

Large Liver Could Be at Risk for Liver Graft Failure During Normothermic Machine Perfusion

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Purpose

A liver that is too large for the recipient can result in large-for-size syndrome (LFSS) during liver transplantation (LT). This study investigates whether large livers (liver weight (LW) >2.6 kg) are at increased risk of graft failure during normothermic machine perfusion (NMP).

Methods

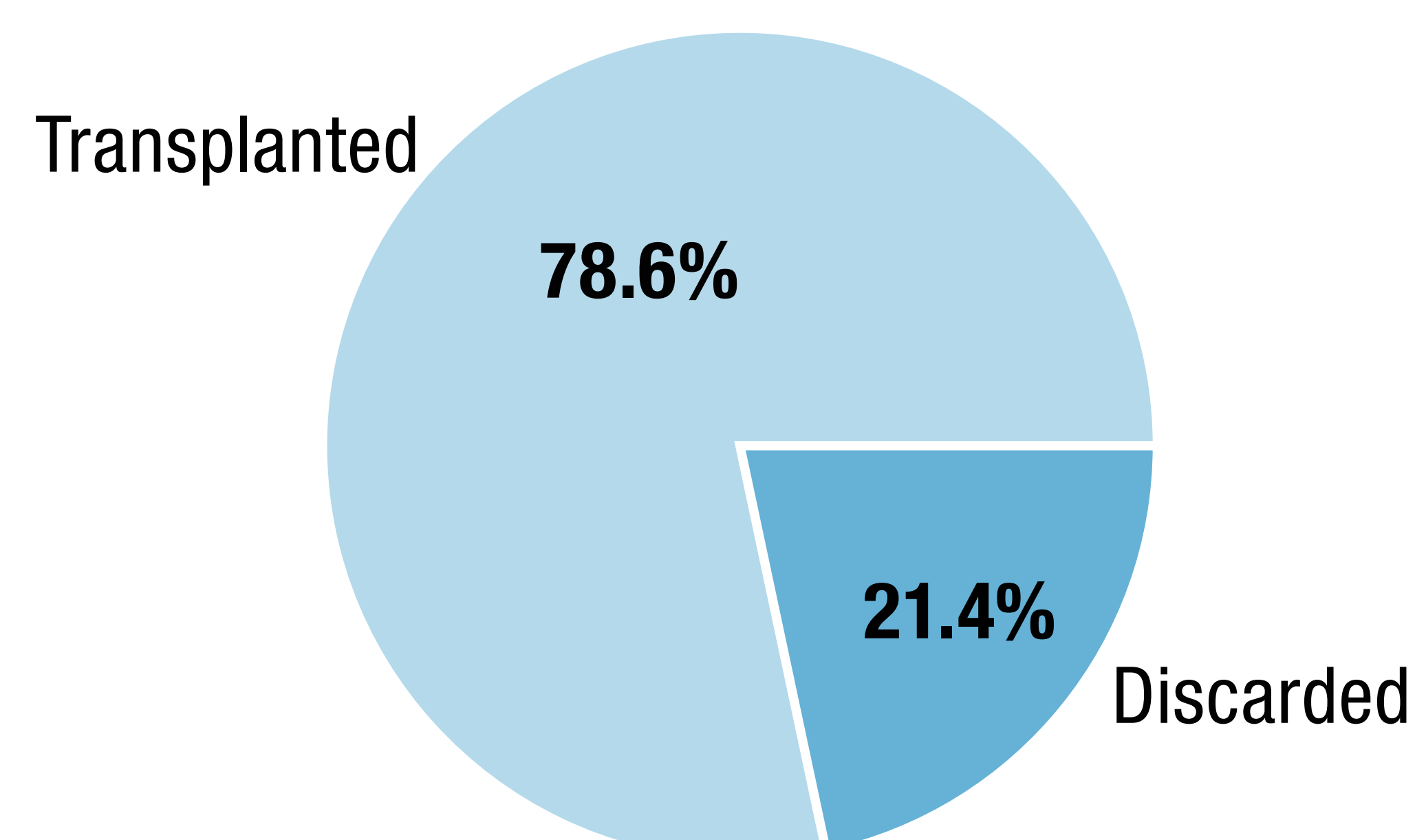
A total of 112 donor livers, characterized by high body mass index (BMI), donation after circulatory death (DCD), and/or macrovascular fatty infiltrate (MVFI), were assessed on the OrganOx metra® system to evaluate their transplant suitability.



