
Review

Transplantation for Alcohol-related Liver Disease: Is It Fair?

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Abstract

Aims: Alcohol-related liver disease (ALD) is the second leading cause of liver transplantation performed in the USA and Europe. We aimed to provide a narrative review of the major ethical issues governing transplantation for ALD.

Methods: We performed a narrative review of the ethical concepts in organ allocation for ALD, including alcoholic hepatitis.

Results: Ethical concerns regarding organ allocation for ALD involve issues of urgency, utility and justice. Post-transplant outcomes for ALD patients are good and ethical considerations limiting organs solely because of alcohol etiology do not bear scrutiny.

Conclusion: ALD will continue to be a major cause for liver failure. The main criteria for transplant in ALD should be the patient's risk of return to harmful drinking, alongside standard assessments of physical and psychosocial fitness for transplant.

INTRODUCTION

Since the first successful liver transplant in 1967, alcohol-related liver disease (ALD) has become the second leading cause of liver transplantation performed in the US and Europe (Fig. 1) (Siddiqui and Charlton, 2016). The 'fairness' of allocating scarce organs to patients with ALD has been debated for years, however this debate has gained fresh interest and intensity due to recent publications on transplantation for acute alcoholic hepatitis (Mathurin *et al.*, 2011). This commentary will briefly review ethical concepts in resource allocation and the current liver allocation system. We will then debate the 'fairness' of transplantation for ALD and provide the practicing clinician with a framework for evaluating such patients—particularly those with acute alcoholic hepatitis.

utility. In the setting of liver transplantation, urgency is the likelihood of dying without a transplant, and utility is the likelihood of surviving with a transplant. A system that balances the two principles would select candidates who are both most likely to die without a transplant and likely to survive with one (also called survival benefit). Such a system maximizes the survival benefit of a scarce organ supply. In this respect, the Model for End-stage Liver Disease (MELD) system functions reasonably well as an indicator of urgency (those most likely to die of liver-related causes within 3 months), as shown in Fig. 2 (Wiesner *et al.*, 2003). Other relevant principles include fairness (equity), which Aristotle reportedly defined as 'treating like alike and different differently'. Importantly, principles that should NOT be considered are those focused on social worth or entitlement. This will be discussed further with respect to ALD below.

ETHICAL CONCEPTS IN RESOURCE ALLOCATION

Resource allocation is part of the larger ethical field of Justice. The most relevant ethical principles (values) for organ allocation are urgency and

CURRENT LIVER TRANSPLANT ALLOCATION SYSTEM

The first formal liver transplant guidelines were created in 1984 after passage of the National Organ Transplant Act. This act created

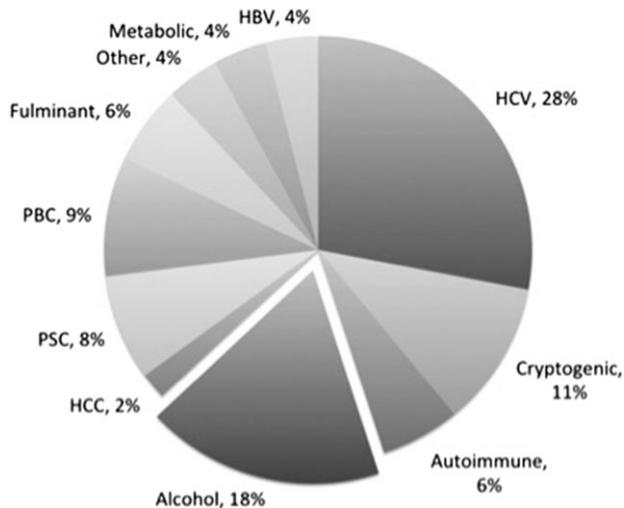


Fig. 1. Etiologies of liver transplantation in the United States. HBV, hepatitis B virus; HCV, hepatitis C virus; HCC, hepatocellular carcinoma; PSC, primary sclerosing cholangitis; PBC, primary biliary cholangitis/cirrhosis.

