# Use of a High-Risk Alcohol Relapse Scale in Evaluating Liver Transplant Candidates

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**Background:** Methods to improve assessment, selection, and monitoring of patients with alcoholic cirrhosis who pursue liver transplantation are sought continuously. We chose to investigate the use of the High-Risk Alcohol Relapse (HRAR) scale in our transplant population in the hope that it would improve our ability to identify and follow patients at highest risk for alcohol relapse.

**Methods:** Detailed alcohol histories of 207 patients evaluated for liver transplantation were collected and graded for severity by using the HRAR. The HRAR provides information on the duration of alcohol use (a measure of chronicity), daily quantity of alcohol use, and rehabilitation experiences (treatment responsiveness). Posttransplant alcohol use was monitored through clinical follow-up in the transplant clinic.

**Results:** Although men and women had similar years of heavy drinking pretransplant, women's daily alcohol consumption was significantly less than men's. HRAR scores did not distinguish those listed for transplant from those not listed or those who drank posttransplant from those who did not. Transplant patients were predominantly in the low-risk group (83% had an HRAR score <4).

**Conclusions:** The HRAR did not have predictive ability in our transplant population. Few of our patients were rated as high risk, and few drank posttransplant. Nevertheless, identifying patients at high risk may improve clinical care and decrease the rate of posttransplant alcohol consumption.

**Key Words:** Alcohol Relapse Scale, Liver Transplant, Alcoholic Liver Disease.

T HE SELECTION OF patients with alcoholic liver disease for orthotopic liver transplantation (OLTX) has been widely debated since the possibility of liver transplantation became a clinical reality in the early 1980s. Concerns over survival (Atterbury, 1986; Scharschmidt, 1984), morbidity and mortality (Schenker et al., 1990; Van Thiel et al., 1984), patient compliance (Cohen and Benjamin, 1991; Sherman and Williams, 1995), alcohol recidivism (Kumar et al., 1990), and moral issues (Moss and Siegler, 1991) have been deliberated in the literature and investigated in studies. Individual programs have formulated their own criteria for selection of candidates, although there are differences between programs (Caplan, 1989; Levenson and Olbrish, 1993; Snyder et al., 1996) especially with respect to the length of pretransplant sobriety.

Although most transplant programs require patients with alcohol histories to undergo psychiatric or psychosocial evaluations to assist in candidacy determinations, a recent survey showed that only half of the programs use a written

protocol for selection and even fewer programs routinely use rating scales to measure suitability (Snyder et al., 1996). Part of the difficulty is that standardized instruments have not been developed to evaluate risk for alcohol relapse in this unique population. Beresford et al. (1990) designed a decision algorithm to define quantifiable measures for selection and prediction of posttransplant outcome for alcoholic cirrhotic patients. Although their Alcoholism Prognosis Scale (APS) is the only published scale for rating pretransplant prognostic features of alcoholism, it was designed as a research tool rather than for use in making clinical recommendations for or against transplantation candidacy. Beresford et al. (1990) studied 38 alcoholic liver transplant candidates who had been accepted for transplantation because they were considered to be at low risk for alcohol relapse in accordance with a low score on the APS. However, the APS did not reliably predict subsequent alcohol use posttransplant (Beresford, 1994).

The High-Risk Alcoholism Relapse (HRAR) scale was designed and piloted in a group of male veterans to rate the risk of alcohol relapse after alcohol rehabilitation (Yates et al., 1993). This scale also has been used to compare the profiles of patients with end-stage liver disease who are undergoing liver transplantation evaluation with the male veterans population (not necessarily with alcoholic liver disease) (DiMartini et al., 1997; Yates et al., 1992). In addition, the HRAR has been incorporated as one measure of transplant suitability at the University of Iowa Liver

Transplant Program (Gerdes et al., 1994). The items in the HRAR were derived from a Cox proportional hazards model that used alcoholism severity variables present at the index treatment (Yates et al., 1993). Three items that comprise the HRAR (daily alcohol consumption, drinking duration, and previous treatment history) had the highest predictive power and independently contributed to early relapse risk (Table 1). The HRAR has predictive validity for early relapse in the first 6 months after treatment, with a sensitivity of 69% and a specificity of 65%. One study showed that fewer patients would meet transplant eligibility criteria by using the 6 months abstinence criterion alone than by using the HRAR scores (Yates, 1996). Thus, the 6 months abstinence criterion alone appears to have limitations in selecting transplant candidates with low alcoholism relapse risk (Yates, 1996). The HRAR currently is being tested as a model to predict risk for alcohol relapse in the general alcohol population after treatment but has yet to be validated with posttransplant relapse or outcome data (Yates et al., 1992). In addition, the original study population did not include women.