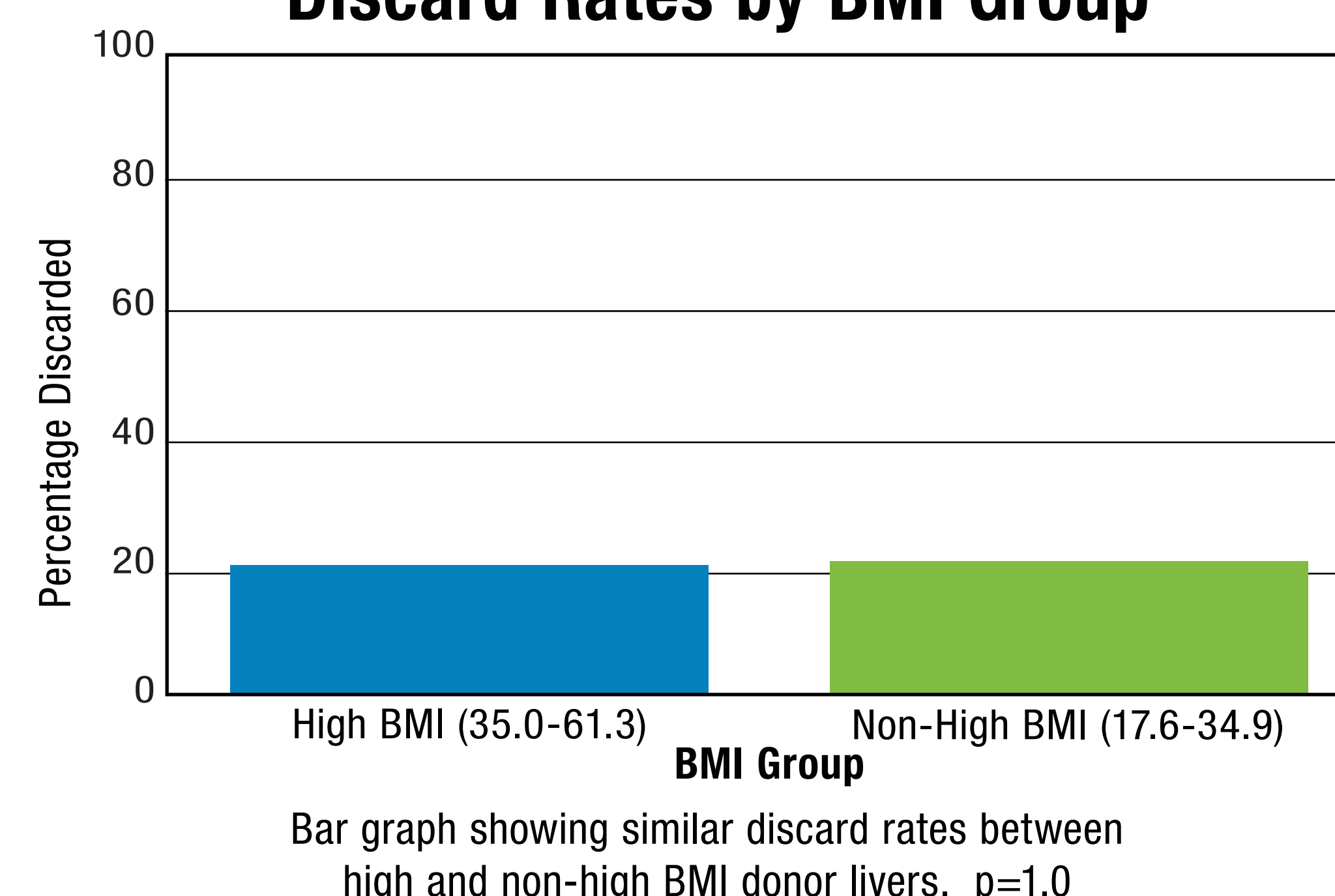
Results

After 4-16 hours of NMP, 88 grafts (78.6%) with acceptable perfusion parameters (e.g., effective lactate clearance and bile production) were successfully transplanted. However, 24 grafts (21.4%) were discarded due to unacceptable parameters, including inadequate lactate clearance and/or lack of bile production. Of the 21 brain-death (BD) donor livers, 2 (9.5%) failed NMP, compared to 22 of 91 (24.2%) DCD livers. Similarly, 6 of 28 (21.4%) high BMI (35.0-61.3 kg/m²) donor livers and 18 of 84 (21.4%) non-high BMI (17.6-34.9 kg/m²) donor livers were discarded. Neither DCD status nor high BMI significantly increased the risk of NMP failure if MVFI was <30% and functional warm ischemia time (fWIT, defined as the interval from systolic pressure <80 mmHg to cold preservation) was <30 minutes ($p = 0.14$ and $p = 1.0$). In contrast, 5 of 7 (71.4%) large livers (age 15-56 years; 1 BD/6 DCD donors; BMI 30.8-58.3 kg/m²; LW 2.65-3.40 kg; MVFI 0-30%) failed NMP, compared to 19 of 105 (18.1%) non-large livers ($p < 0.05$). Large livers initially showed acceptable perfusion (e.g., decreasing lactate levels and bile production) but subsequently exhibited lactate accumulation and ceased bile production within 2-4 hours, even with hepatic artery inflow rates of 0.4-0.6 L/min and portal inflow rates of 0.9-1.5 L/min. These findings suggest that large liver size is a significant risk factor for graft failure during NMP. The increased blood demand of large livers may result in insufficient inflow, potentially contributing to LFSS during LT and NMP failure, especially in cases where LW ≥ 3.0 kg.

