Regular article

Reduction in heavy drinking as a treatment outcome in alcohol dependence

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Abstract

In the field of clinical alcohol disorders treatment in North America, abstinence continues to be largely viewed as the optimal treatment goal; however, there is a growing awareness of limitations when abstinence is considered the only successful outcome. Although this issue has been discussed in research settings, new studies on the public health significance of heavy drinking (defined as five or more standard drinks per drinking day in men, and four or more standard drinks per drinking day in women) in the past 10 years suggest that clinical providers should consider the value of alternative outcomes besides abstinence. A focus on abstinence as the primary outcome fails to capture the impact of treatment on reduction in the pattern and in the frequency of alcohol consumption. In addition, evaluating reduction in drinking as "positive" has value for patients as an indicator of clinical progress. Measurement of continuous variables, such as the quantity and the frequency of alcohol consumption, has provided a clearer understanding of the scope of alcohol-related morbidity and mortality at the societal level, and of the relationship between individual patient characteristics and the naturalistic course of alcohol use, abuse, and dependence. A review of these characteristics suggests that there are clinical benefits associated with reducing heavy drinking in alcohol-dependent patients. Given the significant public health consequences associated with heavy drinking and the benefits associated with its reduction, it is proposed that researchers, public health professionals, and clinicians consider using reduction in heavy drinking as a meaningful clinical indicator of treatment response, and that outcomes be individualized to patients' goals and readiness to change.
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1. Introduction

The burden of disease in alcohol disorders is enormous. The estimated economic cost of alcohol problems in the United States was US$184.6 billion for 1998 alone (Department of Health and Human Services, 2000). Alcohol dependence is a major public health problem; worldwide, alcohol is the fourth leading cause of disability (Murray & Lopez, 1996). Alcohol dependence is present in approximately 4% of the adult population in the United States in a 12-month period (Grant et al., 2004), is common among primary care patients (O'Connor & Schottenfeld, 1998; Fleming, Barry, Manwell, Johnson, & London, 1997), and may contribute to > 100,000 preventable deaths per year (McGinnis & Foege, 1999).

The negative health consequences of alcohol drinking have especially been linked to patterns of chronic heavy drinking (Murray & Lopez, 1996; Rehm, Gmel, Sempos, & Trevisan, 2003). Heavy drinking is typically defined in the research literature as five or more standard drinks per drinking day in men, and four or more standard drinks per drinking day in women (Anton et al., 1999; Kranzler,

Modesto-Lowe, & Van, 2000; National Institute on Alcohol Abuse and Alcoholism, 2005; O'Malley et al., 1992; Volpicelli, Alterman, Hayashida, & O'Brien, 1992). Reduction in such heavy drinking has been increasingly studied in clinical treatment studies. For example, in the recently published large-scale multicenter COMBINE study (Anton et al., 1999), "time to first heavy drinking day" was one of the primary efficacy measures. In this study, naltrexone, in combination with medical management, was found to reduce the risk of a heavy drinking day over time compared to placebo.

Early epidemiological research highlighted the importance of assessing various patterns of drinking, rather than focusing only on abstinence (Cahalan & Cisin, 1968). The development of the widely used Timeline Follow-Back method (Sobell & Sobell, 1992) to measure changes in the quantity and in the frequency of drinking made reduction in drinking levels a standard outcome measure in many clinical trials. In addition, a National Institute of Alcohol Abuse and Alcoholism expert panel specifically recommended that "percent days of heavy drinking" be used as the optimal measure of alcohol treatment outcome in efficacy studies (Sobell, Sobell, Connors, & Agrawal, 2003).

Despite this long-standing use of reduction in drinking levels as an outcome measure in alcohol treatment research, and the more recent attention on some investigations specifically focused on reduction in heavy drinking, the alcohol treatment service delivery sector in North America maintains a predominant focus on abstinence as the measure of optimal treatment effectiveness. The somewhat different issue of "controlled drinking" (Sobell & Sobell, 1978, 1995) generated a long-standing controversy that has partially clouded the larger issue of measuring drinking reduction in clinical care. Thus, to date, measures of reduced drinking developed in research settings have not translated well to the clinical treatment of alcohol dependence.