We used the HRAR items and total score to investigate the alcohol histories of patients with alcoholic cirrhosis who were undergoing liver transplantation evaluation. We were interested in determining the usefulness of the HRAR as part of the psychiatric evaluation and as a predictor of posttransplant alcohol use in the transplant population.

## METHODS

The alcohol histories of 207 consecutive patients with alcoholic liver disease who were undergoing liver transplant evaluation at Thomas E. Starzl Transplant Institute between March 1993 and December 1994 were reviewed for information about length of sobriety, rehabilitation experiences, number of daily drinks, years of heavy drinking, and history of other (nonalcohol) substance abuse/dependence. This information is readily available in the documented psychiatric histories gathered at the time of transplant evaluation. HRAR items were scored based on the documented histories, and the items were summed into a total score (see Table 1 for item scoring). HRAR scores were not used as part of the candidacy determination.

After transplantation, our patients are closely monitored with appointments every 2 weeks for the first 1 to 2 months immediately after discharge from the transplant hospitalization and then 1 to 2 months for the first posttransplant year. Follow-up thereafter is based on medical necessity, although most patients' posttransplant coordinators have regular monthly follow-up by laboratory data (liver function tests, immunosuppression medication levels) and phone contact if the patients are not seen in clinic. During their clinic appointments, patients are questioned by their trans-

plant coordinator and the transplant physicians about any alcohol use. Patients frequently are accompanied to the clinic by family members, who also are questioned about the patient's alcohol use. Blood alcohol levels are randomly checked for alcohol use.

### Statistical Analysis

Continuous variables are presented as the mean ± standard deviation and categorical variables as proportions. The standard two-sample $t$ test and one-way analysis of variance were used to test differences between means, whereas differences in proportions were tested by using either Pearson's $\chi^2$ test or Fisher's exact test. The Wilcoxon Rank Sum test, a nonparametric equivalent to the standard two-sample $t$ test, was used for highly skewed data. All analyses were performed by using the Statistical Package for the Social Sciences, SPSS for Windows (SPSS, Chicago, IL) software.

## RESULTS

### Demographics

In our transplant population, 23% were women, which is similar to the general alcoholic population. Ages ranged from 28 to 74 years (mean 50 ± 10.8 years), and the mean age for women was 50 years compared with 51 years for men. Seventy-six percent of patients had DSM-III-R (American Psychiatric Association, 1987) diagnosis of alcohol dependence made by a psychiatrist (A.D.) and two psychiatric nurse clinical specialists (J.M. and M.G.F.) during the transplantation evaluation psychiatric interview. The majority of the rest of the patients met diagnostic criteria for alcohol abuse. Eighteen percent of the patients had other substance abuse or dependence disorders. Thirty eight percent had an additional liver disease diagnosis (including 31% comorbid viral hepatitis, with 61% of these patients most likely contracting the virus from prior intravenous drug use).

### Alcohol Histories and HRAR Scores

The HRAR total scores for our cohort are shown in Fig. 1. There was no difference between men and women on years of heavy drinking ($p = 0.81$). Most drank >10 years (total 78%) but ≤25 years (total 63%). However, the average daily consumption was less in women (60% drank <9 drinks/day vs. 35% men, $p = 0.002$). The majority, 74% of

**Table 1.** High-Risk Alcohol Relapse Scale Items

| | | |
|---|---|---|
| 1. Duration of heavy drinking | | |
| <11 years = 0 | 11–25 years = 1 | >25 years = 2 |
| 2. Quantity of daily drinking | | |
| <9 drinks = 0 | 9–17 drinks = 1 | >17 drinks = 2 |
| 3. Previous alcohol treatment[a] | | |
| 0 = 0 | 1 = 1 | 2 = 2 |

Severity is graded on a scale from 1 to 6 (sum of the three items). A score of 4 to 6 is classified as the high-risk group.