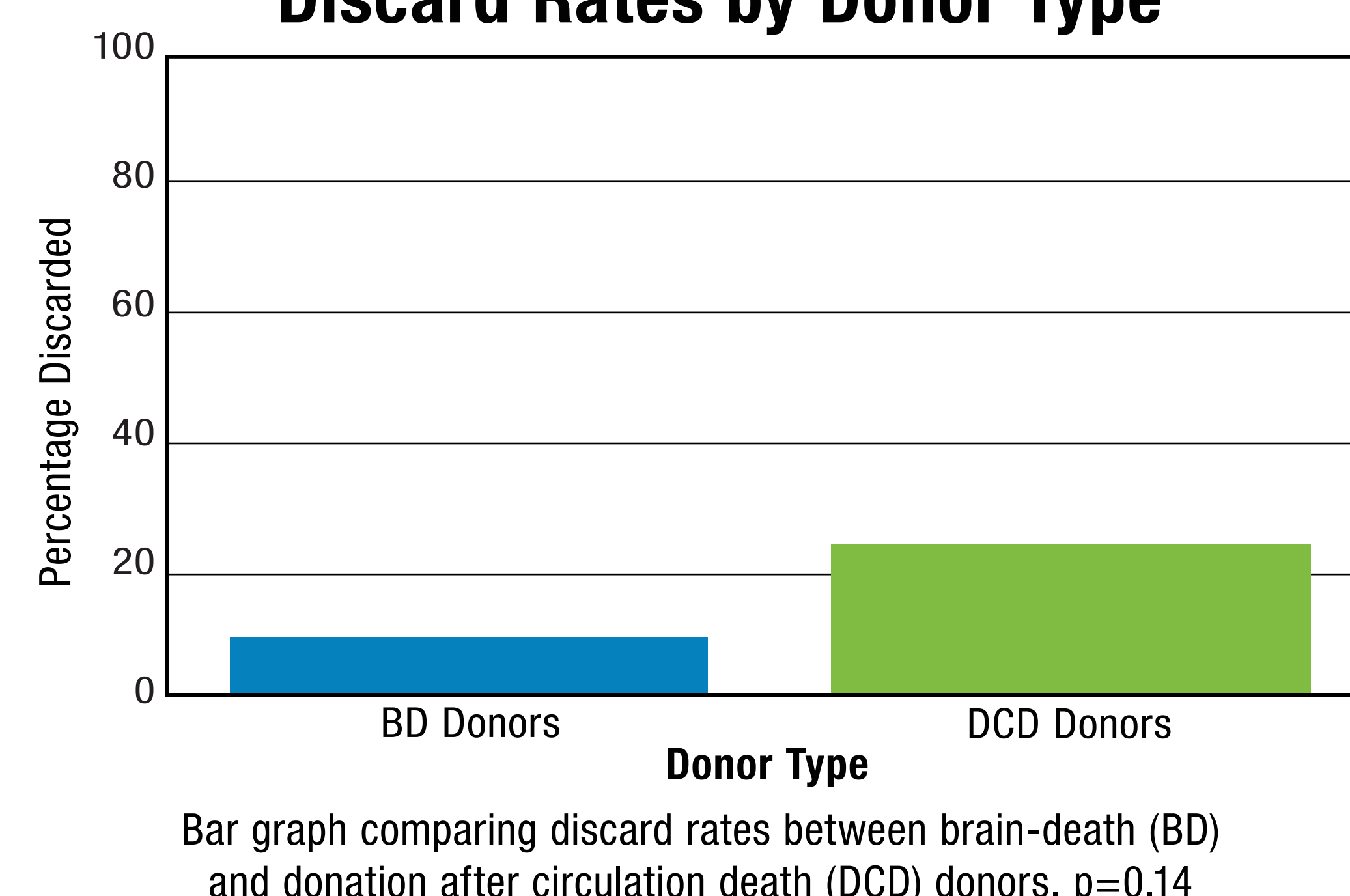
Overall NMP Outcomes



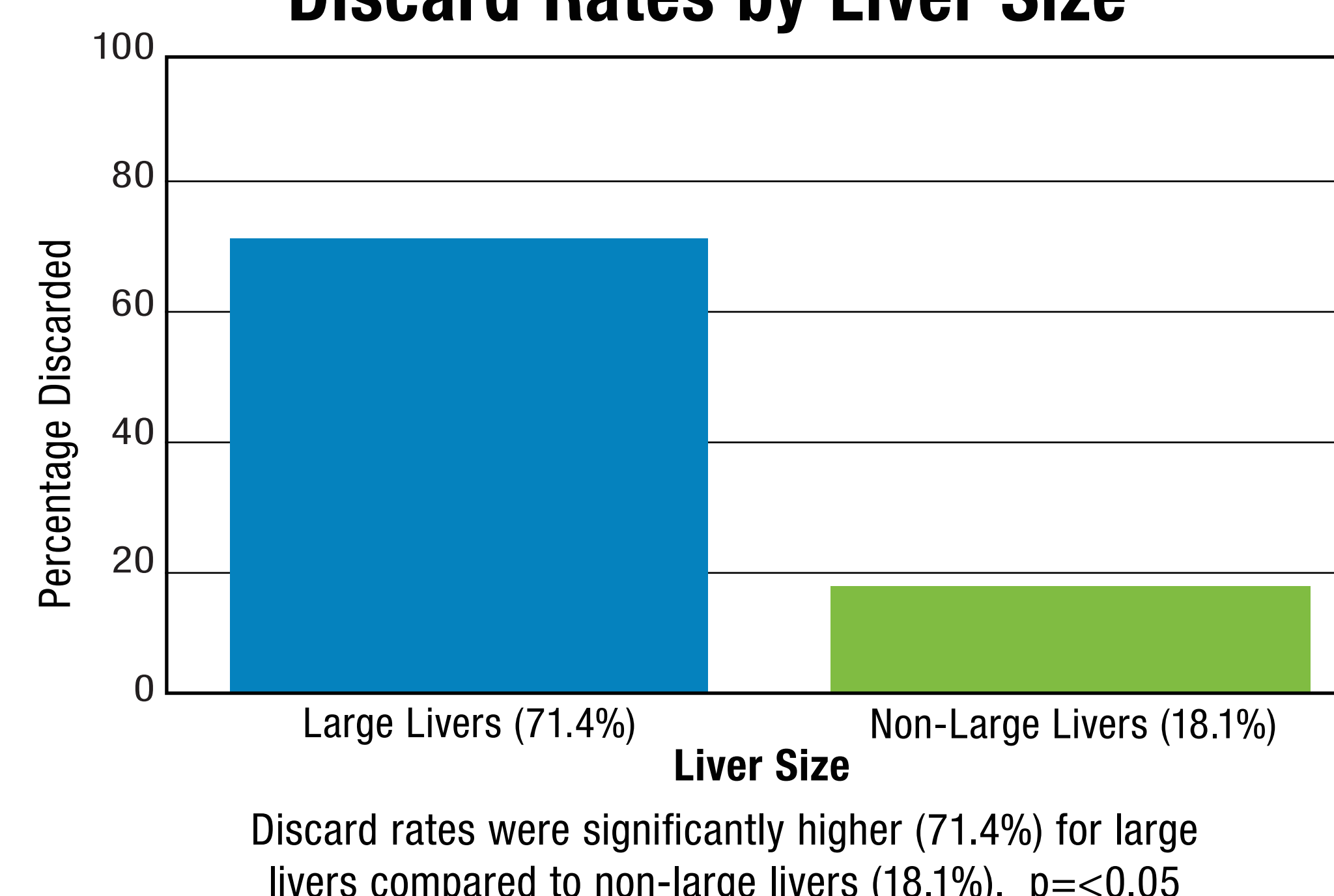
Discard Rates by BMI Group



Discard Rates by Donor Type



Discard Rates by Liver Size



Conclusions

Large livers (≥ 2.6 kg) pose a heightened risk of graft failure during NMP, likely due to inadequate perfusion and blood flow requirements. Further studies are warranted to optimize perfusion strategies for large liver grafts.