In this article, we present the case for a reconsideration of alternatives to abstinence as measures of treatment effectiveness to be used in clinical settings for patients with a diagnosis of alcohol dependence. In particular, evidence is presented for the role and for the utility of reduction in heavy drinking as a clinical measure of treatment effectiveness. The primary justifications for this reconsideration are as follows: (1) extensive data that have accumulated on the personal and societal costs of heavy drinking, and (2) the broader range of psychosocial treatment options and new pharmacotherapies, including extended-release formulations, that are now available for the treatment of alcohol dependence. This broader range of treatment options allows for extending the treatment of alcohol dependence into a variety of service sectors that include patients who may not be ready for abstinence as a treatment goal.

To understand the potential role of reduction in heavy drinking as a measure of treatment effectiveness in clinical settings, it is useful to clarify the distinction between goals of treatment and measures of effectiveness. "Goals of treatment" can be defined as proximal behavioral health objectives regarding alcohol use. Such goals may differ between patients and providers, but it is important to establish a shared goal at the start of treatment for successful collaboration. In clinical practice, goals may require reconsideration and renegotiation during the course of treatment. A clinical "measure" is a tool for evaluating how the patient is progressing toward the goal. The ability to set achievable goals and to utilize high-resolution measures aids the individualization of treatment. Some patients, for example, may not be ready for a goal of abstinence. For these patients, reduction in heavy drinking may be the appropriate short-term goal, and effectiveness can be gauged relative to this goal. In addition to patient treatment goals and provider treatment goals, there are goals defined by societies or cultures with regard to alcohol use that can influence individual goals.

In this article, we first discuss the strengths and weaknesses of various measures of treatment effectiveness used in alcohol dependence treatment and research. We then review selected current literature on the impact of heavy drinking on public health, and we conclude by providing a vision of alcohol treatment that targets treatment goals and their corresponding measures to each individual patient.

2. Outcome measures in alcohol dependence treatment and research

2.1. Abstinence as an outcome measure

Abstinence is an all-or-nothing outcome that has long been regarded as the primary objective of alcohol treatment. Duration of abstinence is the sine qua non of effective treatment and research (Finney, Moyer, & Swearingen, 2003; Jellinek, 1960; National Institute on Alcohol Abuse and Alcoholism, 2005). However, there is a growing awareness of the limitations of abstinence as a primary end point (Miller, Walters, & Bennett, 2001; Wang, Winchell, McCormick, Nevius, & O'Neill, 2002). A number of factors underlie this concern.

Abstinence is a categorical and definitive measure that represents the safest outcome for patients in the views of both clinicians and researchers. In the real world, however, it is often difficult for alcohol-dependent patients to initiate abstinence; many are either not interested in abstinence at the time of entering treatment or unable to commit to abstinence at the time of entering treatment. As a consequence, most clinical trials have included a limited subpopulation of motivated participants who are willing and able to successfully initiate a short period of abstinence prior to treatment. Such trials have limited generalizability to the broader population of alcohol-dependent individuals.

Studies that examine the duration of abstinence usually measure "time to first drink." This approach, however, fails to incorporate into the analysis patients' subsequent drink-
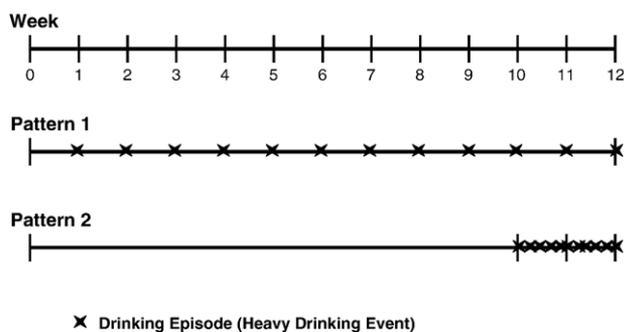
Fig. 1. Examples of two subjects with different treatment responses despite similar numbers of days abstinent. Each asterisk represents a nonabstinent day (adapted from Wang et al., 2002, p. 1804, with permission from Blackwell Publishing).

ing patterns. When findings from seven large multisite studies were combined, only one in four patients was continuously abstinent for a year after treatment (Miller et al., 2001). More recently, members of a U.S. Food and Drug Administration panel addressed the need for measuring the combination of the pattern and the frequency of alcohol consumption (Wang et al., 2002). The authors note that conventional abstinence analyses that rely on a single measure of "time to first drinking event" do not take into account those events that occur after the first event—overlooking important longitudinal trends in what is, after all, a chronic disease (McLellan, O'Brien, Lewis, & Kleber, 2000). As McLellan, McKay, Forman, Cacciola, and Kemp (2005) noted, there is no other chronic illness in which the criterion for success is to remain totally symptom-free. Because of the chronic nature of alcohol dependence, survival analyses are inadequate for detecting important events subsequent to the first drink. A more useful analytic method would be to characterize the entire treatment period, during which drinking patterns vary in any number of ways from complete abstinence to continuous heavy drinking.

