OPTN

Public Comment Proposal

Updating National Liver Review Board Guidance and Policy Clarification

OPTN Liver and Intestinal Organ Transplantation Committee

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Updating National Liver Review Board Guidance and Policy Clarification

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Sponsoring Committee:	*Liver and Intestinal Organ Transplantation*
Public Comment Period:	*January 21, 2021 – March 23, 2021*

Executive Summary

The purpose of the National Liver Review Board (NLRB), which was implemented on May 14, 2019, is to provide equitable access to transplant for liver candidates whose calculated model for end-stage liver disease (MELD) score or pediatric end-stage liver disease (PELD) score does not accurately reflect the candidate's medical urgency.[1] Since implementation, the OPTN Liver and Intestinal Organ Transplantation Committee (the Committee) has regularly evaluated the NLRB to identify opportunities for improvement. This proposal is the latest in a series of enhancements made to the NLRB after implementation.

This proposal seeks to make improvements to the NLRB policy and guidance documents. Specifically, the proposal adds one diagnostic criterion to the requirements for a candidate to be eligible for a standardized exception for cholangiocarcinoma (CCA) in OPTN policy. It also updates the guidance for pediatric exceptions, the guidance for candidates with neuroendocrine tumors (NET), and the guidance for candidates with primary sclerosing cholangitis (PSC) or secondary sclerosing cholangitis (SSC). The updates to NLRB guidance will ensure that all candidates are appropriately reviewed for MELD or PELD exceptions.

The Committee is seeking public comment feedback on the proposed changes listed above.

The Committee submits the following proposal for Board consideration under the authority of the OPTN Final Rule, which states "The OPTN Board of Directors shall be responsible for developing…policies for the equitable allocation for cadaveric organs."[2]

[1] *Proposal to Establish a National Liver Review Board*, OPTN Liver and Intestinal Organ Transplantation Committee, June 2017, Available at https://optn.transplant.hrsa.gov/

[2] 42 CFR §121.4(a)

Background

When being listed for a liver transplant, candidates receive a calculated MELD or PELD score, which is based on a combination of the candidate's clinical lab values.[3] These scores are designed to reflect the probability of death on the waitlist within a 3-month period, with higher scores indicating a higher probability of mortality and increased urgency for transplant. Candidates who are less than 12 years old receive a PELD score, while candidates who are at least 12 years old receive a MELD score. Candidates that are particularly urgent are assigned status 1A or 1B.

When a transplant program believes that a candidate's calculated MELD or PELD score does not accurately reflect a candidate's medical urgency, they may request a score exception. The NLRB is responsible for reviewing exception requests and either approving or denying the requested score.

The NLRB was approved by the OPTN Board of Directors (the Board) at their June 2017 meeting and was implemented on May 14, 2019.[4] The NLRB was designed to create an efficient and equitable system for reviewing exception requests for candidates across the country.

The Committee is committed to continuously improving the NLRB to ensure the system functions efficiently and policy and guidance remain relevant and accurate. The OPTN Board of Directors (the Board) has previously approved a number of enhancements to the NLRB and the changes included in this proposal continue the effort of the Committee to improve the NLRB.[5,6]

Purpose

The purpose of this proposal is to build upon previous enhancements and continue to improve the NLRB by incorporating feedback from the transplant community. The proposed changes are anticipated to create a more efficient and equitable system for the review of exception requests.

The enhancements included in this proposal involve changes to OPTN policy language and the NLRB guidance documents. The guidance documents are intended to provide guidance to review board members and transplant programs to help ensure consistent and equitable review of exception cases. The guidance documents are not OPTN policy and serve as a resource for reviewers and transplant programs. Each of the three specialty review boards (Pediatric, Adult Other Diagnosis, and Adult Hepatocellular Carcinoma (HCC) has a specific guidance document. The Committee is proposing changes to the guidance documents for the Pediatric specialty review board and the Adult Other Diagnosis specialty review board.

[3] The calculation for the MELD and PELD scores can be found in OPTN Policy, Available at https://optn.transplant.hrsa.gov/.
[4] *Proposal to Establish a National Liver Review Board*, OPTN Liver and Intestinal Organ Transplantation Committee, June 2017, Available at https://optn.transplant.hrsa.gov/
[5] *Enhancements to the National Liver Review Board*, OPTN Liver and Intestinal Organ Transplantation Committee, June 2020, Available at https://optn.transplant.hrsa.gov/
[6] *Further Enhancements to the National Liver Review Board*, OPTN Liver and Intestinal Organ Transplantation Committee, December 2020, Available at https://optn.transplant.hrsa.gov/

The Committee submits the following proposal for Board consideration under the authority of the OPTN Final Rule, which states "The OPTN Board of Directors shall be responsible for developing…policies for the equitable allocation for cadaveric organs."[7]

Overview of Proposal

OPTN Policy: Hilar CCA Standardized Exception Criteria

The Committee is proposing one minor addition to OPTN policy as part of this proposal. Under the NLRB, candidates who meet the criteria outlined in OPTN policy for one of the nine standardized diagnoses are eligible to have their initial exception request or extension requests automatically approved. One such diagnosis is hilar CCA.

In addition to meeting a number of other criteria, candidates are automatically approved for a CCA exception if the transplant program documents that the candidate meets the diagnostic criteria for hilar CCA with a malignant appearing stricture on cholangiopathy and at least one of the following:

1. Biopsy or cytology results demonstrating malignancy
2. Carbohydrate antigen 19-9 greater than 100 U/ml in absence of cholangitis
3. Aneuploidy

In addition, the tumor must be considered un-resectable because of technical considerations or underlying liver disease.

This policy was approved by the Board in June 2009 and was implemented in November 2011.[8] However, the Committee recently identified that the presence of an associated hilar mass less than or equal to three centimeters (cm) as a diagnostic criteria for CCA was absent from current policy, causing candidates meeting this diagnostic criteria to be reviewed by the NLRB instead of automatically approved. A liver transplant candidate can also meet the diagnostic criteria for hilar CCA with a malignant appearing stricture and the presence of an associated hilar mass that is less than or equal to three cm in radial diameter.[9] The Committee is proposing the addition of this to the list of diagnostic criteria included above. This addition ensures that all candidates meeting the diagnostic criteria for hilar CCA are eligible to receive a standardized exception, as long as the candidates meets the remaining criteria in policy. The proposed addition will allow more candidates to meet standardized criteria and reduce the number of exception cases reviewed by the Adult Other Diagnosis specialty board.

