohol or drug problems who are at particular risk for serious medical problems because of their substance use. A third advantage may be that individuals who are hospitalized for medical problems related to their substance use may be particularly receptive to intervention.

The barriers to implementing such programs are largely economic. Many hospitals would have difficulty recouping the costs of administering such programs through direct billing. A small number of hospitals might recoup costs indirectly through increased utilization of any affiliated substance abuse treatment programs. Although data on the cost effectiveness of such programs could not be found, managed care programs or their vertically integrated hospitals might simultaneously assist their patients, avoid additional medical problems, and save health care dollars by implementing secondary alcohol and drug prevention programs, at least for their younger and middle-aged inpatients.

The generalizability of the results of this study to other hospitals is unknown. For future studies of the prevalence of substance use disorders in other hospitals, this report illustrates the feasibility of using validated diagnostic instruments in hospital prevalence studies, the importance of distinguishing between current and lifetime substance use disorders, and the po-

tential to measure prevalence of alcohol and drug disorders. This study's main finding is that the prevalence of substance use disorders among general hospital inpatients ages 18 to 49 is large enough to warrant a secondary prevention program for alcohol problems, especially for males. It also suggests a need for research and development on secondary prevention programs for drug problems.

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