Researchers have repeatedly noted that abstinence, as an all-or-nothing categorical variable, is an insufficient measure of outcome because it can miss a pattern of progress or a pattern of deterioration in treatment. Recent evidence suggests that a patient's pattern of alcohol use may be more important than abstinence per se (Pattison, Sobell, & Sobell, 1997; Rehm et al., 2003; Wang et al., 2002). Indeed, although different studies assess different outcome measures, an optimal drinking profile should use multiple measures of alcohol consumption to capture a range of drinking behaviors such as frequency (e.g., How often does a patient drink?) and intensity (e.g., How much alcohol is consumed at each drinking session?) (Tonigan, 2003).

Another problem with abstinence as an outcome measure is that the all-or-nothing characteristic of such a measure carries over to the conceptualization and the definition of drinking behavior when abstinence has ended. Drinking following abstinence is often labeled a "relapse" or an "episode." But after abstinence, drinking occurs along a

continuum. To characterize all such drinking as relapses obscures the fact that often the level of drinking for some patients is substantially lower after treatment than before treatment. The distinctions made by researchers between "lapse" and "relapse," and the distinctions made in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* between "active," "partial remission," and "full remission," help sort out these important differences but do not go far enough to be a sensitive clinical assessment of drinking behavior.

2.2. "Number of days abstinent" or "percent days abstinent"

A related measurement strategy is to assess the total number of days that the study participant has been abstinent for a specified period. This approach overcomes the limitations of a categorical abstinence measure by providing a dimensional measure—a count of the number of (or of the percentage of) days, which captures data across multiple relapsing episodes when these occur. One problem with this approach is that it still forces data on a particular day to be counted as either abstinent or nonabstinent, and patients may have very few abstinent days yet still be clinically improving. Wang et al. (2002) revealed another problem with this approach by comparing two drinking patterns in a clinical trial: "the subject who drinks every Saturday during a 12-week trial but abstains the remainder of the week" versus one who "abstains for the first 10 weeks but spends virtually every day of the last 12 days intoxicated." As shown in Fig. 1, a simple count of days abstinent treats both outcomes as equivalent, whereas the actual consequences of the two patterns may be quite different.

2.3. "Number of drinks consumed" and "drinks per drinking day"

An alternative to the abstinence category is drinking quantity. Drinking quantity is important because it is a proxy for adverse drinking consequences (i.e., the subsequent effects of pathological drinking, such as impaired physical and mental function or health, health-related quality of life [QoL], economic status, and death) (Srisurapanont & Jarusuraisin, 2005). Drinking quantity is a measure that can vary continuously, both on any given day and across time, which provides data other than measures of abstinence or days abstinent. Often measured as either "number of drinks consumed" across a period or "number of drinks per drinking day," this type of measure may still have limitations. The limitation of using "number of drinks consumed" can be readily illustrated by considering two patients who consume an equal number of drinks in a 1-week period (e.g., 14 drinks: Patient A consumes two drinks per night for 1 week, whereas Patient B consumes seven drinks per night on two consecutive weekend nights). These two cases differ, as the former exemplifies "low-risk drinking" (Klatsky, Friedman, & Siegelaub, 1981), whereas the latter is associated with

increased health risks (Cherpitel, Tam, Midanik, Caetano, & Greenfield, 1995; Hunt, 1993). The measure "number of drinks per drinking day" captures the difference between Patient A (with two drinks per drinking day) and Patient B (with seven drinks per drinking day).