The Committee is seeking public comment on the proposed addition to the diagnostic criteria for hilar CCA.

[7] 42 CFR §121.4(a)

[8] *OPTN/UNOS Liver and Intestinal Organ Transplantation Committee Report to the Board of Directors*, OPTN Liver and Intestinal Organ Transplantation Committee, June 2009

[9] Sarwa Darwish Murad et al., "Efficacy of Neoadjuvant Chemoradiation, Followed by Liver Transplantation, for Perihilar Cholangiocarcinoma at 12 US Centers," *Gastroenterology* 143, no. 1 (July 2012): 88-98.e3, https://doi.org/10.1053/j.gastro.2012.04.008.

Guidance Documents

The proposal includes updates to the guidance documents for the Pediatric specialty review board and the Adult Other Diagnosis specialty review board.

Pediatric Guidance

The proposal includes updates to a number of areas of guidance for the Pediatric Specialty Board including:

- Growth failure or nutritional insufficiency
- Complications of portal hypertension, including ascites and gastrointestinal bleeding
- Metabolic liver disease
- Conclusion

These changes are based on a survey conducted by the Society of Pediatric Liver Transplantation (SPLIT) in 2019 and were developed in conjunction with the OPTN Pediatric Transplantation Committee.

Growth Failure and Nutritional Insufficiency

Growth failure is included in the current PELD calculation, which provides additional PELD points for candidates that are more than two standard deviations below the candidate's expected growth based on age and gender using the most recent Center for Disease Control and Prevention's (CDC) National Center for Health Statistics pediatric clinical growth chart. Despite the inclusion of growth failure in the PELD calculation, growth failure remains the most common reason for PELD exceptions.[10] In addition, recent research has shown that the manner in which growth failure is incorporated into the current PELD calculation may not adequately provide additional PELD points to all candidates with growth failure. Some candidates fall into a "growth failure gap," in which their current weight or height is more than two standard deviations below expected for their current age, but they are above the PELD threshold for additional points.[11] An effort is underway to revise the PELD score, but in the meantime, growth failure remains inadequately captured by the current PELD calculation in some cases.[12]

Growth failure has been repeatedly noted as a risk factor for poor outcomes in liver transplant candidates, both before and after transplant.[13] However, current guidance on growth failure states that there is insufficient evidence to support approval for exception points for candidates with growth failure or nutritional insufficiency. The Committee is proposing updates to the guidance for growth failure and nutritional insufficiency based on the fact that research suggests it is not adequately accounted for in the current PELD calculation and it remains an important risk factor for poor waitlist outcomes. More so,

[10] E. R. Perito et al., "Justifying Nonstandard Exception Requests for Pediatric Liver Transplant Candidates: An Analysis of Narratives Submitted to the United Network for Organ Sharing, 2009-2014," *American Journal of Transplantation* 17, no. 8 (February 28, 2017): 2144–54, https://doi.org/10.1111/ajt.14216.

[11] Sonja M. Swenson et al., "Impact of the Pediatric End-Stage Liver Disease (PELD) Growth Failure Thresholds on Mortality among Pediatric Liver Transplant Candidates," *American Journal of Transplantation* 19, no. 12 (September 3, 2019): 3308–18, https://doi.org/10.1111/ajt.15552.

[12] The Committee is in the process of developing a proposal to improve the PELD score and has discussed updating how growth failure is defined as part of that effort.

[13] Sonja M. Swenson et al., "Impact of the Pediatric End-Stage Liver Disease (PELD) Growth Failure Thresholds on Mortality among Pediatric Liver Transplant Candidates," *American Journal of Transplantation* 19, no. 12 (September 3, 2019): 3308–18, https://doi.org/10.1111/ajt.15552.

current guidance is relatively restrictive regarding which candidates should be considered for an exception due to growth failure or nutritional insufficiency.

First, the Committee is proposing the removal of a sentence stating that there is insufficient evidence to support approval of exception points for pediatric candidates with growth failure or nutritional insufficiency. The updated guidance includes a sentence that acknowledges the current PELD calculation does not adequately capture growth failure for all children. This change reflects the recent research showing the presence of a "growth failure gap," in which candidates do not meet the growth failure threshold in the PELD calculation but have an increased risk of waitlist mortality similar to those children meeting the growth failure criteria.[14]

In addition, current guidance is restricted to candidates over one year of age. However, candidates under one year of age are disproportionately impacted by the "growth failure gap" and should be provided a pathway to PELD exception points.[15] The proposed revision removes the age over one criteria.

The proposed changes also include a clarification for the z-score used to identify candidates who should be considered for a PELD exception. Previous guidance was unclear on which candidates met the criteria for being less than two standard deviations below the mean for age and gender. The proposal provides more detail on the anthropometric measurements that can be used to determine if a candidate should be considered for a PELD exception. Current guidance only includes skin fold thickness but the proposed change includes triceps skin fold thickness or mid-arm muscle circumference. This change aligns with standard anthropometric measurement practices in pediatric clinical care.

The proposed changes to the guidance for growth failure and nutritional insufficiency will ensure that candidates whose growth failure or nutritional insufficiency is not adequately captured by the PELD score are appropriately considered for exceptions.

The Committee is seeking public comment feedback on the proposed changes to the guidance for growth failure and nutritional insufficiency.

Complications of portal hypertension, including ascites and gastrointestinal bleeding

The current guidance document for the Pediatric Specialty Board includes recommendations for candidates with complications of portal hypertension, including ascites and gastrointestinal bleeding. The Committee is proposing a number of updates to this section of guidance based on feedback received from the pediatric transplant community. The proposed changes include more detail on what information should be included in exception requests for candidates in certain clinical situations and the addition of guidance for candidates requiring a hospitalization of at least five days with ascites not adequately controlled by oral diuretics and requiring IV diuretic therapy.

First, the Committee is proposing the addition of language that outlines what information should be submitted when applying for an exception for a candidate with gastrointestinal bleeding with ongoing transfusion requirement. This suggestion was brought forth through the SPLIT survey and based on feedback from the Pediatric Committee. They noted that when applying for such exceptions, reviewers

[14] Ibid.
[15] Ibid.

often request more information on the types of treatment or reasons that certain treatment options were not attempted. The Committee did make clear that reviewers should not be providing treatment recommendations in their comments, but it would be helpful to include some information as part of the initial exception request so that reviewers have a complete understanding of the candidate's clinical situation.[16] Therefore, the Committee is proposing the addition of language that encourages transplant programs to include the interventions and treatments attempted, or the contraindications to their use, and the amount and dates of transfusions attempted in exception requests for candidates with gastrointestinal bleeding. The Committee is also proposing the removal of language suggesting that transplant programs provide information on placement of transjugular intrahepatic portosystemic shunts (TIPS) or ongoing octreotide administration, as these would be included in the proposed new language.

