Type	Canadian Transplant Registry
Program	Inter-provincial sharing: Liver
Policy Title	Liver Allocation: Matching and Ranking

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Policy Sponsor	Liver Transplant Advisory Committee (LTAC)
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Provincial/Territorial Sign-Off	2021-06-09
Effective Date	TBD

Purpose

The Canadian Transplant Registry (CTR) identifies transplant opportunities across Canada, for liver transplant candidates who are designated as medically urgent. This policy outlines the rules used to identify and rank patients who are eligible for interprovincial liver sharing.

Policy

1. Identifying Potential Recipient Matches

There are three steps that the matching algorithm performs to generate the list of potential recipients (i.e., matches) for a liver from a deceased donor who has been registered in the CTR:

1) Blood Group (ABO) Compatibility
2) Recipient and Transplant Program specific filters:

Filter Attribute
Accept a donor to specified maximum age (<45, <55, <65, no restriction)
Accept a donor above a specified minimum age (>10, >11, >12, >13, >14, >15, >16, >17, >18, no restriction)
Accept a donor who has tested positive for Hepatitis B core antibody
Accept a donor who has tested positive for Hepatitis C
Accept a DCD (donation after cardio-circulatory death) donor

HLA Virtual Crossmatching will be included as an optional capability of the CTR for liver patients. If HLA antibodies are entered for a waitlisted individual, especially a multi-visceral patient, those antibodies will be used to produce a predicted positive or negative virtual crossmatch, but it will not exclude this patient from the matching. This information would be supplied as supplementary information for consideration by the reviewing program.

1.1 Blood Group Compatibility

1.1.1 Potential recipients are first identified by an assessment of blood group compatibility, which is determined according to the following table.

Blood Group (ABO) Compatibility	
If donor blood group is:	then recipient blood group can be:
O, A2	O, A, B, AB
A	A, AB
B, A2B	B, AB
AB	AB

Table 1. Blood Group (ABO) Compatibility

1.1.2 Transplant programs can designate potential recipients as eligible for ABO incompatible transplants, regardless of age.

1.1.3 Potential recipients designated as eligible for ABO incompatible transplants will be included in the list of matched potential recipients by the matching algorithm.

1.2 MELD-Na

1.2.1 The formula for calculation of the MELD-Na (SRTR) [7] = MELD + 1.32 * (137 – sodium mmol/L) – [0.033 *MELD * (137 – sodium mmol/L)]

- If sodium is less than 125 mmol/L then sodium level will be 125 mmol/L
- If sodium is greater than 137 mmol/L then sodium level will be 137 mmol/L
- Where MELD = (0.957 x ln(creatinine mg/dL) + 0.378 x ln(bilirubin mg/dL) + 1.120 x ln(INR) + 0.6431) * 10
- Laboratory values less than 1.0 are set to 1.0 for the calculation of the MELD score
- The maximum MELD score is 40. The MELD score derived from this calculation will be rounded to the tenth decimal place and then multiplied by 10.
- If "had dialysis twice, or 24 hours of CVVHD, within a week prior to the serum creatinine test?" = YES then creatinine level will be 4.0 mg/dL
- If serum creatinine is greater than 4.0 mg/dL then serum creatinine level will be 4.0 mg/dL

- Creatinine levels in μmol/L will be converted to mg/dL by dividing them by 88.4
- Bilirubin levels in μmol/L will be converted to mg/dL by dividing them by 17.1
- Lab Test Frequency Guideline – in accordance with the Liver Leading Practice Forum (May 2016), the following are recommended testing frequencies for ensuring their MELD-Na values are up-to-date and valid:
  - MELD-Na score ≥ 30; Lab tests need to be collected and entered at least every 7 days
  - MELD-Na score 29-21; Lab tests need to be collected and entered at least every 30 days
  - MELD-Na score ≤ 20; Lab tests need to be collected and entered at least every 90 days
  - For the sake of this policy almost all 3Fs and 4Fs will have MELD of 30 or greater
  - For 3LS patients, testing frequency will be as per home TPN program protocols

1.3 Canadian Pediatric Allocation for Liver System (CPALS)

1.3.1   A CPALS score shall be used for all paediatric patients, which is defined as any child less than 18 years of age.