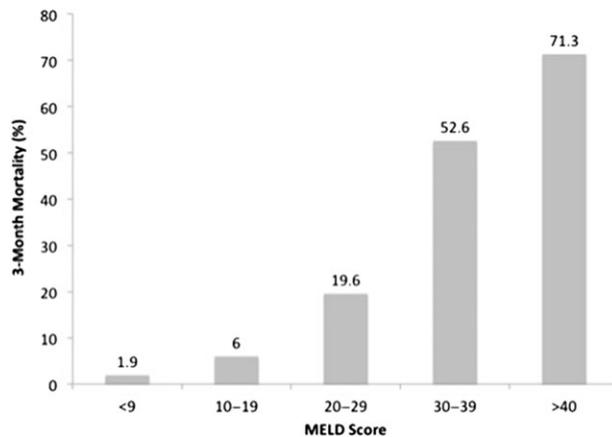


Fig. 2. Three-month patient mortality by Model for End-stage Liver Disease (MELD) score (data taken from Table 4 in Wiesner *et al.*, 2003).

the Organ Procurement and Transplantation Network (OPTN), which is managed by the United Network for Organ Sharing (UNOS). Under the auspices of UNOS, approximately 140 transplant centers across the US are divided into 60 Organ Procurement Organizations (OPOs) with one to eight transplant centers per OPO (Coombes and Trotter, 2005). When a patient is identified as needing evaluation for liver transplantation, he or she is referred to one of the transplant centers for evaluation of medical suitability. This includes assessment of liver function, cardiac and general health, and surgical and anesthetic risk (O'Leary *et al.*, 2008). Evaluation also includes psychiatric assessment for substance abuse as well as psychiatric illness or other adjustment issues which may reduce the likelihood of a successful transplant. Social work evaluation includes assessment of the patient's social support network as well as financial counseling (O'Leary *et al.*, 2008).

The results of the evaluation are reviewed by a transplant committee typically composed of transplant surgeons, hepatologists, transplant coordinators, social workers, transplant psychiatrists/psychologists and others as needed to determine if the patient is an

appropriate candidate (Volk *et al.*, 2011). Patients deemed to be candidates for transplantation are then listed according to UNOS guidelines. Most centers require patients with ALD to be abstinent for at least 6 months, though some centers are considering earlier survival for alcoholic hepatitis patients undergoing urgent liver transplantation (Mathurin *et al.*, 2011). With few exceptions, since 2002 priority on the liver transplant waiting list has been primarily governed by the MELD score. When an organ becomes available, it is typically offered to the patient with a compatible blood type who has the highest MELD score in that OPO area. In other words, priority on the transplant list is primarily based on objective criteria, but decisions regarding listing and de-listing are primarily subjective.

THE 'FAIRNESS DEBATE' IN TRANSPLANTATION OF ALCOHOL-RELATED LIVER DISEASE

While liver transplantation for ALD is common, the practice is not without controversy with questions raised predominantly about fairness (Moss and Siegler, 1991; Glannon, 2009; Zambrano, 2016). Is it fair to give ALD patients such a scarce resource at all? And if so, is the allocation process fair to both the public and to the ALD patient him or herself? Objections to transplantation for patients with ALD generally fall into two major categories: those based upon medical suitability of the ALD patient and risk of post-transplant relapse and those based upon a perceived injustice in granting such a scarce resource to a patient who, it is believed, bears at least some personal responsibility for their liver disease.