The purpose of the additional language is to provide the NLRB reviewers with all pertinent information for the candidate and reduce the number of exceptions for gastrointestinal bleeding that are denied because such information is not provided.

The Committee is proposing a similar addition for candidates who have serum sodium less than 130 g/dL on two occasions more than two weeks apart. Current guidance includes a recommendation that candidates with severe or complicated ascites and serum sodium less than 130 g/dL on two occasions more than two weeks apart should be considered for an exception. However, the Committee is proposing the addition of language that suggests transplant programs specify the dates, values, and treatment in order to demonstrate the persistence and severity. This new language is intended to give more direct guidance to transplant programs on what information to include in exception requests for these candidates. The purpose is to ensure that NLRB reviewers have all relevant information and decrease the number of exception requests that are denied because they are lacking necessary information.

In addition, current pediatric guidance includes recommendations for candidates with severe or complicated ascites with either multiple therapeutic paracenteses or hydrothorax requiring chest tube or therapeutic thoracenteses. However, current guidance specifically states that the candidate must have at least two therapeutic paracenteses in the previous 30 days, not including diagnostic paracentesis. There is no similar specificity provided for therapeutic thoracentesis. The Committee is proposing the addition of language that states a candidate should have at least two thoracenteses in the last 60 days not including the diagnostic thoracentesis. This change was first proposed by the SPLIT survey and members of the Pediatric Committee. The purpose is to provide similar guidance for candidates with paracenteses and thoracenteses and ensure that the appropriate candidates are considered for an exception. The Committee decided to change the timeframe for the two thoracenteses to be in the previous 60 days, as opposed to the previous 30 days, because thoracenteses procedures in pediatric candidates are riskier and are typically done in candidates with higher risk of waitlist mortality.[17]

The final proposed change to this section of the guidance document is the addition of language that recommends an exception for candidates requiring a hospitalization of at least five days with ascites not adequately controlled by oral diuretics and requiring IV diuretic therapy. Current guidance states that candidates with ascites adequately controlled by diuretics in the outpatient setting should not be

[16] See NLRB Subcommittee meeting summary, July 9, 2020. Available at https://optn.transplant.hrsa.gov/
[17] See NLRB Subcommittee meeting summary, July 9, 2020. Available at https://optn.transplant.hrsa.gov/

considered for an exception, but there is no guidance for candidates who are hospitalized and requiring IV diuretic therapy. The Committee agreed that it is rare for pediatric candidates to be admitted for ascites requiring IV diuretics but that these candidates should be considered for a higher MELD or PELD score as the candidates have increased medical urgency for transplantation.[18] The Committee felt that recommending a hospitalization of five days would ensure that the candidate is sick enough to warrant an exception and preclude any transplant programs from admitting a candidate for a brief amount of time just to get an exception.[19]

The Committee is seeking feedback on the proposed changes listed above, but is specifically interested in feedback on the proposed addition of guidance for candidates admitted with ascites requiring IV diuretic therapy.

Metabolic Liver Disease

In OPTN Policy, pediatric candidates with a metabolic disease are eligible for a standardized exception. If a candidate does not receive a transplant within 30 days of being registered with an exception for a metabolic disease, the candidate is eligible to be listed as status 1B. However, the only metabolic diseases that qualify for the standardized exception, and therefore as status 1B, are urea cycle disorders and organic acidemias.

Since implementation of the NLRB, members of the pediatric community have noted that there are other metabolic disorders that may be appropriate for exception points. These diagnoses are rare, but it is important that guidance exists for transplant programs and reviewers when such a diagnosis is present. The Committee is proposing the addition of language to the guidance for the Pediatric specialty board recommending that these candidates be considered for a MELD or PELD exception.

The proposed language notes that an exhaustive list of all metabolic disorders and the exact clinical criteria for all metabolic disorders is impossible to provide, but candidates with a rare metabolic disorder should be able to receive an exception if appropriate. In order to receive an exception for a rare metabolic disorder, the proposed language suggests that transplant programs should describe how liver transplant will address the disease complication or mortality risk, provide references to other comparable diagnoses in guidance to justify the request and the points requested, and include any experience from similar cases that shows how liver transplant was beneficial for the patient.

The purpose of this proposed addition is to ensure that candidates with rare metabolic disorders are provided an opportunity to receive an exception when appropriate.

The Committee is seeking public comment feedback on the new language for candidates with rare metabolic liver diseases.

Conclusion

The Committee is proposing an addition to the conclusion section of the pediatric guidance document that allows transplant programs and reviewers to consider additional, pertinent evidence to a candidate's clinical situation, even if it is not explicitly included in guidance. The addition of this language reflects feedback that there may be additional clinical information that is relevant to a

[18] Ibid.
[19] Ibid.

candidate's clinical scenario but falls outside of what is currently included in guidance. The inclusion of this evidence in an exception request should be considered by reviewers as appropriate, even if it is not included in the specific guidance for a certain diagnosis. The language acknowledges that every candidate is unique and it is impossible for the guidance to account for every clinical situation.

The Committee is seeking public feedback on the proposed addition to the conclusion.

Adult Other Diagnosis Guidance

The proposal includes improvements to two areas of Adult Other Diagnosis guidance, NET and PSC/SSC.

Neuroendocrine Tumors (NET)

Current NLRB guidance provides a MELD exception recommendation for candidates with NET. One of the criterion included in the exception guidance is for the candidate to be less than 60 years old. The Committee is proposing that the age less than 60 criterion be removed to allow candidates over the age of 60 to also be considered for a MELD exception if they meet the other criteria in guidance.

