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Donor-recipient matching: Myths and realities

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Summary

Liver transplant outcomes keep improving, with refinements of surgical technique, immunosuppression and post-transplant care. However, these excellent results and the limited number of organs available have led to an increasing number of potential recipients with end-stage liver disease worldwide. Deaths on waiting lists have led liver transplant teams maximize every organ offered and used in terms of pre and post-transplant benefit. Donor-recipient (D-R) matching could be defined as the technique to check D-R pairs adequately associated by the presence of the constituents of some patterns from donor and patient variables. D-R matching has been strongly analysed and policies in donor allocation have tried to maximize organ utilization whilst still protecting individual interests. However, D-R matching has been written through trial and error and the development of each new score has been followed by strong discrepancies and controversies. Current allocation systems are based on isolated or combined donor or recipient characteristics. This review intends to analyze current knowledge about D-R matching methods, focusing on three main categories: patient-based policies, donor-based policies and combined donor–recipient systems. All of them lay on three mainstays that support three different concepts of D-R matching: prioritarianism (favouring the worst-off), utilitarianism (maximising total benefit) and social benefit (cost-effectiveness). All of them, with their pros and cons, offer an exciting controversial topic to be discussed. All of them together define D-R matching today, turning into myth what we considered a reality in the past.

Keywords: Liver; Transplantation; Donor-recipient; Matching; Outcomes; Allocation.
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Abbreviations: D-R, donor-recipient; UNOS, United Network of Organ Sharing; MELD, Model for End Stage Liver Disease; SBE, Symptom-based exceptions; INR, International Normalized Ratio; LT, Liver transplantation; ECD, Extended criteria donors; SB, Survival benefit; CIT, Cold ischemia time; DRI, Donor risk index; DCD, Donation after cardiac death; SRTR, Scientific Registry of Transplant Recipients; PGF, Primary graft failure; SOLD, Score Of Liver Donor; SOFT, Survival Outcomes Following Liver Transplant; ROC, Receiver operating curves; BAR, Balance of risk score; HCC, Hepatocellular carcinoma; HCV, Hepatitis C virus.

Introduction

Liver allocation policies have been staged by precise strategies to turn arbitrary criteria into well-established and objective models of prioritization. The fast onset of this turnover has led to the coexistence of different models and metrics, with their pros and cons, with their goodness and boundaries, with their dogmas and fashions; in short, with their myths and realities.

Liver transplant (LT) outcomes have improved over the past two decades. Unfortunately, with an increasing number of individuals with end-stage liver disease and a limited number of organs to afford this demand, this growing discrepancy has addressed the dismal scenario of waitlist deaths [1]. Moreover, the use of less stringent selection criteria to expand the donor pool has evidenced the importance of recipient and donor factors on transplant outcomes [2].

Donor-recipient (D-R) matching has been strongly analysed and policies in donor allocation have tried to maximize organ utilization whilst still protecting individual patient interests. However, D-R matching has been written through trial and error, with early baseline weak rules [3] which have changed continuously. Several analyses and over-analyses of databases have yielded non-uniform donor and/or recipient selection criteria to make an appropriate D-R matching. In the late 1990s, traditional regression models, estimating the average association of one factor with another, were used [4]. Consequently, an independent association could be demonstrated, whilst adjusting for other confounding factors. However, this was a simplistic approach when lots of donor and recipient variables were considered [5–7]. Subsequent complexity with stratified models was more realistic, and very useful scores have been depicted with this approach [8]. However, the increasing expectancy with the development of each new score has been followed by strong discrepancies and controversies [9,10].

Match is defined as "a pair suitably associated" [11]. D-R matching could be defined as "the technique to check D-R

