Reply to: "The UK DCD Risk Score: Still no consensus on futility in DCD liver transplantation"

To the Editor:

We read with great interest the letter by Hessheimer *et al.*,[1] where the authors discuss the allocation of donation after circulatory death (DCD) livers and comment on variations and terminology of risk factors in context with the recently published UK DCD Risk Score. This new prediction model was developed from the DCD cohort in the UK, and classifies DCD liver transplantation according to the overall donor and recipient risk. For example, livers from younger donors with a short functional donor warm ischemia (fDWIT) engrafted into low-risk recipients with a few points in the model of end-stage liver disease (MELD) system achieve excellent graft survival rates, given the cold ischemia time (CIT) is short (overall low-risk group). In contrast, DCD livers from elderly donors with higher donor body mass index (BMI) and a prolonged fDWIT, carry a higher risk when additionally exposed to longer CIT and combined with sicker and older recipients. Such combinations are allocated to the high-risk or futile group, with an impaired 5-year graft survival of 60% and 20%, respectively.[2]

In their letter, Hessheimer *et al.* criticize the balance concept of the UK DCD Risk Score, which appears however clinically very useful, as it considers donor, graft and recipient factors for outcome prediction. Importantly, such cumulative assessment of risk factors has been recently applied in different prediction models, including the survival outcomes following liver transplantation (SOFT)-score and the balance of risk (BAR)-score, which were statistically superior compared to models, where exclusively donor or recipient factors were included.[3–5] Furthermore, most available prediction models in the field of DCD liver transplantation imply multiple donor and recipient parameters, though the statistical method of development differs significantly.[2]

Next, the authors discuss the parameter retransplantation and claim that this more challenging liver transplant procedure does not classify as futile in general. We agree and would like to highlight that liver candidates who receive a retransplantation are not classified as futile *per se*, by the UK DCD Risk Score.[2] Importantly, donor-recipient combinations may remain high risk (9 points) with acceptable outcomes, instead of futile (>10 points), given all other risk parameters are low, including donor age of ≤60 years, donor BMI of ≤25 kg/m^2, fDWIT of ≤20 minutes, CIT of ≤6 hours, recipient age of ≤60 years and lab MELD ≤25 points.[2] Such features are the advantage of the balance concept, to pair livers of better quality with higher risk recipients. In this context, the previously reported excellent outcomes with the utilization of DCD livers with the above-mentioned overall low-risk donor- and recipient combinations are well expected.[6]

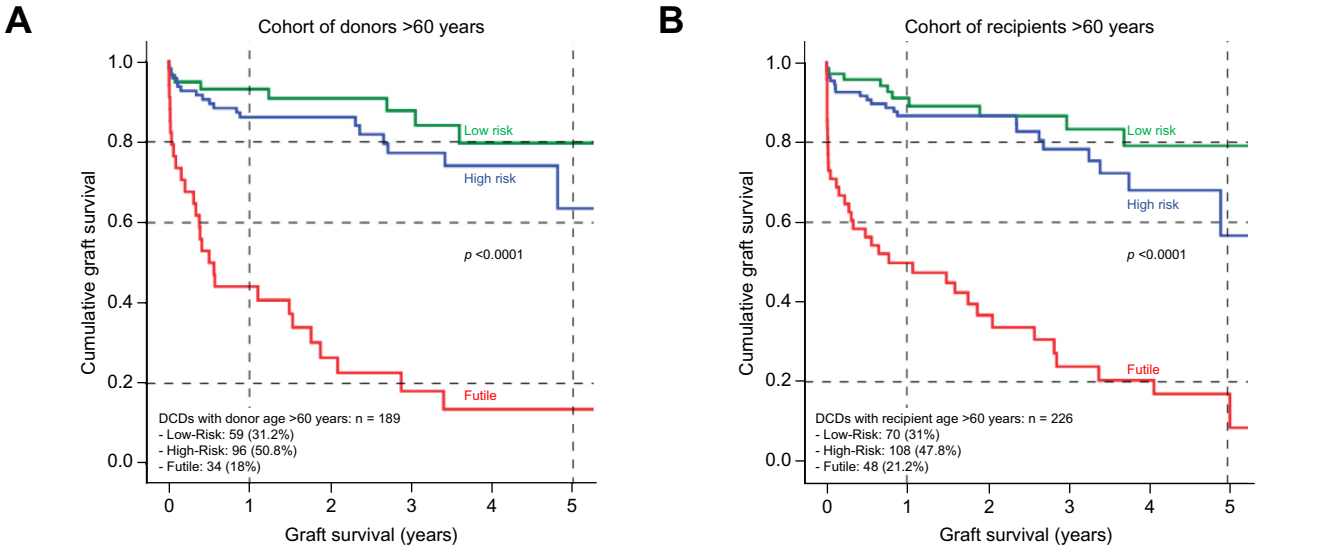
In addition, the authors discuss that the distribution of 3 score points for recipient age of >60 years appears less relevant compared to, for example, donor age (2 points for donor age >60 years), which was frequently assessed for the impact on the development of biliary and overall complications.[7] Recipient age is however a well-known risk factor in liver transplantation and more specifically has been demonstrated to impact significantly on outcomes after utilization of DCD organs.[7,8] Importantly, elderly recipients are at particular risk of not coping with the reperfusion hit following transplantation of higher risk DCD livers, which may lead to severe complications and inferior long-term outcomes.[7]