The proposed change was initiated by a member of the Committee who noted that a recent candidate listed at his or her transplant program received an exception for NET prior to turning 60 but then had an extension of that exception denied after turning 60. The Committee determined that a candidate should not lose a previously approved exception upon turning 60 and that the age less than 60 threshold should be reviewed as an area for improvement.[20]

The age less than 60 threshold was initially included in guidance due to research available at the time that outlined specific criteria for NET patients who should be considered for liver transplantation.[21] When discussing the criteria, the Committee noted that recipients under the age of 60, regardless of diagnosis, tend to have better post-transplant outcomes as they are younger and generally healthier than older transplant recipients.[22] This fact should not be used as a means to exclude candidates over the age of 60 from receiving a MELD exception. The Committee also noted that the age less than 60 threshold was a relative criteria in the research used to originally develop the guidance.[23]

The Committee reviewed updated data showing that recipients with NET who were over the age of 60 had acceptable post-transplant outcomes, which were similar to those under the age of 60. This data showed that since 2000, there have been 227 recipients transplanted with metastatic NET, 46 of whom (20.3%) had an age greater than or equal to 59. Three of the recipients were excluded for death within 30 days of transplant. Of this subset of recipients, the rate of survival was 95% within one year of transplant, 84% within three years, and 56% within five years.[24]

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[20] See NLRB Subcommittee meeting summary, October 13, 2020. Available at https://optn.transplant.hrsa.gov/

[21] Vincenzo Mazzaferro, Andrea Pulvirenti, and Jorgelina Coppa, "Neuroendocrine Tumors Metastatic to the Liver: How to Select Patients for Liver Transplantation?" *Journal of Hepatology* 47, no. 4 (October 2007): 460–66, https://doi.org/10.1016/j.jhep.2007.07.004.

[22] See NLRB Subcommittee meeting summary, October 13, 2020. Available at https://optn.transplant.hrsa.gov/

[23] Taizo Hibi et al., "Liver Transplantation for Colorectal and Neuroendocrine Liver Metastases and Hepatoblastoma. Working Group Report From the ILTS Transplant Oncology Consensus Conference," *Transplantation* 104, no. 6 (June 2020): 1131–35, https://doi.org/10.1097/tp.0000000000003118.

[24] OPTN data was provided by a Committee member based on liver transplants performed between January 1, 2020 and July 31, 2015. The rates are based on OPTN data as of September 4, 2020.

The Committee is proposing that the age less than 60 threshold be removed from the guidance for NET based on updated data that shows recipients over the age of 60 have acceptable post-transplant outcomes.

The proposed changes also include the removal of language in the guidance that was vague and provided no clear instruction either for transplant programs or reviewers.

The Committee is seeking public comment feedback on the proposed changes to NET guidance.

Primary Sclerosing Cholangitis and Secondary Sclerosing Cholangitis

The Committee is also proposing changes to the guidance for candidates with PSC. Candidates with PSC, which is a chronic liver disease affecting the bile ducts, have historically had lower waitlist mortality rates compared to candidates with other diagnoses and similar MELD scores.[25] As a result, the guidance for PSC is relatively restrictive in recommending a MELD exception for these candidates. However, while candidates with PSC have lower waitlist mortality rates overall, they are prone to additional adverse outcomes such as development of CCA and sepsis due to ascending cholangitis.[26]

During the public comment period from August 2020 to October 2020, the Committee sponsored a public comment proposal titled, *Further Enhancements to the National Liver Review Board.*[27] The majority of public comment feedback received on this proposal related to the current guidance for PSC. Many of the comments came from candidates or family members of candidates with PSC, asking the Committee to reconsider the MELD exception guidance for PSC.[28] However, there were no proposed changes included in that proposal related to PSC guidance. As a result of the influx of comments, the Committee decided to review the PSC guidance.

Currently, the guidance states that most patients with PSC do not require a MELD exception score as the complications of their liver disease are similar to complications of other liver diseases and their risk of adverse events on the waiting list will be accurately predicted by the calculated MELD score. However, current guidance states that candidates with PSC meeting specific criteria can be considered for a MELD exception. The candidates must have been admitted to the intensive care unit (ICU) two or more times over a three month period for hemodynamic instability requiring vasopressors and must have cirrhosis. In addition, the candidate must have one of the following:

- Biliary tract structure that is not responsive to treatment by interventional radiology or therapeutic endoscopy
- Highly-resistant infectious organism

The intent of the current guidance is to limit MELD exceptions to only those PSC candidates with increased mortality risk and higher urgency for transplant based on the presence of advanced biliary strictures and risk of sepsis due to cholangitis.

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[25] David Goldberg et al., "Waitlist Survival of Patients with Primary Sclerosing Cholangitis in the Model for End-Stage Liver Disease Era," *Liver Transplantation* 17, no. 11 (October 26, 2011): 1355–63, https://doi.org/10.1002/lt.22396.
[26] Ibid.
[27] Further Enhancements *to the National Liver Review Board*, OPTN Liver and Intestinal Organ Transplantation Committee, December 2020, Available at https://optn.transplant.hrsa.gov/
[28] All public comments are available at https://optn.transplant.hrsa.gov/

In determining if the guidance should be updated, the Committee reviewed recent data on candidates with PSC. **Table 1** shows the waitlist dropout rates per 100 patient-years waiting by PSC diagnosis and all diagnoses, stratified by MELD and PELD score.[29] Overall, the waitlist dropout rate was significantly lower for candidates with PSC, which aligns with previous research and the current guidance. However, the waitlist dropout rate was significantly higher for PSC candidates with a MELD or PELD greater than 37 or listed as status 1A or 1B.

Table 1: Liver Waitlist Dropout Rates Per 100 Patient-Years Waiting, Patients Ever Waiting During 1/01/2015 to 7/31/2020 by PSC Diagnosis and Overall

MELD or PELD Score or Status	Patient Diagnosis Group	Patients Ever Waiting	Dropouts per 100 Patient-Years	95% CI
M/P <15	All	40192	7.57	[7.29, 7.86]
	PSC	1978	3.36	[2.58, 4.31]
M/P 15-28	All	43764	19.18	[18.59, 19.78]
	PSC	2332	12.37	[10.51, 14.45]
M/P 29-32	All	16250	40.31	[37.90, 42.83]
	PSC	821	49.41	[35.75, 66.55]
M/P 33-36	All	9493	67.34	[62.56, 72.39]
	PSC	468	111.61	[71.51, 166.06]
M/P 37+, Status 1s	All	10594	339.93	[325.39, 354.94]
	PSC	387	801.61	[630.52, 1004.83]
Overall	All	66437	17.15	[16.83, 17.48]
	PSC	3083	11.20	[10.08, 12.41]

Based on this information, the Committee is proposing that the guidance for candidates with PSC be updated to recommend that candidates be admitted to the hospital two or more times within a one year period instead of recommending that candidates be admitted to the ICU two or more times over a three month period. The proposed update also states that candidates must be admitted to the hospital with a documented blood stream infection or evidence of sepsis including hemodynamic instability requiring vasopressors. The updated language is more in line with current hospital resources and may also better identify the most urgent candidates with PSC, who may be at risk of further decompensation and progression to high MELD scores with the associated increased risk of waitlist mortality compared to patients with similar high MELD scores who do not have PSC.