1.3.2   The methodology used for calculating the CPALS score for pediatric patients is as follows:

Patient Group	Score
Life-threatening complications of liver disease with imminent risk of death - Mechanical ventilator - Severe GI bleeding requiring at least 30cc/kg of replacement within the previous 24 hours - GCS <10 - Renal failure and need for dialysis	40 points

Liver disease with conditions associated with high risk of death within weeks to months
 	
- Liver malignancies
- Hepato-pulmonary syndrome
  - PaO2<60
  - Confirmed shunt
  - No primary pulmonary cause
Porto-pulmonary hypertension
	30 points to 39 points if not transplanted within 1 month

End-Stage Liver Disease	24 points* + additional 3 points every 3 months to a maximum of 39 points (*Note: use calculated CPALS /PELD/ Na-MELD if score greater than exception points)

Inborn Errors of Metabolism Associated with Rapid Deterioration of Metabolic Stability - Urea cycle defects with rapidly progressive disease	40 points
Inborn Errors of Metabolism with more Stable, Chronically Managed Metabolic Status - Urea cycle defects • Amino-acidopathies with high ammonia - Organic acidemias - Crigler-Najjar type 1 - Primary oxaluria	29 points + additional 2 points every 2 months to a maximum of 39 points

2. Ranking of Matched Potential Recipients

2.1 If more than one potential recipient is a match for a donor liver, matches are prioritized by the Canadian Transplant Registry based on the following ranking criteria.

Interprovincial Ranking Attribute	Rank
Pediatric Patient (<18 years of age) with Medical urgency (Status = 4F)	1
Adult Patient with Medical urgency (Status = 4F)	2
Pediatric Patient (<18 years of age) with Medical urgency (Status = 3F or 3LS) • Patients with a status of 3F will be prioritized over patients in 3LS status unless the calculated PELD or Na-MELD (for children 12-18y old) score is >35 for the 3LS patients. In these cases a mandatory discussion between centers with 3F and 3LS patient will be required.	3
Adult Patient with Medical urgency (Status = 3F) • Patients with a status of 3F will be prioritized over patients in 3LS status unless their calculated MELD-Na is >35. In these cases, a mandatory discussion between centers with 3F and 3LS patient will be required.	4
Pediatric Patient at or below 6kg in weight (Status = 3P)	5
Number of Days Listed at Current Medical Status, including hold time	6

The donor and potential recipient are in the same service region
• Adults (5 service regions):
   ○ Atlantic Canada (Nova Scotia, New Brunswick, Newfoundland & Labrador, Prince Edward Island)
   ○ Quebec
   ○ Manitoba and Ontario
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o   Saskatchewan, Alberta
     o   British Columbia
  •   Pediatric (3 service regions)
     o   Toronto - Ontario/Atlantic Canada/Manitoba
     o   Quebec
     o Edmonton - Alberta/Saskatchewan/BC, Yukon, Nunavut, NWT	

Table 2. Interprovincial Ranking Attributes

Below Interprovincial Ranking Attributes	**Rank**
The CTR National Waitlist will continue to list all liver patients of all medical urgency levels. For patients below the interprovincial eligibility (i.e. 4F / 3F / 3LS / 3P), actively listed patients will be sorted based on their MELD-Na or CPALS score, their ABO, and finally their time on list.	

  2.1.1   All potential recipients (i.e., patients wait-listed for liver transplant either designated as Medically Urgent (Status = 4F or 3F) are reviewed annually at a meeting of representatives from a majority of transplant centres (i.e., Canadian Liver Transplant Network meetings).

  2.2   Candidate wait time is from date of first listing in CTR and includes any time on hold.

3. Review

This policy is reviewed at the discretion of the Liver Transplant Advisory Committee (LTAC), Donation and Transplantation Administrators Advisory Committee (DTAAC), and the Organ Donation and Transplantation Expert Advisory Committee (ODTEAC).

References
None

Version History		
Version	**Date**	**Comments /Changes**
v1.0	<Date>	Original version