

# The Rochester Relapse Risk Scale: Farther along the path to a standardized approach to predicting substance relapse in liver transplant candidates

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## Introduction

Alcohol relapse is associated with worse outcomes in patients after orthotopic liver transplant (OLT), but methods of relapse risk assessment vary across transplant centers (Zhu 2018). The aim of our study was to evaluate the ability of the Rochester Relapse Risk Scale (R<sub>3</sub>S), a relapse predictor model composed of relapse risk factors identified in the substance use literature, to predict relapse and to examine the relationships between the included risk factors and relapse.

## Methods

This was a retrospective, observational cohort study of 409 adult patients with a history of problematic substance use evaluated for OLT at our Center from 1/2012 to 12/2021. The Institutional Review Board approved the study. Participants were evaluated with the R<sub>3</sub>S and stratified by relapse risk level, then evaluated for substance relapse for up to five years after evaluation. The primary outcome was rate of substance relapse after evaluation. Univariate analyses evaluated differences between patients with and without substance relapse for each risk factor. Multivariate analysis was then performed for variables with a p-value < 0.20.

Risk Factor	Definition
Poor support	Level of support unlikely to lead to successful transplantation
History of substance abuse in a 1 <sup>st</sup> degree relative <6 months abstinence	Duration of abstinence at the time of evaluation
Psychiatric comorbidity	History of psychiatric symptomatology that is or has been impacting patient's healthcare
Dependence <sup>a</sup> diagnosis	Per DSM-IV criteria
Defensiveness	Emotional defensiveness specifically around substance abuse
Poor self-efficacy	Difficulty providing oneself with necessities of daily life
History of chemical dependency (CD)/relapse prevention (RP) program(s)	This does not include attending AA
More than 1 substance of abuse	Meeting criteria for dependence, abuse or use disorder, excluding tobacco
Limited coping <sup>b</sup>	Long-standing coping strategies that have typically not been adequate to effectively adapt to life's vicissitudes
High-Risk Alcohol Relapse (HRAR) score >2 <sup>c</sup>	See De Gottardi et al. for components of HRAR.

Table 1. Risk factors included

## Results

There was a positive correlation between relapse rates and risk category assignment, though relapse rates did not vary significantly between moderate and moderate-high risk individuals. There were independent associations between relapse and <6 months of abstinence (adjusted hazard ratio [HR] 2.052; 95% CI, 1.42-2.96), High-Risk Alcoholism Relapse (HRAR) score >2 (HR 1.78; 95% CI 1.13-2.79), and limited coping (HR 1.46; 95% CI 0.94-2.24). Assessing the rates of relapse in the R<sub>3</sub>S 2.0 cohort with the number of multivariate predictors of relapse (<6 months abstinence, HRAR score >2, and limited coping) yielded a positive correlation: 17.3% relapse for no predictors, 39.7% for one, 50% for two, and 77.8% for all three. Likelihood of, and time to, relapse varied for each relapse risk stratum determined by the R<sub>3</sub>S (Figure 1).

Table 2. Patient Demographics

Characteristic	n = 409
Age at evaluation, median (IQR), years	54 (46-60)
Male, n (%)	302 (73.8)
Race, n (%)	
Caucasian	349 (85.3)
African American	33 (8.1)
Hispanic	20 (4.9)
Native American	4 (1)
Asian	3 (0.7)
ESLD diagnosis, n (%)	
Alcoholic Cirrhosis	327 (80)
HCV	126 (30.8)
NASH	27 (6.6)
Acute Alcoholic Hepatitis	14 (3.4)
Abit	3 (0.7)
Other	10 (3.9)
HCC, n (%)	110 (26.9)
MELD-Nx score, median (IQR)	19 (11-27)
Charlson Comorbidity Index score, median (IQR)	5 (4-7)
Outpatient psychiatric evaluation location, n (%)	
Substance abuse history, n (%)	
Alcohol	409 (97.8)
Marijuana	170 (41.5)
Cocaine	105 (25.7)
Heroin	38 (9.3)
Other	35 (8.6)
Received liver transplant during study follow-up, n (%)	123 (30.1)