The Committee agreed that this proposed change will provide access to MELD exception scores for candidates with PSC before their risk of waitlist dropout increases. In addition, the Committee felt that the inclusion of ICU admissions in the guidance was subjective, as different hospitals have different thresholds for admitting patients to the ICU. The Committee is recommending the one year time period because it aligns with their effort to provide exceptions to candidates with PSC prior being too sick for transplant, while also ensuring that the hospital admissions are clinically relevant and related.[30]

The Committee is seeking public comment feedback on the proposed changes to guidance for candidates with PSC.

[29] Waitlist dropout includes removal due to death or too sick to transplant

[30] See NLRB Subcommittee meeting summary, October 8, 2020. Available at https://optn.transplant.hrsa.gov/

NOTA and Final Rule Analysis

The Committee submits the proposed changes to liver allocation policy (*Policy 9.5.A: Requirements for Cholangiocarcinoma (CCA) MELD or PELD Score Exceptions*) for Board consideration under the authority of the OPTN Final Rule, which states "The OPTN Board of Directors shall be responsible for developing…policies for the equitable allocation for cadaveric organs."[31] The Final Rule requires that when developing policies for the equitable allocation of cadaveric organs, such policies must be developed "in accordance with §121.8," which requires that allocation policies "(1) Shall be based on sound medical judgment; (2) Shall seek to achieve the best use of donated organs; (3) Shall preserve the ability of a transplant program to decline an offer of an organ or not to use the organ for the potential recipient in accordance with §121.7(b)(4)(d) and (e); (4) Shall be specific for each organ type or combination of organ types to be transplanted into a transplant candidate; (5) Shall be designed to avoid wasting organs, to avoid futile transplants, to promote patient access to transplantation, and to promote the efficient management of organ placement;…(8) Shall not be based on the candidate's place of residence or place of listing, except to the extent required by paragraphs (a)(1)-(5) of this section." This proposal:

- **Is based on sound medical judgment**[32] because it is an evidenced-based change relying on the following evidence:
    - Medical expertise of the Committee that candidates with a hilar mass less than or equal to three centimeters in radial diameter meet the diagnostic criteria for hilar CCA.
    - Peer review literature supporting the Committee's proposal.
- **Seeks to achieve the best use of donated organs**[33] **by** ensuring organs are allocated and transplanted according to medical urgency.
    - This proposal seeks to achieve the best use of donated organs by ensuring that only those candidates meeting established clinical criteria are able to receive priority on the waitlist by being eligible for standardized CCA exceptions.
- **Is designed to…promote patient access to transplantation**[34] **by** giving similarly situated candidates equitable opportunities to receive an organ offer.
    - This proposal is designed to promote patient access to transplantation by allowing candidates meeting established clinical criteria to be eligible for a standardized CCA exception.

This proposal is not based on the candidate's place of residence or place of listing. This proposal also preserves the ability of a transplant program to decline an offer or not use the organ for a potential recipient,[35] and it is specific to an organ type, in this case, livers.[36]

Although the proposal outlined in this briefing paper addresses certain aspects of the Final Rule listed above, the Committee does not expect impacts on the following aspects of the Final Rule:

[31] 42 CFR §121.4(a).
[32] 42 CFR §121.8(a)(1).
[33] 42 CFR §121.8(a)(2).
[34] Id.
[35] 42 CFR §121.8(a)(3).
[36] 42 CFR §121.8(a)(4).

- Shall be designed to avoid wasting organs, to avoid futile transplants, … and to promote the efficient management of organ placement;

Additionally, the OPTN issues the *Guidance to Liver Transplant Programs and the National Liver Review Board for Adult MELD Exception Review* and *Guidance to Liver Transplant Programs and the National Liver Review Board for Pediatric MELD or PELD Exception Review* for the operation of the OPTN.[37] This guidance will support the operation of the NLRB by assisting the reviewers with evaluating exception requests. The OPTN Final Rule requires the Board to establish performance goals for allocation policies, including "reducing inter-transplant program variance."[38] This guidance document will assist in reducing inter-transplant program variance by facilitating more consistent review of exception cases.

Implementation Considerations

Member and OPTN Operations

The proposed addition to the standardized criteria for a CCA exception in policy will need to be programmed. The changes to guidance do not need to be programmed, but all relevant guidance documents will need to be updated. All changes will be communicated to the community prior to implementation. Transplant programs and NLRB reviewers will need to be aware of the changes.

The Final Rule also requires the OPTN to "consider whether to adopt transition procedures" whenever organ allocation policies are revised.[39] The Committee did not identify any populations that may be treated "less favorably than they would have been treated under the previous policies" if these proposed policies are approved by the Board of Directors.

Operations affecting Histocompatibility Laboratories

This proposal will have no operational impact on histocompatibility laboratories.

Operations affecting Organ Procurement Organizations

This proposal will have no operational impact on organ procurement organizations.

Operations affecting Transplant Hospitals

Transplant programs will need to be familiar with the proposed changes to policy and guidance when submitting exception requests for candidates.

Operations affecting the OPTN

The proposed changes to the standardized CCA criteria will need to be programmed in UNet^{SM}. Changes to guidance will not need to be programmed but relevant guidance documents will need to be updated. The OPTN will communicate any changes prior to becoming effective and will provide educational resources as appropriate.

[37] 2019 OPTN Contract Task 3.2.4: Development, revision, maintenance, of OPTN Bylaws, policies, standards and guidelines for the operation of the OPTN.
[38] 42 C.F.R. §121.8(b)(4)
[39] 42 C.F.R. § 121.8(d).

Potential Impact on Select Patient Populations

All updates in the proposal are intended to expand the criteria for candidates to receive a MELD or PELD exception.

Candidates that meet the updated criteria for a standardized CCA exception will now be eligible to have their exception automatically approved, instead of reviewed by the NLRB. Guidance will no longer recommend that candidates with NET be less than age 60, which will likely increase the number of NET candidates who are approved for an exception. The proposed changes to PSC guidance will likely allow more candidates to receive an exception as well. Instead of requiring that candidates be admitted to the ICU two or more times in a three month period, guidance will recommend that candidates who have been admitted to the hospital two or more times in a one year period be considered for an exception. This will likely increase the number of candidates with PSC who are approved for an exception.