PREDICTING POST-TRANSPLANT RELAPSE

Current practice (though not absolute across all transplant centers) includes a requirement for a period of total abstinence from alcohol, usually 6 months, before listing for transplant. The rationale for this is 2-fold. First, it allows for removal of the primary hepatotoxin, in this case alcohol, and may allow the liver to recover some function, perhaps enough to avoid transplantation. Second, it allows the patient to demonstrate a commitment to abstinence and the ability to remain drug and alcohol-free. However, evidence for a strong correlation between pre-transplant abstinence duration and post-transplant risk for relapse is contradictory and inconclusive. The 6-month rule has not been found to reliably and strongly correlate with post-transplant relapse rates though it does provide an opportunity to determine if the patient's liver will recover and possibly avoid transplantation (Weinrieb *et al.*, 2000; Neuberger, 2007).

This loose 'requirement' for 6 months of abstinence also does not address how to treat ALD patients who present with high MELD scores and recent drinking. Such patients often have acute alcoholic hepatitis, a profound systemic inflammatory disorder triggered by hepatic inflammation from excessive alcohol use, which carries a high mortality (as high as 50% at 3 months in some studies) (Thursz and Morgan, 2016). Though the liver can recover function with alcohol abstinence, it is not entirely clear which patients will have hepatic recovery within the 6-month timeframe. Requiring patients to demonstrate such abstinence and engage in recovery for 6 months (or even less) is often tantamount to a death sentence for those with high MELD scores at initial evaluation. In response to this, some centers have developed center-specific criteria for transplanting alcoholic hepatitis patients, with reported outcomes comparable to transplantation for other conditions, though these initial optimistic estimates have been questioned in subsequent literature

(Mathurin *et al.*, 2011). The ideal candidate for this is a patient with heavy drinking but no prior adverse sequelae (no prior signs of liver disease, no negative impact on work or family life).

When objections were raised to liver transplantation for ALD in the late 1980s and early 1990s, concern about post-transplant alcohol relapse, graft failure, and mortality were at the forefront. In the intervening years, more data has emerged regarding the trends in post-transplant graft and survival outcomes. ALD transplant recipients have been found to have the same patient and graft survival as non-ALD liver transplant recipients and, in fact, have improved survival outcomes compared to hepatitis C transplant recipients (Lucey, 2014). With respect to post-transplant relapse, ALD patients have been found to have lower amounts of relapse than expected, though studies examining this are confounded by varying definitions of what counts as relapse (ranging from any alcohol use to heavy drinking) as well as by patient reluctance to disclose alcohol use due to the negative consequences for transplant eligibility such disclosures may have. A meta-analysis published in 2008 examined rates of relapse for all substance abuse, including alcohol, in solid organ transplant recipients as well as examining risk factors for relapse and found that relapse to any alcohol use was low at only 6 per 100 patient years and relapse to heavy alcohol use was even lower at 2.5 per 100 patient years (Dew *et al.*, 2008). Risk factors for relapse included poor social support, familial alcohol abuse history, and pre-transplant abstinence of ≤ 6 months.

When patients do relapse, what are the consequences for patient and graft survival? The transplant community has generally considered any alcohol consumption post-transplant to be a relapse while the addiction medicine community distinguishes between a slip (defined as an intermittent short-term drinking event followed by immediate reestablishment of abstinence) from a relapse (defined as prolonged and harmful drinking behavior) (Pfitzmann *et al.*, 2007; Dew *et al.*, 2008). As a result, reported relapse rates are widely variable, ranging from 7-95%. However, a single-center prospective study found that, by 8 years of follow-up, roughly 50% of ALD patients post-transplant had at least one drink while only 6-7% fully relapsed in excessive harmful drinking (DiMartini *et al.*, 2010). Another study placed the recurrence of severe alcohol relapse at 17% post-transplant with about 1/3 of these heavy drinkers developing rapidly recurrent alcohol-related cirrhosis in less than 5 years with a poor prognosis (Dumortier *et al.*, 2015). These patients also had higher mortality compared to those who do not return to heavy drinking.