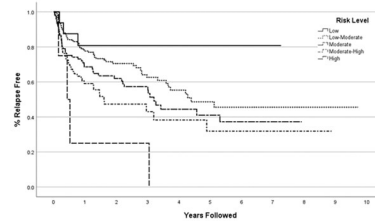


Table 3. Presence of individual risk factors

Risk Factor	R3S 1.0, n = 126	R3S 2.0, n = 283	Total, n = 409
Poor support	9 (7%)	21 (7.4%)	44 (10.8)
History of substance abuse in a 1 <sup>st</sup> degree relative	76 (60.3%)	163 (57.6%)	239 (58.4%)
< 6 months abstinence	65 (51.6%)	180 (63.6%)	245 (59.9%)
Psychiatric comorbidity	31 (24.6%)	51 (18%)	82 (20%)
Dependence <sup>a</sup> diagnosis	115 (91.3%)	175 (61.8%)	290 (70.9%)
Defensiveness	79 (62.7%)	171 (60.4%)	250 (61.1%)
Poor self-efficacy	13 (10.3%)	22 (7.8%)	35 (8.6%)
History of CD/ RP program(s)	65 (51.6%)	114 (40.3%)	179 (43.8%)
More than 1 substance of abuse	71 (56.3%)	79 (27.9%)	150 (36.7%)
Limited coping <sup>b</sup>	-	84 (29.7%)	-
High-Risk Alcohol Relapse (HRAR) score >2 <sup>c</sup>	-	61 (21.6%)	-

## Conclusions

While our data supports a linear relationship between duration of abstinence and relapse, it is not necessarily supportive of the 6-month abstinence cutoff historically popular among transplant centers. Other studies have demonstrated a significant relationship between an HRAR score > 3 and relapse risk (De Gottardi, 2007). We have used a cutoff of HRAR >2 to increase the discernment of problematic use and have found an independent relationship at this lower threshold. We did not confirm an independent relationship between psychiatric comorbidity and relapse as has been previously reported (Erim 2017). However, limited coping had an independent relationship with relapse and may measure a similar aspect.

In our population, the risk levels assigned by the R<sub>3</sub>S correlated with relapse rates. Our additional findings that only limited coping, HRAR score >2, and <6 months abstinence have independent associations with relapse suggest that an abbreviated version of the R<sub>3</sub>S with fewer factors is the next step in the refinement of this scale.

Risk Category	R3S 1.0, n = 126	R3S 2.0, n = 283	Total, n = 409
Low (≤ 2 factors)	3 (2.4%)	14 (4.9%)	17 (4.2%)
Low-Moderate (3-4 factors)	47 (37.3%)	146 (51.6%)	193 (47.2%)
Moderate (5-6 factors)	41 (32.5%)	68 (24%)	109 (26.7%)
Moderate-High (7-8 factors)	34 (27%)	51 (18%)	85 (20.8%)
High (≥ 9 factors)	1 (0.8%)	4 (1.4%)	5 (1.2%)

Table 4. Risk categorization after the R3S Assessment

## References

- Zhu J, Chen PY, Frankel M, Selby RR, Fong TL. Contemporary policies regarding alcohol and marijuana use among liver transplant programs in the United States. *Transplantation* 2018; 102(3):433-439.
- De Gottardi A, Spahr L, Gelez P, et al. A simple score for predicting alcohol relapse after liver transplantation: results from 387 patients over 15 years. *Arch Intern Med*. 2007;167(11):1183-1188.
- Erim Y, Scheel J, Beckmann M, Klein CG, Paul A. Standardized evaluation of candidates before liver transplantation with the transplant evaluation rating scale. *Psychosomatics*. 2017;58(2):141-150.