For pediatric candidates, the proposed changes will increase the number of candidates who are approved for an exception for growth failure or nutritional insufficiency, ascites requiring a hospitalization, or rare metabolic diseases. The additional changes to guidance provide more specificity on the information that should be provided by transplant programs when applying for exceptions, which does not expand the guidance, but does increase the likelihood of having an exception approved.

Projected Fiscal Impact

Projected Impact on Histocompatibility Laboratories

This proposal is not expected to have a fiscal impact on histocompatibility laboratories.

Projected Impact on Organ Procurement Organizations

This proposal is not expected to have a fiscal impact on organ procurement organizations.

Projected Impact on Transplant Hospitals

This proposal is not expected to have a fiscal impact on transplant hospitals.

Projected Impact on the OPTN

The proposal is a demand-sized programming requested, requiring an estimated 150 hours to program. Additional implementation and ongoing support is estimated to be 180 hours.

Post-implementation Monitoring

Member Compliance

The Final Rule requires that allocation policies “include appropriate procedures to promote and review compliance including, to the extent appropriate, prospective and retrospective reviews of each transplant program's application of the policies to patients listed or proposed to be listed at the program.”[40]

[40] 42 CFR §121.8(a)(7).

The proposed language will not change the current routine monitoring of OPTN members. Site surveyors will continue to review a sample of medical records, and any material incorporated into the medical record by reference, for documentation that data reported through UNet℠ is consistent with source documentation including all qualifying criteria used for standardized exceptions reported on the MELD or PELD exception or exception extension form.

Policy Evaluation

The Final Rule requires that allocation policies "be reviewed periodically and revised as appropriate."[41] In addition to those monitoring reports and items previously enumerated in post-implementation evaluation plans related to the NLRB, the UNOS Research Department will analyze relevant outputs in pre vs. post analyses for the additional policy changes and guidance updates. Such analyses will continue the cadence of previously laid out evaluation plans for the NLRB, or longer if requested by the Committee.

Relevant analyses:

- Number and percent of pediatric exception requests
    - Overall and by case outcome
- Number and percent of CCA exceptions meeting standard policy criteria versus requiring review by NLRB
- Number of exception cases for NET
    - Overall and by case outcome
- Number of exception cases for PSC/SSC
    - Overall and by case outcome

Additional metrics as requested by the Committee, relevant to the proposed policy and guidance changes.

Conclusion

This proposal represents the most recent effort of the Committee to continuously improve the NLRB based on published research and feedback from the transplant community. The proposed updates to the standardized criteria for CCA will ensure that the appropriate candidates are eligible to have their exception automatically approved. The proposed changes to pediatric guidance reflect feedback from the pediatric community and include updates to guidance for growth failure/nutritional insufficiency, complications of portal hypertension including ascites and gastrointestinal bleeding, and the conclusion. The proposal also adds a new section for candidates with rare metabolic disorders. The proposed changes to NET guidance will recommend candidates over the age of 60 be considered for a MELD exception. Additionally, the proposed updates to guidance for candidates with PSC will provide a pathway for candidates to receive a MELD exception prior to becoming too sick for transplant. Together, these proposed changes will improve the NLRB and the overall liver allocation system.

[41] 42 CFR §121.8(a)(6).

Policy and Guidance Language

Proposed new language is underlined (<u>example</u>) and language that is proposed for removal is struck through (~~example~~). Heading numbers, table and figure captions, and cross-references affected by the numbering of these policies will be updated as necessary.

9.5.A Requirements for Cholangiocarcinoma (CCA) MELD or PELD Score Exceptions

A candidate will receive a MELD or PELD score exception for CCA, if the candidate's transplant hospital meets *all* the following qualifications:

1. Submits a written protocol for patient care to the Liver and Intestinal Organ Transplantation Committee that must include *all* of the following:
   - Candidate selection criteria
   - Administration of neoadjuvant therapy before transplantation
   - Operative staging to exclude any patient with regional hepatic lymph node metastases, intrahepatic metastases, or extrahepatic disease
   - Any data requested by the Liver and Intestinal Organ Transplantation Committee

2. Documents that the candidate meets the diagnostic criteria for hilar CCA with a malignant appearing stricture on cholangiography and at least *one* of the following:
   - Biopsy or cytology results demonstrating malignancy
   - Carbohydrate antigen 19-9 greater than 100 U/mL in absence of cholangitis
   - Aneuploidy
   - <u>Hilar mass, which is less than or equal to 3 cm in radial diameter (if not less than or equal to 3 cm in radial diameter, or extension into liver parenchyma, the mass exceeds size criteria and the candidate is not eligible for a standardized exception)</u>

   The tumor must be considered un-resectable because of technical considerations or underlying liver disease.

3. Submits cross-sectional imaging studies. If cross-sectional imaging studies demonstrate a mass, the mass must be single and less than three cm.

4. Documents the exclusion of intrahepatic and extrahepatic metastases by cross-sectional imaging studies of the chest and abdomen within 90 days prior to submission of the initial exception request.

5. Assesses regional hepatic lymph node involvement and peritoneal metastases by operative staging after completion of neoadjuvant therapy and before liver transplantation. Endoscopic ultrasound-guided aspiration of regional hepatic lymph nodes may be advisable to exclude patients with obvious metastases before neo-adjuvant therapy is initiated.

6. Transperitoneal aspiration or biopsy of the primary tumor (either by endoscopic ultrasound, operative or percutaneous approaches) must be avoided because of the high risk of tumor seeding associated with these procedures.

A candidate who meets the requirements for a standardized MELD or PELD score exception will be assigned a score according to *Table 9-2*.

Table 9-2: CCA Exception Scores

Age	Age at registration	Score
At least 18 years old	At least 18 years old	3 points below MMaT
At least 12 years old	Less than 18 years old	Equal to MMaT
Less than 12 years old	Less than 12 years old	Equal to MPaT

In order to be approved for an extension of this MELD or PELD score exception, transplant hospitals must submit an exception extension request according to *Policy 9.4.C: MELD or PELD Exception Extensions,* and provide cross-sectional imaging studies of the chest and abdomen that exclude intrahepatic and extrahepatic metastases. These required imaging studies must have been completed within 30 days prior to the submission of the extension request.