Taken together, the above studies show that relapse is less common post-transplant than previously thought but that, where it does occur and is associated with heavy drinking as opposed to mere 'slips', it is responsible for increased mortality due to recurrent alcohol-related liver disease. However, the vast majority of ALD transplant recipients appears to do well post-transplant, and as a group have better outcomes than patients with hepatitis C, for example (Lucey, 2014). Best practices for ALD patients mandates a thoughtful and thorough psychiatric and social evaluation to determine patient-specific factors that might increase risk of post-transplant relapse, with the goal of managing the alcohol use disorder aggressively throughout the transplant process.

IS IT FAIR TO TRANSPLANT PATIENTS WITH ALCOHOL-RELATED LIVER DISEASE AT ALL?

Across multiple surveys in both the US and the UK, patients with ALD are regularly ranked as less deserving of transplantation. A

survey conducted in Oregon required participants to rank 714 different diagnoses and treatments for coverage. Liver transplantation for nonalcohol-related liver diseases was ranked at 364 whereas that for ALD was ranked at 695 (Dixon and Welch, 1991). Similarly, a survey of the lay public, general practitioners, gastroenterologists and transplant clinicians in the UK revealed that each group uniformly gave lower priority to those with ALD as well as those with more antisocial personality traits (such as an incarcerated violent criminal) (Neuberger, 2007).

Clearly, ALD patients are viewed as less deserving, but the underlying reasons why those with alcohol use disorders are ranked lower in the above studies is not clear. Cirrhosis in general is a stigmatized condition and often affects patients of lower socioeconomic status (Vaughn-Sandler *et al.*, 2014). Some have argued that the ability to assign at least some degree of personal responsibility to ALD patients differentiates them from other liver failure patients (Moss and Siegler, 1991; Glannon, 2009). Patients with alcohol use disorders, it is argued, are responsible for their liver disease, and should therefore have a weaker claim to a liver transplant compared to those who had no role in developing liver disease. Such arguments for lower priority for or exclusion of ALD patients from liver transplant are undergirded by the idea that the absolute scarcity and nonrenewable nature of livers places such allocation decisions in a special class. As a consequence of this absolute scarcity, stricter allocation decisions must apply, and the ALD patient, by way of his or her presumed personal responsibility for their liver failure, thus falls farther down the priority list. Personal responsibility would not be a general category for rationing, it is argued, because other healthcare resources are *not* absolutely scarce in the same way. Arguments for lower priority based upon personal responsibility, may mask judgments regarding social desirability, a criterion that has been rightly deemed unethical for consideration for transplant allocation (Ubel *et al.*, 1999).

Yet this argument is problematic. First, it unfairly singles out a vulnerable population for lower priority, the result of which would be their death in the absence of a liver transplant. Second, a wide variety of healthcare problems can be attributed to individual personal responsibility. For example, patients with nonalcoholic steatohepatitis are more likely to be overweight and obese and to have diabetes, all conditions which could be argued to have a significant component of personal responsibility in their inception in addition to their management. Yet, there is virtually no discussion about the personal responsibility for their health problems nor is there a call to place such patients lower on the list for transplantation. Extending this argument beyond the transplant community, one can see that we do not withhold life-saving treatment from car accident victims who failed to wear a seat-belt, motorcycle riders who do not wear helmets, or former smokers who now require coronary bypass surgery, even if such treatment results in high healthcare costs and utilization.

Despite cursory acknowledgements of widespread personal responsibility for healthcare, at least within the transplant literature there is little focus on such issues outside the realm of alcohol-related liver disease. Why this is so is uncertain, but it may be related to the long-standing and entrenched notion of alcoholism as a moral problem. The notion of alcoholism as a moral failing rather than a disease stretches back beyond the temperance movement in the latter part of the 19th century, which did much to cement the idea of alcoholism as a moral problem in the minds of the nation (Tracy, 2009). In spite of vigorous efforts to change this idea and view alcoholism as a disease devoid of moral agency in those

afflicted, such efforts have not succeeded entirely. While addiction medicine as a professional discipline has achieved recognition with specialist training programs, accreditation, specific licensing exams, and robust literature and journals devoted to alcohol use disorders, this has not been enough to change public or even medical opinion to wholly accept alcoholism as a disease. Public preference studies showing that patients with alcohol use disorders are routinely given lower priority on transplant allocation lists may reflect this belief that alcohol use disorders are less 'diseases' and more moral failings.