There is a more subtle problem with the measure of drinks per drinking day, however, which is that it may convey a false impression of precision. Results may be calculated to one or more decimal places, yet confidence in the metric is open to question: Above a certain threshold, most clinicians and researchers might doubt the clinical relevance of, for example, a reduction in drinks/drinking day from 12 drinks per day to 11 drinks per day, even if it is statistically significant. Moreover, the number of drinks per drinking day fails to capture the frequency with which drinking days occur. A further problem with the measurement of drinks per drinking day is that it has no true zero value (because only days with drinking are considered); thus, abstainers pose a problem when this measure is used.

2.4. Other alternative outcome measures

In the past decade, researchers have thus shifted their focus from a sole reliance on abstinence to other drinking-related measures to assess response to treatment (Finney et al., 2003; Gastfriend, Donovan, Lefebvre, & Murray, 2005; Sobell et al., 2003; Wang et al., 2002). These include "time to return to heavy drinking" and percentage or number of days or episodes of heavy drinking.

Recent studies have also added variables, such as number of drinking days or percent days of heavy drinking, to complement abstinence data. In these studies, neither abstinence measures nor drinking measures are given primacy. Instead, two variables are used simultaneously, and recruitment must be substantially increased (at great cost) to achieve a sample size with sufficient power for dual outcomes. For example, the National Institute on Alcohol Abuse and Alcoholism Project MATCH (1997) study used the combination of percent days abstinent and drinks per drinking day, whereas the COMBINE study used the combination of percent days abstinent and time to first heavy drinking day (COMBINE Study Research Group, 2003; Gastfriend et al., 2005). Although multivariate statistical methods can be used to simultaneously examine two dependent variables (e.g., frequency of drinking and quantity of drinking) without planning for a substantially increased sample size, most investigators favor the clinical appeal and interpretability of individual outcome measures. Furthermore, clinicians need straightforward and interpretable outcome measures, not multivariate linear composites, when assessing treatment effectiveness with individual patients.

This heterogeneity of outcome measures illustrates the challenge of meaningfully characterizing clinical treatment progress in alcohol dependence. This range of outcomes suggests the limitations of both categorical abstinence and continuous measures such as drinks per drinking day. To overcome these measurement challenges, investigators have proposed a variable that combines the continuous measure of number of heavy drinking episodes within a particular period, with the categorical threshold defined as a "heavy drinking day."

Our recommendation is that, for clinical use, outcome measures need to be tailored to each patient's readiness to change and goals of treatment. Abstinence and reduction in number of days of drinking are appropriate measures of clinical effectiveness for many patients. For other patients, however, reduction in heavy drinking might be the primary measure of treatment effectiveness, especially given the benefits of such reduction to the individual and to society. It is also important to reevaluate goals. Although abstinence is often a relatively stable pattern over time, patients who continue to drink alcohol go in and out of different patterns of drinking over time (Miller, Leckman, Delaney, & Tinkcom, 1992). These data suggest that, particularly for patients who continue to drink alcohol, clinicians need to reevaluate goals as treatment progresses over time so that realistic goals appropriate to each patient's readiness to change are targeted.

3. Heavy drinking threshold is associated with morbidity and mortality

Numerous epidemiological studies have demonstrated the association between chronic heavy drinking of alcohol and impaired behavior, coordination, motor vehicle crashes, other injuries and drowning, and tissue and organ damage (particularly brain and liver damage) (Cherpitel et al., 1995; Harper & Matsumoto, 2005; Klatsky et al., 1981; Midanik, Tam, Greenfield, & Caetano, 1996; Room, Babor, & Rehm, 2005). Consumption of five or more drinks per day by men has consistently been associated with a variety of adverse health consequences (Midanik et al., 1996).

These findings have led experts to view the monitoring of the rates of heavy drinking in a population as a priority for public health. Measurement of the quantity and the frequency of alcohol consumption has provided a clearer understanding of the scope of alcohol-related morbidity and mortality on a population level, and of the relationship between individual characteristics and the naturalistic course of alcohol use, abuse, and dependence on a per-patient level (Greenfield & Kerr, 2003). There is a dose-dependent relationship between level of alcohol consumption and disease risk for most categories of disease, with higher consumption conferring more risk. This relationship holds true in multiple disease and health behavior categories, including liver disease, cardio-vascular disease, cancer, suicide, and domestic violence.