Guidance to Liver Transplant Programs and the National Liver Review Board for:

Pediatric MELD/PELD Exception Review

Growth Failure or Nutritional Insufficiency

~~There is insufficient evidence to support approval of exception points for pediatric candidates with any broadly defined growth failure or nutritional insufficiency. However,~~ It is now known that the PELD score, as currently calculated, does not accurately capture growth failure for all children. ~~e~~Exceptions should be considered for candidates who meet any of the following criteria:

- Growth parameters
  - ~~For candidates over 1 year of age,~~ < 5th percentile for: height, weight (may adjust to estimated dry weight if ascites)
  - Z-score ~~(Weight for height)~~ (weight, height, or BMI/weight-for-length) less than 2 standard deviations below the mean for age and gender
- Anthropometrics
  - Triceps s~~S~~kin fold thickness or mid-arm muscle circumference < 5th percentile for age and gender ~~for children > 1 year~~
- Failure of nasoenteric tube feedings as evidenced by failure to demonstrate improvement in growth failure in the previous month based on either weight or anthropometrics
- Requirement for TPN nutrition to allow for growth or to maintain euglycemia

Complications of portal hypertension, including ascites and gastrointestinal bleeding

Approval of MELD or PELD exception points for hospitalized pediatric candidates with complications of portal hypertension may be appropriate in some instances. Documentation submitted for case review should indicate:

- Gastrointestinal bleeding with on-going transfusion requirement, specification of interventions and treatments attempted or contraindications to their use, and the amount and dates of transfusions
- ~~Transjugular intrahepatic portosystemic shunt (TIPS) placement as a bridge to transplant. Indicate if TIPS is not an option or variceal bleeding unresponsive to ablative therapy~~
- ~~Ongoing octreotide administration~~

There is insufficient evidence to support approval of exception points in the presence of splenomegaly or varices without bleeding. There is also insufficient evidence to support approval of exception points for pediatric candidates with ascites controlled by diuretics in the outpatient setting. Exception points may be considered for candidates with severe or complicated ascites in at least one of the following clinical scenarios:

- Serum sodium less than 130, two times greater than 2 weeks apart (specify dates, values, and treatment required to demonstrate persistence and severity)

- Multiple therapeutic paracenteses (at least 2 in the previous 30 days, not including diagnostic paracentesis)
- Hydrothorax requiring chest tube or therapeutic thoracentesis (at least 2 in the previous 60 days, not including diagnostic thoracentesis)
- Patients requiring a hospitalization of at least 5 days with ascites not adequately controlled by oral diuretics and requiring IV diuretic therapy

Metabolic Liver Disease

In addition to the standard metabolic indications for transplant, there are rare metabolic diseases that present in childhood with liver failure, cirrhosis, or other life-threatening complications that may be successfully ameliorated by liver transplant. An exhaustive list of rare disorders that could be appropriate for a MELD or PELD exception is beyond the scope of this guideline. Approval of MELD or PELD exceptions may be appropriate in cases of rare metabolic disease in which liver transplant can ameliorate the life-threatening risk of the disease.

Transplant programs should submit:

- How liver transplant addresses disease complications and mortality risk
- Reference to other comparable MELD or PELD exception categories as appropriate, to justify points requested
- Experience from other cases in which liver transplant was utilized, from published literature or other.

Conclusion

Liver transplant programs, Review Board members and the Committee should consult this resource when assessing pediatric MELD, PELD and status exception requests. Liver programs should also consider this guidance when submitting exception requests for pediatric candidates with these diagnoses. However, these guidelines are not prescriptive of clinical practice.

This guidance may not be reflective of all available evidence pertinent to a specific case. Additional evidence pertinent to a child's clinical course can also be considered when reviewing exception applications.

Guidance to Liver Transplant Programs and the National Liver Review Board for:

Adult MELD Exception Review

Neuroendocrine Tumors (NET)

A review of the literature supports that candidates with NET are expected to have a low risk of waiting list drop-out. ~~Initial recommendations included age less than 60. Older patients with a lot of disease burden may be referred to transplant as a last resort, leading to poor outcomes, while data presented at the AASLD show that very young patients with NET and early stage disease do well. Committee members believed that these initial guidelines could include strict criteria that could be expanded based upon the experience of the Review Board.~~

Transplant programs should ~~also~~ be aware of ~~these~~ the following criteria when submitting exceptions for NET. The Review Board should consider the following criteria when reviewing exception applications for candidates with NET.

- ~~Recipient age <60 years.~~
- Resection of primary malignancy and extra-hepatic disease without any evidence of recurrence at least six months prior to MELD exception request.
- Neuroendocrine Liver Metastasis (NLM) limited to the liver, Bi-lobar, not amenable to resection.

Tumors in the liver should meet the following radiographic characteristics on *either* CT or MRI:

1. If CT Scan:
    a. Triple phase contrast Lesions may be seen on only one of the three phases
    b. Arterial phase: may demonstrate a strong enhancement
    c. Large lesions can become necrotic/calcified
2. If MRI Appearance:
    a. Liver metastasis are hypodense on T1 and hypervascular in T2 wave images
    b. Diffusion restriction
    c. Majority of lesions are hypervascular on arterial phase with wash –out during portal venous phase
    d. Hepatobiliary phase post Gadoxetate Disodium (Eovist): Hypointense lesions are characteristics of NET

1. Consider for exception only those with a NET of Gastro-entero-pancreatic (GEP) origin tumors with portal system drainage. Note: Neuroendocrine tumors with the primary located in the lower rectum, esophagus, lung, adrenal gland and thyroid are not candidates for automatic MELD exception.
2. Lower - intermediate grade following the WHO classification. Only well differentiated (Low grade, G1) and moderately differentiated (intermediate grade G2). Mitotic rate <20 per 10 HPF with less than 20% ki 67 positive markers.
3. Tumor metastatic replacement should not exceed 50% of the total liver volume.
4. Negative metastatic workup should include one of the following:

a. Positron emission tomography (PET scan)
b. Somatostatin receptor scintigraphy
c. Gallium-68 (68Ga) labeled somatostatin analogue 1,4,7,10-tetraazacyclododedcane-N, N', N",N'"-tetraacetic acid (DOTA)-D-Phe1-Try3–octreotide (DOTATOC), or other scintigraphy to rule out extra-hepatic disease, especially bone metastasis.

Note: Exploratory laparotomy and or laparoscopy is not required prior to MELD exception request.