In the case of alcoholic hepatitis, issues concerning justice, urgency, and utility are thrown into stark relief. Patients with alcoholic hepatitis have much higher short-term mortality, in some cases as high as 50% at 3 months (O'Shea *et al.*, 2010; Thursz and Morgan, 2016). Effective medical treatments are scarce, with only prednisolone showing borderline short-term benefit and no long-term benefit (Singh *et al.*, 2015; Thursz *et al.*, 2015). Without question, alcohol cessation is the biggest predictor of long-term mortality, with those who abstain completely surviving longer than those who do not (Louvet *et al.*, 2016). However, many patients with acute alcoholic hepatitis simply do not have time to demonstrate weeks to months of alcohol abstinence, whether to determine if their liver will recover or to meet the 6-month abstinence requirement frequently required for transplant consideration. Should such patients be transplanted in spite of a lack of demonstrable abstinence?

A landmark French study showed that carefully selected patients with acute alcoholic hepatitis could be transplanted with acceptable short- and long-term post-transplant outcomes (Mathurin *et al.*, 2011). Attempts to replicate this experience in the US have shown that similarly few alcoholic hepatitis patients meet stringent criteria for transplant, but among those few, 1- and 2-year survival was acceptable, at 100% and 89%, respectively (Im *et al.*, 2016; Lee *et al.*, 2017). A study from the United Network for Organ Sharing (UNOS) database showed that patients transplanted for alcoholic hepatitis, when compared to those transplanted for alcohol-related cirrhosis, had comparable 5-year graft and patient survival (Singal *et al.*, 2012). While it appears, that, for carefully selected patients with acute alcoholic hepatitis, liver transplantation meets the ethical principle of utility, a cautionary note is warranted. In the larger study, the two deaths in the alcoholic hepatitis cohort occurred >1 year from transplant, but both were due to severe and intractable alcohol relapse. This occurred despite aggressive monitoring and damaged transplant team morale as a result (Lee *et al.*, 2017). While excluding all patients with acute alcoholic hepatitis would unnecessarily condemn to death some who would otherwise do well, caution is warranted, and patients should be very carefully selected, with care taken to ensure appropriate follow-up with quick and effective treatment of slips and relapses. Better prediction models for alcohol relapse post-transplant would be a welcome addition to the pre-transplant risk stratification armamentarium. Until such time, transplant programs that choose to transplant alcoholic hepatitis patients should have robust pre- and post-transplant resources for alcohol use disorder evaluation treatment, monitoring, and support (Mathurin *et al.*, 2011).

A FRAMEWORK FOR EVALUATING PATIENTS WITH ALD

Thousands of patients are hospitalized for ALD in the US, and not all of these patients can be managed by transplant centers. Experienced practicing gastroenterologists are often able to screen potential candidates for referral by following a simple framework.

First, take a detailed alcohol history to confirm the diagnosis. Many patients are labeled with 'ALD' despite consuming no more than the recommended intake (one drink daily for women, two drinks daily for men). Second, find out the patient's perception about whether their alcohol consumption is to blame for their illness, and whether they are willing to engage in substance abuse treatment. These reflect their degree of insight into their addiction, a major determinant of eventual transplant candidacy. Inquire about their social support, another prerequisite for transplantation. Finally, determine their duration of sobriety. In some cases, a patient with only 4 months' sobriety who has excellent insight and strong social support may be a better candidate than a patient with 8 months' sobriety who lacks these characteristics. Nonetheless, criteria vary by transplant center, and community physicians should understand the criteria for referral at their local center.