3.1. Hepatic

Liver disease is highly associated with chronic heavy drinking (National Institute on Alcohol Abuse and
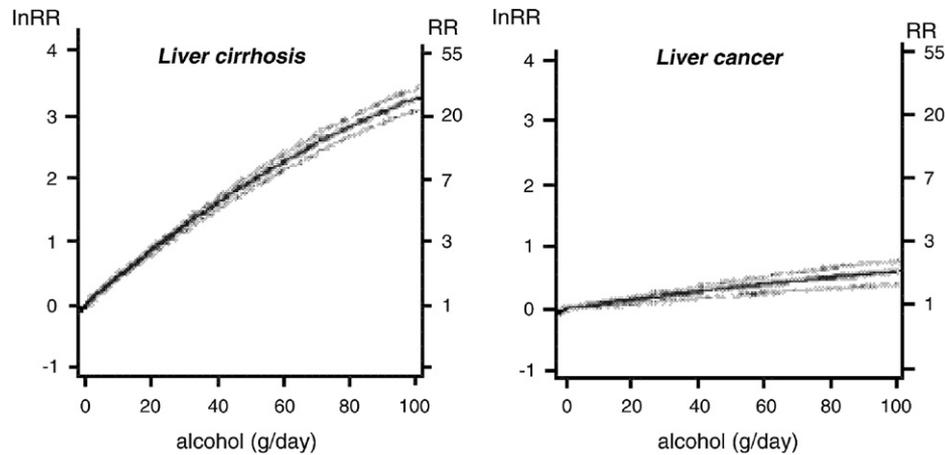
Fig. 2. Dose–response relationship between alcohol consumption and risk of liver cirrhosis and liver cancer, showing 2-fold to 20-fold increases in relative risk, depending on the quantity of daily alcohol consumption (reprinted from Corrao et al., p. 616, copyright 2004, with permission from Elsevier).

Alcoholism, 2003): Alcohol abuse is implicated in 40–90% of deaths from liver cirrhosis in the United States (Meister, Whelan, & Kava, 2000). In both liver cirrhosis and liver cancer, there is a clear dose–response relationship between alcohol consumption and the risk of these diseases, as shown in Fig. 2.

3.2. Cardiovascular

Research has documented a correlation between alcohol consumption and coronary heart disease (Corrao, Bagnardi, Zambon, & La Vecchia, 2004). Light to moderate drinking is associated with decreased mortality from coronary heart disease and ischemic stroke, although these findings are correlational and, as such, causality has not been demonstrated (Rehm et al., 2003). Heavy drinking, on the other hand, is associated with increased morbidity and mortality (Corrao et al., 2004).

3.3. Suicide

One of the most severe consequences of alcohol dependence is suicide. Although suicide is often perceived as primarily associated with depression, in fact, the degree of alcohol drinking is strongly associated with suicide risk (Cornelius, Salloum, Day, Thase, & Mann, 1996), with drinking above low-risk levels conferring a several-fold increase in the likelihood of suicide (Ross, Bernstein, Trent, Henderson, & Paganini-Hill, 1990).

3.4. Domestic violence

Several studies confirm a relationship between increased frequency and increased intensity of domestic violence, and heavy drinking. U.S. Army soldiers who were heavy drinkers were 66% more likely to engage in spousal abuse than were nondrinkers (Bell, Harford, McCarroll, & Senier, 2004). In a national survey of American couples, the more

frequently heavy drinking occurred, the greater was the occurrence of intimate partner violence (Caetano, McGrath, Ramisetty-Mikler, & Field, 2005). Murphy, Winters, O'Farrell, Fals-Stewart, and Murphy (2005) surveyed alcohol-dependent men and their partners about conflicts that did involve physical violence versus conflicts that did not involve physical violence, and they found that the men had consumed significantly more drinks in the 12 hours before a conflict that turned violent. In another study of women presenting to an urban emergency department, "partner's alcohol use" was a significant risk factor for intimate partner violence, and that risk increased with every five drinks consumed per week (Lipsky, Caetano, Field, & Larkin, 2005).

As a result of the many physiological diseases and behaviors affected by heavy drinking, overall health-related QoL suffers in direct proportion to the frequency of heavy drinking. In a multisite study of extended-release naltrexone administered to 624 alcohol-dependent outpatients, Kranzler, Liou, Loewy, Silverman, and Ehrich (2005) reported that a high rate of heavy drinking is associated with problems in function and QoL. Scores on the Medical Outcomes Study 36-item Short Form (Ware, 1997) Mental Component Summary were significantly lower than U.S. population norms. In this large sample of alcohol-dependent patients, deficits in mental-health-related QoL were significantly correlated with rates of heavy drinking. This finding is consistent with other reports that associated reduced QoL with chronic and episodic heavy drinking (reviewed in Donovan, Mattson, Cisler, Longabaugh, & Zweben, 2005).

