

## MELD-Based Allocation Scheme for Liver Transplantation in Israel

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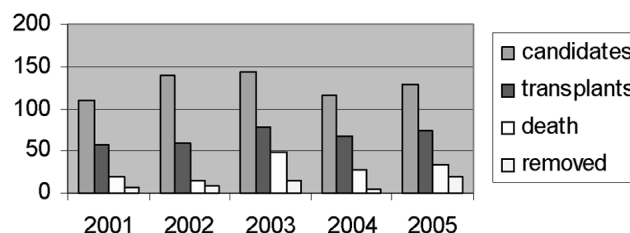
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End-stage liver disease continues to be a challenge for the medical community because of the limited therapeutic options available for care and the high morbidity and mortality resulting from disease complications. Liver transplantation is available for selected patients with ESLD and has changed both life expectancy and quality of life of these patients. Unfortunately, because of the increasing gap between the demand for transplant and the number of organ donors, liver transplantation is not universally available. This gap is responsible for waiting list mortality, i.e., death due to different complications, including spontaneous bacterial peritonitis, hepatorenal syndrome, and uncontrolled variceal bleeding. In the United States in 2005 the mortality rate while awaiting transplantation was close to 20%. In Israel in 2005 there were 126 candidates listed for liver transplantation and fewer than 50% of them were transplanted [1]; the mortality rate while waiting for transplant was 26.3% [Figure 1] [Israel Transplant Center, personal communication].

The ideal organ allocation system would reduce mortality on the waiting list to minimum without compromising post-transplant survival. The parameters used for allocation should be relevant to disease severity and as objective as possible. The scheme for allocation should be easy to implement and to audit. The current allocation is based on prioritization of the sickest patients with the lowest predicted survival while waiting for transplantation. The Child-Turcotte-Pugh score has been in use for many years to assess disease severity of patients with ESLD, and it was later applied together with waiting time as a criterion for donor liver allocation in the USA [2]. The main drawback of the CTP score is the use of a semi-quantitative scale of different measurable parameters (bilirubin, prothrombin time, albumin) and the inclusion of non-objective parameters, i.e., degree of encephalopathy and amount of ascites. Two factors urged clinicians and policy makers in organ procurement organizations to change this allocation scheme and make it more equitable: namely, the severe shortage of organs for transplant and the growth in the number of programs performing liver transplantation. Both factors concurred to create an imbalance in mortality rates of candidates for transplant between different regions according to their organ supply and number of programs.

The Model of End-Stage Liver Disease was designed to predict



**Figure 1.** Israel Liver Transplantation Registry

mortality in patients with ESLD [3]. The MELD score is a computation of bilirubin, international normalized ratio and creatinine, laboratory tests that are readily available and have little variability across medical centers. MELD score values range from 6 to 40. Unlike the CTP score, all components are used as continuous parameters in a logarithmic formula. Interestingly, a non-liver parameter included in the MELD score, creatinine, seems to be a very important predictor of survival both before and after transplantation [4]. In the MELD-based allocation, waiting time plays no role, except for patients with equal scores. Because of the rapid deterioration and the risk of death in patients with a high MELD score ( $> 17$ ) [5], a tight follow-up and periodic updated reports to organ procurement organizations are mandatory in the MELD system to give these patients a better chance to be offered an organ. In contrast to all other allocation systems, the MELD score was validated across various patient groups with different disease etiologies and across countries [6-8]. The MELD score-based allocation was implemented successfully in the United States in February 2002. Since then mortality on the waiting list dropped significantly. There is debate whether transplanting sicker patients as reflected by higher MELD scores results in increased mortality after liver transplantation [9].

The overall success with the implementation of the MELD-based allocation in the U.S. has led other countries to consider introducing a similar allocation. Although there is optimism with the use of MELD, several questions remain: Does the MELD score reflect severe sickness in all ESLD patients? Can the good results in the U.S. be reproduced elsewhere?

Bilirubin, creatinine and INR do not necessarily reflect all facets of sickness from ESLD – such as increased risk from hepatopulmonary syndrome, hepatocellular carcinoma, metabolic

ESLD = end-stage liver disease

CTP = Child-Turcotte-Pugh

INR = international normalized ratio

disease, refractory ascites, refractory variceal bleeding. Therefore, in the MELD-based allocation, the regional committee can agree upon giving particular patients a higher MELD score than the calculated one in order to enable access to timely transplantation.

The paper by Ben Chaim et al. in this issue of *IMAJ* [10] raises concerns about the suitability of the MELD-based allocation system in Israel given the higher mortality among those on the liver transplant waiting list when compared to the results in the U.S. The American system is based upon an extensive waiting list and a relatively high organ donation rate. Despite the lack of organs there too, an ESLD patient who experiences complications has a better chance to receive a donor liver than a similar patient in Israel. This might explain why the mortality among patients in the study by Ben Chaim and team was higher in the patients with lower MELD scores, e.g., less sick and stable patients. Another explanation for the high mortality rate in the intermediate risk group in that series might be the poor patient care and late referral to a transplant center, as suggested by the authors. Indeed, timely treatment of complications and a regular update of the MELD score by a transplant coordinator may prioritize these patients and give them a better chance to survive while awaiting transplantation.

The previous liver allocation system in Israel used the New England Continuous [Liver] Disease Severity Score (mNECDSS), which is based on the CPT score with additional points given for specific complications and minimal emphasis on waiting time. An analysis performed by the Israel Transplant Center to validate the MELD score before its implementation using the 2004 waiting list showed indeed that had the MELD score been used instead, the mNECDSS would not necessarily have saved lives (personal communication). Similarly, on the basis of the current literature, it was argued that the MELD score does not perform better than the CTP score for patients with cirrhosis on the waiting list and cannot predict post-liver transplant mortality [11]. Because cirrhosis-related complications are associated with poor prognosis and patients with complications are often not granted appropriate high MELD scores [12], it seems that inclusion of complications in the allocation scheme may lower waiting list mortality. New allocation schemes have been suggested recently, including the addition of a fourth category into the semi-quantitative scale of the CTP score [13], or the addition of serum sodium to the MELD score [14], which may help patients with intractable ascites.

In summary, because of its simplicity and equitability with all its potential shortcomings, the MELD score is a useful tool for liver allocation, while the transplant community still strives to design a better allocation method and to find different solutions to increase the number of organs for transplant.

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*During times of universal deceit, telling the truth becomes a revolutionary act*

George Orwell (1903-1950), British writer, best known for his classics – *Animal Farm* and *1984*