CONCLUSION

ALD will continue to be a major cause for liver failure worldwide, and arguments against transplantation on the basis of personal responsibility do not bear scrutiny. The main criteria for determining candidacy should be the patient's risk of return to harmful drinking after transplantation, evaluated by characteristics such as insight, social support, and duration of sobriety. Ultimately, determination of candidacy for these patients is best made by a multidisciplinary team, which includes experienced addiction psychiatrists and/or psychologists, to make a careful evaluation of the many facets of the patient's alcohol use disorder. While some centers have begun offering transplantation to patients with acute alcoholic hepatitis with acceptable short and long-term outcomes, caution is warranted and such patients must be very carefully selected and followed for alcohol slips and relapses. Regardless of transplant candidacy, maintenance of complete alcohol abstinence is critical to both short- and long-term survival of ALD patients. Efforts to assess the severity of alcohol use and connect patients to alcohol use disorder treatment should be given as much attention as management of the complications of liver disease itself. Complete alcohol abstinence is the intervention most likely to prolong the patient's life, prepare them for successful listing for transplant (should they need it), and ensure long-term success post-transplant.

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CONFLICT OF INTEREST STATEMENT

None declared.

REFERENCES

- Coombes JM, Trotter JF. (2005) Development of the allocation system for deceased donor liver transplantation. *Clin Med Res* 3:87–92. doi:10.3121/cm.3.2.87. Marshfield Clinic.
- Dew MA, DiMartini AF, Steel J, *et al.* (2008) Meta-analysis of risk for relapse to substance use after transplantation of the liver or other solid organs. *Liver Transpl* 14:159–72. doi:10.1002/lt.21278.
- DiMartini A, Dew MA, Day N, *et al.* (2010) Trajectories of alcohol consumption following liver transplantation. *Am J Transpl* 10:2305–12. doi:10.1111/j.1600-6143.2010.03232.x. Blackwell Publishing Inc.