Heavy drinking is a central feature of alcohol dependence and is both clinically meaningful and of great public health importance. Among various measures of drinking behavior, heavy drinking shows the highest correlation with negative life consequences, such as impaired driving, interpersonal problems, and injuries (Greenfield, 1998). This consistent pattern of a strong and significant correlation between rates of heavy drinking and a variety of medical diseases and
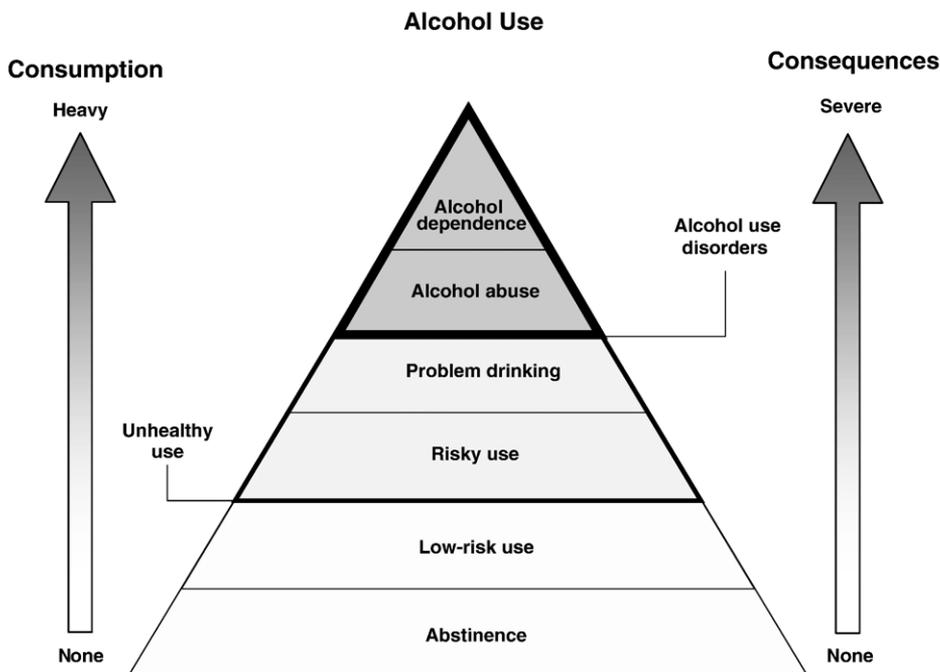
Fig. 3. The spectrum of alcohol use (adapted from Institute of Medicine, 1990, p. 30; Saitz, 2005, p. 598). Copyright © 2005 Massachusetts Medical Society. All rights reserved.

adverse behavioral consequences has been illustrated by a pathophysiological pyramid (adapted from Institute of Medicine, 1990), as shown in Fig. 3. Increasingly heavier drinking correlates with increasing consequences and higher thresholds of drinking category, until the pattern reaches definitive stages of alcohol disease states (e.g., alcohol abuse and alcohol dependence). Furthermore, clinicians are recommended to screen patients for unhealthy alcohol use to identify alcohol abuse and alcohol dependence even in patients who are asymptomatic, have early-stage problems, or do not recognize their problems as being alcohol-related (Saitz, 2005). Assessment should include the determination of the patient's level of consumption on drinking days on the scale of alcohol use, even if it does not meet diagnostic criteria for an alcohol use disorder, because heavy drinking is strongly correlated with the likelihood and the severity of adverse consequences (Fig. 3).