[a] In our cohort, regular Alcoholic Anonymous attendance, at least several times per week, was also counted as rehabilitation experience.
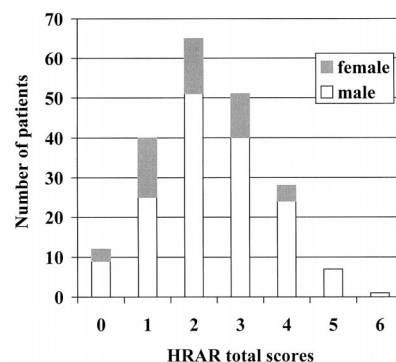


**Fig. 1.** Distribution of HRAR scale total scores.

patients, had no alcohol rehabilitation experience (no differences between men and women). Of those who attended rehabilitation, only 12% attended more than one rehabilitation program. Eighty-three percent of the cohort ($n =$ 171) were in the low-risk group (HRAR score < 4). Only one patient scored 6 (the highest score). Women were less likely to be in the high-risk group (HRAR score ≥ 4; 8.3% vs. 20%, $p = 0.081$), and no woman had a score >4 (see Fig. 1).

### Transplant Listing and Transplantation

Of the 207 patients, 79 were not listed at initial evaluation (43% had <6 months sobriety and had not completed alcohol rehabilitation, but others were not listed because they were considered not ill enough to be currently listed). Of those listed ($n = 128$), 78 patients underwent OLTX between March 1993 and July 1997.

Length of sobriety was significantly different between those listed for transplant and those not listed, but surprisingly, the larger mean length of sobriety was in the not-listed group (29 vs. 19 months, $p = 0.0051$), which perhaps reflected their better health status. The mean length of sobriety for the transplanted group was >1.5 years (19 months). Length of sobriety is not an item in the HRAR score.

Interestingly, there was no difference between HRAR scores of those listed and those not listed (mean HRAR total scores 2.2 ± 1.1 vs. 2.4 ± 1.3, $p = 0.174$). In fact, the mean scores are low with little standard deviation, which suggests that there are no outliers. HRAR scores and length of sobriety were not correlated.

### Post-OLTX Alcohol Use

Alcohol use was determined by the patient's admission of drinking or by collateral information from another physician or family member involved in the patient's care. Although we randomly check blood alcohol levels post-OLTX, none were positive in our cohort. Of the 72 patients who survived the transplant hospitalization, four used some alcohol post-OLTX. One patient drank alcohol extensively, was declined for retransplantation, and died. All four patients who drank alcohol were men.

### HRAR Scores, Length of Sobriety, and Post-OLTX Alcohol Use

Although we hypothesized that higher HRAR scores would predict post-OLTX alcohol use, there was no difference in HRAR scores between those who used alcohol post-OLTX and those who did not ($p = 0.87$). Although the numbers are too small for further analysis of pretransplant length of sobriety, three of the patients who drank after transplantation reported a year or more of pretransplant sobriety (12, 18, and 36 months).

## DISCUSSION

The HRAR items provide information on the duration of alcohol use (a measure of chronicity), daily quantity of alcohol use, and rehabilitation experiences (treatment responsiveness). Due to the majority of low HRAR scores, our liver transplant candidates with alcoholic cirrhosis appear to have less severe forms of alcoholism than a typical treatment sample. Patients with more severe alcoholism may die before transplant assessment, may not be referred by primary care providers for transplant evaluation due to the severity of their alcoholism, or may lack access to transplant services because of socioeconomic reasons.

Epidemiologic studies have shown that women can develop alcoholic cirrhosis with less ethanol consumption over shorter periods of time than men (Diehl, 1997). This was apparent in our cohort of liver transplant candidates, as women tended to drink less alcohol per day for shorter durations than men. This suggests that women could be targeted as a population that needs specific education about ethanol risks and treatment early on to prevent the development of cirrhosis.