- Dixon J, Welch HG. (1991) Priority setting: lessons from Oregon. *Lancet* 337:891–4. doi:10.1016/0140-6736(91)90213-9. Elsevier.
- Dumortier JEROM, Dharancy SEB, Cannesson AEL, et al. (2015) Recurrent alcoholic cirrhosis in severe alcoholic relapse after liver transplantation: a frequent and serious complication. *Am J Gastroenterol* 110:1–7. doi:10.1038/ajg.2015.204. Nature Publishing Group.
- Glannon W. (2009) Responsibility and priority in liver transplantation. *Camb Q Healthc Ethics* 18:23–35. doi:10.1017/S0963180108090051. Cambridge University Press.
- Im GY, Kim-Schluger L, Shenoy A, et al. (2016) Early liver transplantation for severe alcoholic hepatitis in the United States—a single-center experience. *Am J Transpl* 16:841–9. doi:10.1111/ajt.13586.
- Lee BP, Chen P-H, Haugen C, et al. (2017) Three-year results of a pilot program in early liver transplantation for severe alcoholic hepatitis. *Ann Surg* 265:20–9. doi:10.1097/SLA.0000000000001831.
- Louvet A, Labreuche J, Artru F, et al. (2016) Drivers of short- and long-term mortality in severe alcoholic hepatitis: a complex relationship between alcohol relapse and early improvement in liver function. *Hepatology* 64:22A.
- Lucey MR. (2014) Liver transplantation for alcoholic liver disease. *Nat Rev Gastroenterol Hepatol* 11:300–7. doi:10.1038/nrgastro.2013.247. Nature Research.
- Mathurin P, Moreno C, Samuel D, et al. (2011) Early liver transplantation for severe alcoholic hepatitis. *New Engl J Med* 365:1790–1800. doi:10.1056/NEJMoa1105703. Massachusetts Medical Society.
- Moss AH, Siegler M. (1991) Should alcoholics compete equally for liver transplantation? *JAMA* 265:1295–8. doi:10.1001/jama.1991.03460100097032. American Medical Association.
- Neuberger J. (2007) Public and professional attitudes to transplanting alcoholic patients. *Liver Transpl* 13:S65–8. doi:10.1002/lt.21337. Wiley Subscription Services, Inc., A Wiley Company.
- O’Leary JG, Lepe R, Davis GL. (2008) Indications for liver transplantation. *Gastroenterology* 134:1764–76. doi:10.1053/j.gastro.2008.02.028.
- O’Shea RS, Dasarathy S, McCullough AJ, Practice Guideline Committee of the American Association for the Study of Liver Diseases Practice Parameters Committee of the American College of Gastroenterology. (2010) Alcoholic liver disease. *Hepatology* 307–28. doi:10.1002/hep.23258. Wiley Subscription Services, Inc., A Wiley Company.
- Pfizzmann R, Schwenzer J, Rayes N, et al. (2007) Long-term survival and predictors of relapse after orthotopic liver transplantation for alcoholic liver disease. *Liver Transpl* 13:197–205. doi:10.1002/lt.20934. Wiley Subscription Services, Inc., A Wiley Company.
- Siddiqui MS, Charlton M. (2016) Liver transplantation for alcoholic and non-alcoholic fatty liver disease: pretransplant selection and posttransplant management. *Gastroenterology* 150:1849–62. doi:10.1053/j.gastro.2016.02.077.
- Singal AK, Bashir H, Anand BS, et al. (2012) Outcomes after liver transplantation for alcoholic hepatitis are similar to alcoholic cirrhosis: exploratory analysis from the UNOS database. *Hepatology* 55:1398–1405. doi:10.1002/hep.25544. Wiley Subscription Services, Inc., A Wiley Company.
- Singh S, Murad MH, Chandar AK, et al. (2015) Comparative effectiveness of pharmacological interventions for severe alcoholic hepatitis: a systematic review and network meta-analysis. *Gastroenterology* 149:958–70.e12. doi:10.1053/j.gastro.2015.06.006.
- Thursz M, Morgan TR. (2016) Treatment of severe alcoholic hepatitis. *Gastroenterology* 150:1823–34. doi:10.1053/j.gastro.2016.02.074. Elsevier, Inc.
- Thursz MR, Richardson P, Allison M, et al. (2015) Prednisolone or pentoxifylline for alcoholic hepatitis. *N Engl J Med* 372:1619–28. doi:10.1056/NEJMoa1412278. Massachusetts Medical Society.
- Tracy SW. (2009) *Alcoholism in America*. Baltimore, MD and London UK: Johns Hopkins University Press.
- Ubel PA, Baron J, Asch DA. (1999) Social acceptability, personal responsibility, and prognosis in public judgments and transplant allocation. *Bioethics* 13:57–68. doi:10.1111/1467-8519.00131. Blackwell Publishers Ltd.
- Vaughn-Sandler V, Sherman C, Aronson A, et al. (2014) Consequences of perceived stigma among patients with cirrhosis. *Dig Dis Sci* 59:681–6. doi:10.1007/s10620-013-2942-0. Springer US.
- Volk ML, Biggins SW, Huang MA, et al. (2011) Decision making in liver transplant selection committees: a multicenter study. *Ann Intern Med* 155:503–8. doi:10.7326/0003-4819-155-8-201110180-00006. American College of Physicians.
- Weinrieb RM, Van Horn DHA, McLellan AT, et al. (2000) Interpreting the significance of drinking by alcohol-dependent liver transplant patients: Fostering candor is the key to recovery. *Liver Transplantation* 6:769–76. doi:10.1053/jlts.2000.18497. W.B. Saunders.
- Wiesner R, Edwards E, Freeman R, et al. (2003) Model for end-stage liver disease (MELD) and allocation of donor livers. *Gastroenterology* 124:91–6. doi:10.1053/gast.2003.50016.
- Zambrano A. (2016) Why alcoholics ought to compete equally for liver transplants. *Bioethics* 30:689–97. doi:10.1111/bioe.12274.