4. Heavy drinking shows a dose–response relationship with morbidity and mortality

Analyses assessing the relationship between patterns of alcohol use and disease risk indicate increased risks for a variety of adverse health consequences that are detectable with each additional alcoholic drink per day (Corrao, Bagnardi, Zambon, & Arico, 1999; Smith-Warner et al., 1998). In their meta-analysis of 156 studies involving 116,702 subjects, Corrao et al. assessed the relative risk of 15 diseases or conditions with increasing alcohol intake levels (25 g/day, or about two standard drinks; 50 g/day, or

four standard drinks; and 100 g/day, or eight standard drinks) and found that all but one (gastroduodenal ulcer) showed increased risks with increased alcohol intake above a thresh-

Table 1
Alcohol-related diseases and percentages attributable to alcohol use worldwide

Disorder	Percent Death or Disability Attributable to Alcohol
Malignant neoplasms	
Mouth and oropharynx cancers	19
Esophageal cancer	29
Liver cancer	25
Breast cancer	7
Neuropsychiatric disorders	
Unipolar depressive disorder	2
Epilepsy	18
Alcohol use disorders	100
Diabetes mellitus	−1
Cardiovascular disorders	
Ischemic heart disease	2
Hemorrhagic stroke	10
Ischemic stroke	−1
Gastrointestinal diseases	
Cirrhosis of the liver	32
Unintentional injury	
Motor vehicle accidents	20
Drownings	10
Falls	7
Poisonings	18
Intentional injury	
Self-inflicted injuries	11
Homicide	24

Note. From Room, Babor, and Rehm (2005). Adapted from *The Lancet*, with permission from Elsevier.

Table 2
Relative risks of disease for three levels of alcohol consumption

Disorder	Relative risk at alcohol doses of		
	25 g/day	50 g/day	100 g/day
Malignant neoplasms			
Oral cavity and pharynx	1.86	3.11	6.45
Esophagus	1.39	1.93	3.59
Larynx	1.43	2.02	3.86
Colon	1.05	1.10	1.21
Rectum	1.09	1.19	1.42
Liver	1.19	1.40	1.81
Breast	1.25	1.55	2.41
Non-neoplastic conditions			
Essential hypertension	1.43	2.04	4.15
Coronary heart disease	0.81	0.87	1.13
Ischemic stroke	0.90	1.17	4.37
Hemorrhagic stroke	1.19	1.82	4.70
Gastroduodenal ulcer	0.98	0.97	0.93
Liver cirrhosis	2.90	7.13	26.52
Chronic pancreatitis	1.34	1.78	3.19
Injuries and violence	1.12	1.26	1.58

Note. Adapted from Corrao et al. (2004). Copyright 2004, with permission from Elsevier.

old of 100 g/day (Corrao et al., 2004). Table 1 displays the diseases assessed, and Table 2 displays the relative risk of each at increasing levels of alcohol consumption.

Among women who consumed < 60 g/day alcohol, Smith-Warner et al. (1998) found a linear relationship between daily alcohol intake and risk for invasive breast cancer, with risk increases of 9% for every 10-g increase in daily alcohol consumption.

5. Reduced heavy drinking: Association with reduced morbidity and mortality

5.1. Findings on a population basis

Heavy drinking is usually conceptualized as a phenomenon within individuals, but it has an analogous manifestation in the setting of an entire community. The literature on community-based alcohol use reports that heavy consumption within a community results from practices such as lax monitoring of underage bar service to minors, widely advertised happy-hour promotions, and absence of intoxicated-driving enforcement. Research shows the adverse effects of such uncontrolled distribution of alcohol on auto accidents (Hingson & Winter, 2003; Holder et al., 2000), violent assaults resulting in emergency room visits and hospitalizations (Holder et al., 2000), and domestic violence (Markowitz & Grossman, 1996). This literature also documents that community interventions that succeed in reducing heavy consumption (e.g., through regulation of advertising, reduction of happy-hour promotions, and better policing) also yield significant reduction in adverse consequences on a population basis (Holder et al., 2000; Hingson et al., 2005).

5.2. Treatment outcome findings on a per-patient or clinical basis

The natural history of alcohol dependence involves chronic periods of heavy alcohol use and, if abstinence is achieved, periodic return to drinking. During these periods of drinking, individuals may sustain steady levels of heavy drinking; however, others show a pattern of decreasing rates of heavy drinking over time. This decreasing pattern is consistent with the widely known psychosocial model of change, the Transtheoretical Model of Stages of Change (Prochaska, DiClemente, & Norcross, 1992), which holds that the natural course of recovery is not "binary" (i.e., not all-or-nothing) but more often involves multiple periods of drinking (at various levels) with progressive awareness of, and efforts to manage, unhealthy behaviors over time.

