MELD allocation has been in place in the United States since March 2002. Prior to then, patients with chronic liver disease were ranked on the waiting list by status (i.e. 2a, 2b or 3), which was determined based on their Child-Pugh Class and hospitalization status. The “tiebreaker” within status was the waiting time. Because large regional differences in waiting times for liver transplantation throughout the United States have led to the perception that livers have not been fairly allocated, the United States Congress authorized a study by the Institute of Medicine to address liver organ allocation. They concluded that liver allocation would be better accomplished by developing a continuous disease severity score, which emphasized the degree of liver dysfunction and decreased the importance of waiting time in organ allocation. The primary metric by which MELD and other scoring systems were compared was based on the ability to predict 3-month mortality on the wait list. However, before MELD allocation was put into place, a number of data sets were used to test the robustness of MELD to predict short-term mortality including a series of patients hospitalized for cirrhosis, patients with cirrhosis who were outpatients and patients with cholestatic forms of liver disease. Both datasets in the United States and Europe were utilized.

We also recognized at that time that MELD scores would not reflect the likelihood of pre-transplant mortality in some patients being listed for liver transplantation, e.g. those with hepatocellular carcinoma (HCC). This was addressed by putting in place a system of regional review boards. These regional review boards assessed applications by transplant centers to grant additional MELD points for patients with a variety of conditions [2]. The goal here was to allow all patients waiting for liver transplantation, to compete equally for an organ, regardless of the reason for liver transplantation.

After MELD allocation went into place in the United States in 2002, several observations were immediate [3]. First, the MELD score at which patients were given transplants, doubled. In addition, the number of transplants for hepatocellular carcinoma tripled. The number of combined liver-kidney transplants also doubled. Importantly, the wait list mortality did decrease, which was the primary intention of MELD allocation. It was also important that MELD did not increase post transplant mortality rates.

Several other things occurred following the institution of MELD allocation that may or may not be specifically related to MELD allocation. First, the number of live donor liver transplants in the USA decreased substantially. This also was around the time of a very highly publicized donor death at Mount Sinai Hospital in New York and which of these had the greatest impact is not clear. However, we have never performed as many live donor transplants in the United States as were performed in 2001 (the year prior to instituting MELD allocation). In addition, the number of new additions to the wait list decreased by ~10% and indeed, more patients were placed on the wait list in 2001 than in any other year since then. Moreover, the number of patients on the active wait list has not increased since 2002 [4].

In the September 2007 issue of the Journal of
Gastrointestinal and Liver Diseases an article from the Fundeni Clinical Institute in Bucharest reported on the ability of MELD to predict wait list mortality in Romanian patients awaiting liver transplantation [5]. The authors of this report found that MELD score variation in the last three months was the only independent predictor of death on the wait list in Romania. They compared receiver-operator “ROC” curves and found that the C (correlation) statistic for prediction of death on the wait list was .73 for MELD score at listing, while it was .86 for MELD variation within the last three months.

With regard to this study, it is important to point out that there are several obvious differences between the state of liver transplantation in Romania and in the United States. First, only eleven patients out of the two hundred and eight patients listed for liver transplantation were actually transplanted during the study, which, compared with the USA is very low transplantation rate. In addition, the estimated waiting time for liver transplantation in Romania is substantially longer than for transplantation in the United States. By contrast, 42 patients died while waiting during the study period. It also appears that the patients in this study were relatively healthy with a mean Child-Pugh score of 7.2 and a mean MELD score of 13. To put this into perspective, livers are not offered to patients in the USA with a MELD of < 15 until the liver has been offered to every wait listed patient in the region with a MELD score of >15 (see below).

Allocation by Δ MELD has been studied in the United States by Merion et al [6] and by Brambha et al [7]. In the Merion study, they found that a Δ MELD of +5 in 30-day period was associated with a 3-fold greater risk of wait list mortality, independent of the MELD score. By contrast, Brambha et al found that the hazard ratio for Δ MELD was 1.10, i.e. only associated with a 10% increased wait list mortality above that predicted by the current MELD score. Whether MELD will be used to improve liver allocation in the USA is not clear at this time.

It is important to emphasize that MELD allocation in the U.S. is a “work in progress”. For example, the number of exception points granted for HCC has decreased dramatically since 2002. When patients with an exceptional MELD score for HCC were compared with those with the same calculated MELD score, those with HCC had a substantially greater transplantation rate and a lower wait list mortality than patients with the same calculated MELD score. This indicates that candidates with HCC were being overly compensated for their disease. At present, points are only granted for a T2 lesion, based on data from UCSF, showing that virtually nobody “falls off” the wait list in a one year period of time with T1 lesions [8], and the number of points that people receive with T2 lesions has decreased from 29 to 22. In addition, we have tried to standardize MELD exception scores for other diseases such as familial amyloidosis, hepatopulmonary syndrome and hereditary oxalosis [2]. We have also tried to address the marked increase in the number of combined liver-kidney transplants by holding two consensus conferences in the USA to come up with established criteria which might determine who actually should undergo combined liver-kidney transplantation [9]. Finally, it has been determined that patients with relatively low MELD scores and ascites may also be at risk of increased wait list mortality as compared with that predicted by the MELD score alone. In many cases, this can be corrected by including a factor for low serum sodium in the MELD equation.

One of the other things that MELD allocation has taught us is that not everyone with cirrhosis, benefits from transplantation. In fact, a seminal study published by Merion et al in the United States [10] demonstrated that patients with a MELD score of <15 are more likely to be better served by remaining on the wait list than undergoing liver transplantation. Thus, in the U.S. we have established the “Share 15” rule. This rule states that patients with a MELD score of <15 will not be offered livers until everyone in the region with a MELD score of greater than 15 has had a chance to accept the liver. The other thing this study has taught us is that transplant benefit, which is calculated to be the likely years of survival with transplantation minus the likely years of survival on the wait list, increases progressively with an increasing MELD score so that there appears to be no futile transplants purely based on MELD score and patients with the highest MELD score have the greatest transplant benefit.

As mentioned earlier, the “Final Rule” mandates that organ allocation be by transplant benefit. A potentially major change in MELD allocation that is currently being examined in the U.S. is to allocate organs by transplant benefit, not only taking into account pre-transplant mortality, but also taking into account post-transplant mortality and the impact of specific donor factors on outcome.

It truly must be emphasized that MELD is a work in progress. While it certainly has had an extremely positive effect on the state of transplantation in the United States, it is quite clear that it might not be the case for every country. The transplant rate in Romania is substantially different from that in the United States and it is conceivable that a different system of organ allocation may better serve patients in this country as compared to the United States. However, in the study by Gheorghe et al [5], the C-statistic for current MELD score was 0.85, while for Δ MELD it was 0.86 which are not clinically different and indicate an excellent correlation of both with wait list mortality. Therefore, I would recommend to try MELD allocation in Romania and I suspect that, in the end, it will be viewed as positively as we have in the USA.

References
2. Wiesner R, Lake JR, Freeman RB, Gish RG. Model for End-Stage Liver Disease (MELD) Exception Guidelines. Liver Transpl 2006;
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