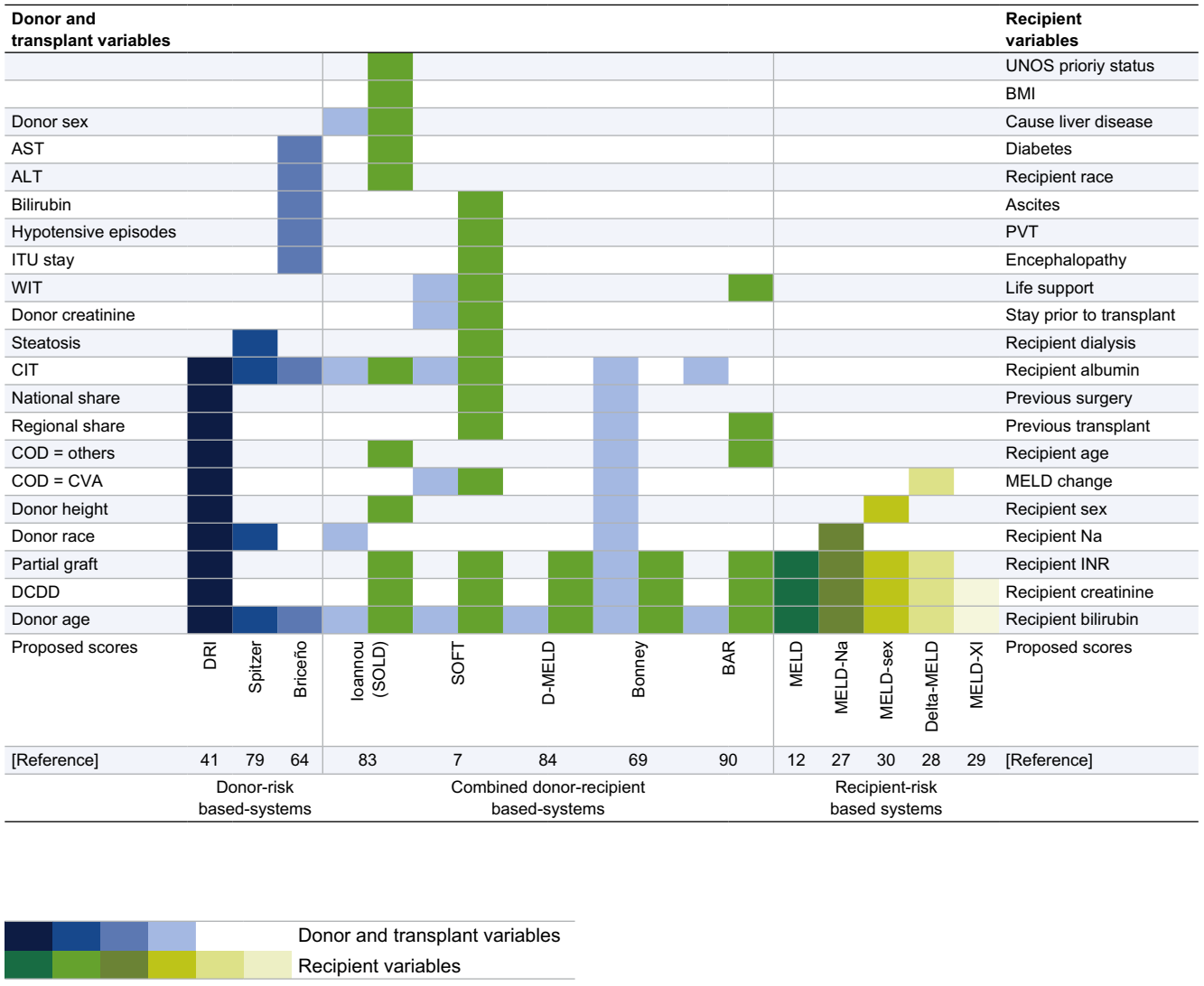

Fig. 1. Current composite formulations of donor-risk-based systems (left), patient-risk-based systems (right) and combined donor-recipient-based systems (middle) for donor-recipient matching available in literature. COD (cause of death), CVA (cardiovascular accident), DCDD (donation after circulatory determination of death) and PVT (portal vein thrombosis).

pairs adequately associated by the presence of the constituents of some patterns from donor and patient variables". This definition, however, lacks of purpose. Possible purposes can be graft survival, patient survival, waitlist survival, benefit survival and evidence-based survival; furthermore, all of them can be tabulated in terms of transparency, individual and/or social justice, population utility and overall equity [10]. D-R matching combines a donor acceptance policy and an allocation policy to get advantages (i.e., survival) over a random, experimental or subjective interpretation in terms of better precision. In some circumstances, D-R matching means a higher exactness. Current allocation systems are based on isolated or combined donor or recipient characteristics (Fig. 1). We will focus this review considering patient characteristics-based systems, donor risks-based systems, and combined D-R-based systems (Table 1).

Patient-based policies

Urgency principle: MELD/MELD-like

In the early years of LT, allocation was a clinician-guided decision. Time on waiting list became the major determinant to receive a graft, but this allocation system engendered an unacceptable number of inequities for many candidate subsets and profound regional and centre differences. In this context, a score named MELD [12], the acronym of the Model for End Stage Liver Disease, became a metric by which the severity of liver disease could be accurately described. Moreover, listed candidates could be ranked by the risk of waiting list mortality independently of time on it (medical urgency) [5]. UNOS made several changes to the calculation of MELD score [13]. These adjustments finished in a continuous score, representing the lowest and the highest