Several investigators have reported reduction in drinking rates as an effect of treatment, indicating an outcome that would be missed by the traditional abstinence metric (Anton et al., 1999; O'Malley et al., 1992; Volpicelli et al., 1992). In an analysis that combined data from seven large multisite studies, 75% of study participants had ongoing episodes of drinking, yet alcohol consumption was reduced overall by 87% among those who continued to drink, with a corresponding 60% decrease in alcohol-related problems (Miller et al., 2001). Although the majority of patients did not achieve abstinence, those who were nonabstinent experienced significant reduction in alcohol-related problems, leading the authors to note, "this substantial level of improvement in 'unremitted' patients tends to be overlooked when outcomes are dichotomized as successful or relapsed." Consequently, reduction in heavy drinking was a realistic and clinically meaningful outcome of treatment, and it was a clinically relevant outcome for the majority of study participants.

6. Heavy drinking versus abstinence: Separate outcomes or a continuum?

If reduction in heavy drinking is a worthwhile indicator of treatment response, then how does it relate to the overall treatment goal of abstinence? A treatment might offer benefits for either objective, or it may benefit a variety of patients, ranging from those who are ready to initiate abstinence to those who simply want to reduce the harmful effects of heavy drinking.

7. Conclusion

To summarize, the alcohol-dependent population has a variety of options for treatment goals, and treatment need not be reserved only for those who are prepared for full abstinence. People seeking alcohol treatment may enter with various degrees of readiness: (1) those who are not ready to

seek abstinence; (2) those who are not able to achieve initial abstinence; and (3) those who are ready, willing, and able to initiate abstinence. Treatment success may not necessarily manifest as a single categorical outcome (i.e., abstinence), but rather as a continuum. This continuum effect seems to manifest differently depending on the nature of the disease and the recovery readiness of the individual with alcohol dependence. Individuals who are not yet ready or not yet able to commit to total abstinence may seek to reduce the amount they are drinking per occasion and work toward a goal of abstinence (Mariani & Levin, 2004). In the patient who is already abstinent, the objective may be prolongation of the abstinent state (and reduction in the rate of heavy drinking, if the patient happens to return to drinking).

Although there are large differences between countries in the acceptability of nonabstinence as a goal of treatment (Donovan & Heather, 1997), in the authors' clinical experience, alcohol treatment providers in the United States often promote a treatment goal of abstinence for all individuals with alcohol dependence, but many are willing to work with patients who are not yet ready to accept a goal of abstinence to engage and retain the patient in treatment. There is increasing support for the view that the optimal approach to a patient with alcohol dependence involves assessing readiness for treatment and adapting treatment accordingly, modifying it over time (Miller, Zweben, DiClemente, & Rychtarik, 1994). This model has been used in other medical diseases that involve behavioral self-management, with notable success. For example, in the management of hypercholesterolemia, treatment with lipid-lowering agents is not withheld on the grounds that these might be inconsistent with strict diet management. Rather, modern medicine provides what pharmacological foundation it can to ameliorate diseases such as heart disease and diabetes while educating within the doctor–patient relationship about the importance of achieving the best behavioral management possible for one's disease.

This is the view of recently revised clinical guidelines issued by the National Institute on Alcohol Abuse and Alcoholism (2005):

"... The safest course is abstinence, and that would be the usual clinical recommendation. Still, it is best to determine individualized goals with each patient. Some patients may not be willing to endorse abstinence as a goal, especially at first. If an alcohol-dependent patient agrees to reduce drinking substantially, it is best to engage them in that goal while continuing to note that abstinence remains the optimal outcome."

Nearly 200 years ago, the Temperance Movement redefined "temperance," which included varying degrees of alcohol use, to mean "total abstinence" from all alcohol (Tyrrell, 1979; White, 1998). Until recently, reduction in heavy drinking has largely been overlooked as a viable treatment outcome by practitioners and researchers. Although the goal of total abstinence remains important, reduction in heavy drinking offers numerous benefits, both as an intermediate clinical goal and as a research metric. Given the significant public health consequences associated with heavy drinking and the benefits associated with its reduction, it is proposed that researchers, public health professionals, and clinicians consider reduction in heavy drinking as a meaningful measure of treatment effectiveness.

Acknowledgment

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