In this context, the balance concept appears of importance, as elderly recipients can receive better DCD grafts because both donor and recipient age alone were not shown to impact significantly on outcomes, when all other risk parameters are kept low.[9]

Next, the authors criticize the relatively young median donor age in the development and validation cohort of the score model. Overall, the impact of donor age on outcomes after DCD liver transplantation is currently under debate, with recent series failing to stratify patient and graft survival at a threshold of 50 or 60 years, while older reports previously suggested to decline DCD livers from elderly donors of >60 years, which has therefore remained standard practice in several centres to date.[7,9,10] In contrast, consensus exists regarding the increasing risk for the development of ischemic cholangiopathy and subsequent limited graft survival when advanced donor age is combined with prolonged warm ischemia time. Several centres traditionally discard elderly DCD livers, especially in the presence of other risk factors, including elevated donor BMI as surrogate marker for steatosis, donor diabetes or atherosclerosis or high recipient MELD score.[7] Hessheimer *et al.* apply the UK DCD Risk Score in the controlled DCD cohort from Spain and found the model less predictive compared to results from other large cohorts in the UK and USA. The authors should be congratulated on the achievement of a short donor warm ischemia time with an overall low donor and recipient risk in DCD liver transplantation in Spain. Only 7 livers (7/212 = 3.3%) were classified as futile and the authors claim the slightly higher donor age in their cohort as the main factor for the different performance of the score.[1]

To further explore the impact of our prediction model, we have calculated the graft survival in 2 DCD sub-cohorts, first recipients above the age of 60 years and secondly in the subgroup of donors above 60 years of age (Fig. 1). Interestingly, the UK DCD Risk model remained equally predictive for graft survival in both subgroups. The main risk factors, including donor warm ischemia time and cold storage, were distributed similarly in such populations, cumulating to a median UK DCD Risk Score of 7 and 8 points, both allocated to the high-risk group. Respecting the score threshold, all risk combinations achieved a good outcome with a median score of less than 10 points and a subsequent 5-year graft survival above 70% (Fig. 1).

In summary, we would like to congratulate the team from Spain for their application of the UK DCD Risk Score and encourage other centres to calculate the model in their own population. Our group is currently preparing a large multicentre



DCD population	Donor age (years)	Donor BMI (kg/m²)	Total warm ischemia time (minutes)	Functional warm ischemia time (minutes)	Asystolic warm ischemia time (minutes)	Cold storage time (hours)	Recipient age (years)	UK DCD Risk Score (points)
Donors >60 yr (n = 189)	65 (62-70)	26 (23-28)	27 (22-32)	16 (13-20)	12 (10-14)	7.1 (6.1-8.1)	57 (50-63)	7 (5-10)
Recipients >60 yr (n = 226)	51 (37-61)	25 (23-28)	28 (23-32)	17 (14-20)	13 (11-15)	7.2 (6.2-8.3)	64 (62-66)	8 (6-10)
Entire DCD cohort (n = 689)[2]	51 (37-61)	25 (23-28)	27 (22-31)	17 (14-20)	13 (11-15)	7.3 (6.4-8.2)	56 (49-62)	5 (4-8)

Fig. 1. Performance of the UK DCD Risk Score in older donors and recipient age >60 years of age. The predictive value of the UK DCD Risk Score was assessed in 2 interesting subpopulations, currently attracting attention. First elderly donors (>60 years) and secondly transplantation of DCD liver into older recipients (>60 years of age). Interestingly, the model performed equally well in both sub-cohorts, when compared to the overall DCD cohort and a cumulative donor-recipient risk with more than 10 points (futile group) achieved very limited 5-year graft survival of less than 20%. DCD, donation after circulatory death. Statistical analysis was performed using the SPSS statistical software package (SPSS, V20, IBM, NY). Continuous variables in the table were summarized as median and interquartile range and graft-failure free survival surves were computed using Kaplan-Meier stimates. (This figure appears in colour on the web.)

cohort analysis to link different levels of donor-recipient risk with outcomes in DCD liver transplantation.

Conflict of interest

The authors declare no conflicts of interest that pertain to this manuscript.

Please refer to the accompanying ICMJE disclosure forms for further details.

Authors' contributions

AS and PM wrote the manuscript.

Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jhep.2019.01.029.

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Author names in bold designate shared co-first authorship

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Letters to the Editor

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