There are several explanations for why the HRAR did not predict recidivism in our transplant sample. Because few transplant patients had high HRAR scores, this reduces the scale's power to be predictive in this study. Additionally, predictive models are difficult to evaluate when small numbers of cases emerge. In this study, only four transplant recipients resumed significant drinking. A final explanation is the HRAR model is not valid in transplant recipients but may be valid in all patients with alcoholic cirrhosis. A study of the HRAR's predictive validity in a series of patients with alcoholic cirrhosis is currently underway.

## REFERENCES

American Psychiatric Association (1987) *Diagnostic and Statistical Manual of Mental Disorders*. 3rd ed, rev. American Psychiatric Association, Washington, DC.

Atterbury CE (1986) The alcoholic in the lifeboat: Should drinkers be candidates for liver transplantation? J Clin Gastroenterol 8:1–4.

Beresford TP, Turcotte JG, Merion R, Burtch G, Blow FC, Campbell D, Brower KJ, Coffman K, Lucey M (1990) A rational approach to liver transplantation for the alcoholic patient. Psychosomatics 31:241–254.

Beresford TP (1994) Psychiatric follow-up care of alcohol-dependent liver graft recipients, in *Liver Transplantation and the Alcoholic Patient* (Lucey MR, Merion RM, Beresford TP eds), pp 96–112. Cambridge University Press, New York.

Caplan AL (1989) Problems in the policies and criteria used to allocate organs for transplantation in the United States. Transplant Proc 21:3381–3387.

Cohen C, Benjamin M (1991) Alcoholics and liver transplantation. The Ethics and Social Impact Committee of the Transplant and Health Policy Center, Ann Arbor, Michigan. JAMA 265:1299–1301.

Diehl AM (1997) Alcoholic liver disease. Liver Transpl Surg 3:206–211.

DiMartini AF, Khera G, Yates W, Irish W, Magill J, Fitzgerald MG (1997) Use of a high risk alcohol relapse scale in evaluating liver transplant candidates. Presentation at the Academy of Psychosomatic Medicine Annual Meeting, November 21, Coronado, CA.

Gerdes T, Yates W, Martin M, LaBrecque D (1994) Transplantation of patients with alcoholic liver disease. Iowa Med 84:349–352.

Kumar S, Stauber RE, Gavaler JS (1990) Orthotopic liver transplantation for alcoholic liver disease. Hepatology 11:159–164.

Levenson JL, Olbrish ME (1993) Psychosocial evaluation of organ transplant candidates: A comparative survey of process, criteria, and outcomes in heart, liver and kidney transplantation. Psychosomatics 34: 314–323.

Moss AH, Siegler M (1991) Should alcoholics compete equally for liver transplantation? JAMA 265:1295–1298.

Scharschmidt BF (1984) Human liver transplantation: Analysis of data on 540 patients from four centers. Hepatology (Suppl 1) 4:S95–S101.

Schenker S, Perkins HS, Sorrell MF (1990) Should patients with end-stage alcoholic liver disease have a new liver? *Hepatology* 11:314–319.

Sherman D, Williams R (1995) Liver transplantation and the alcoholic patient. Alcohol Alcohol 30:141–143.

Snyder SL, Drooker M, Strain J (1996) A survey estimate of academic liver transplant teams' selection practices for alcohol-dependent applicants. Psychosomatics 37:432–437.

Van Thiel DH, Schade RR, Gavaler JS, Shaw BW, Iwatsuki S, Starzl T (1984) Medical aspects of liver transplantation. Hepatology (Suppl 1) 4:S79–S83.

Yates WR, Booth BM, Brown K, Masterson, B (1992) A model to estimate alcoholism relapse risk: Implications for liver transplantation candidates. Presentation at the Annual Academy of Psychosomatic Medicine Meeting, October 31, San Diego, CA.

Yates WR, Booth BM, Reed DA, Brown K, Masterson BJ (1993) Descriptive and predictive validity of a high-risk alcoholism relapse model. J Stud Alcohol 54:645–651.

Yates W (1996) The validity of the six months of abstinence criteria for liver transplantation. Presentation at the 4th Biennial Psychiatric, Psychosocial, and Ethical Issues in Organ Transplantation conference, November 13, San Antonio, TX.