1. No evidence for extra-hepatic tumor recurrence based on metastatic radiologic workup at least 3 months prior to MELD exception request (submit date).
2. Recheck metastatic workup every 3 months for MELD exception increase consideration by the Review Board. Occurrence of extra-hepatic progression – for instance lymph-nodal Ga68 positive locations – should indicate de-listing. Patients may come back to the list if any extra-hepatic disease is zeroed and remained so for at least 6 months.
3. Presence of extra-hepatic solid organ metastases (i.e. lungs, bones) should be a permanent exclusion criteria

Primary Sclerosing Cholangitis or Secondary Sclerosing Cholangitis

Candidates with Primary Sclerosing Cholangitis (PSC) or Secondary Sclerosing Cholangitis (SSC) ~~historically have low mortality rates, and therefore do not need exception scores.~~ may be at risk of adverse outcomes secondary to sepsis from cholangitis, which may not be reflected in the candidate's calculated MELD score. Based on clinical experience and a review of the available literature, the Committee recommends that ~~four specific~~ the following elements be considered.

~~**Transplant programs should provide the following criteria when submitting exceptions for PSC or SSC. The Review Board should consider the following criteria when reviewing exception applications for candidates with PSC or SSC.**~~

The candidate must meet both of the following two criteria:

1. The candidate has been admitted ~~to the intensive care unit (ICU)~~ to the hospital two or more times ~~over a three month period for hemodynamic instability requiring vasopressors~~ within a one year period with a documented blood stream infection or evidence of sepsis including hemodynamic instability requiring vasopressors
2. The candidate has cirrhosis

In addition the candidate must have one of the following criteria:

- The candidate has biliary tract stricture which are not responsive to treatment by interventional radiology (PTC) or therapeutic endoscopy (ERCP) or
- The candidate has been diagnosed with a highly-resistant infectious organism (e.g. Vancomycin Resistant Enterococcus (VRE), Extended Spectrum Beta-Lactamase (ESBL) producing gram negative organisms, Carbapenem-resistant Enterobacteriaceae (CRE), and Multidrug-resistant Acinetobacter.)

Appendix 1: PSC Data

The Committee reviewed the following data when discussing the proposed changes to PSC guidance.

Figure 1: Number of Registrations on Liver Waiting List with PSC Diagnosis during 1/1/2018-7/31/2020, by Month

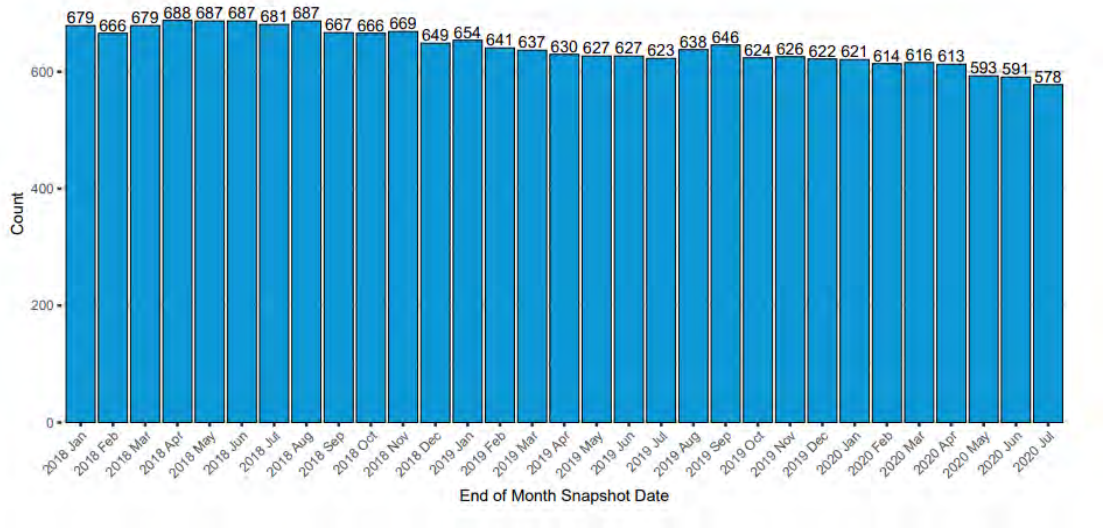

Figure 2: Percent of Registrations on Liver Waiting List with PSC Diagnoses during 1/1/2018 - 7/31/2020 by Month

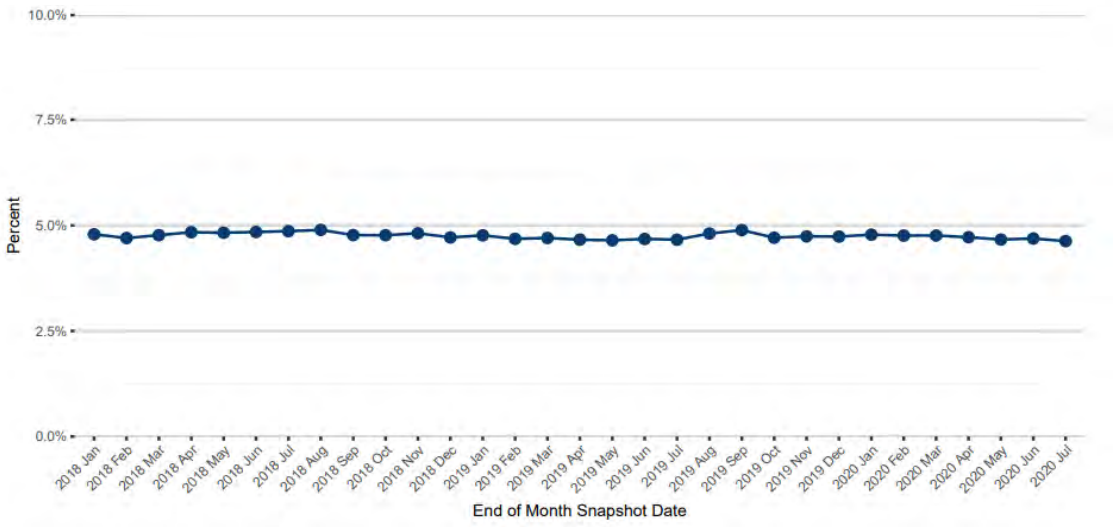

Figure 3: Liver Waiting List Drop-Out Rates per 100 Patient-Years Waiting, Patients Ever Waiting During 1/1/2015 - 7/31/2020, by PSC Diagnosis and Overall

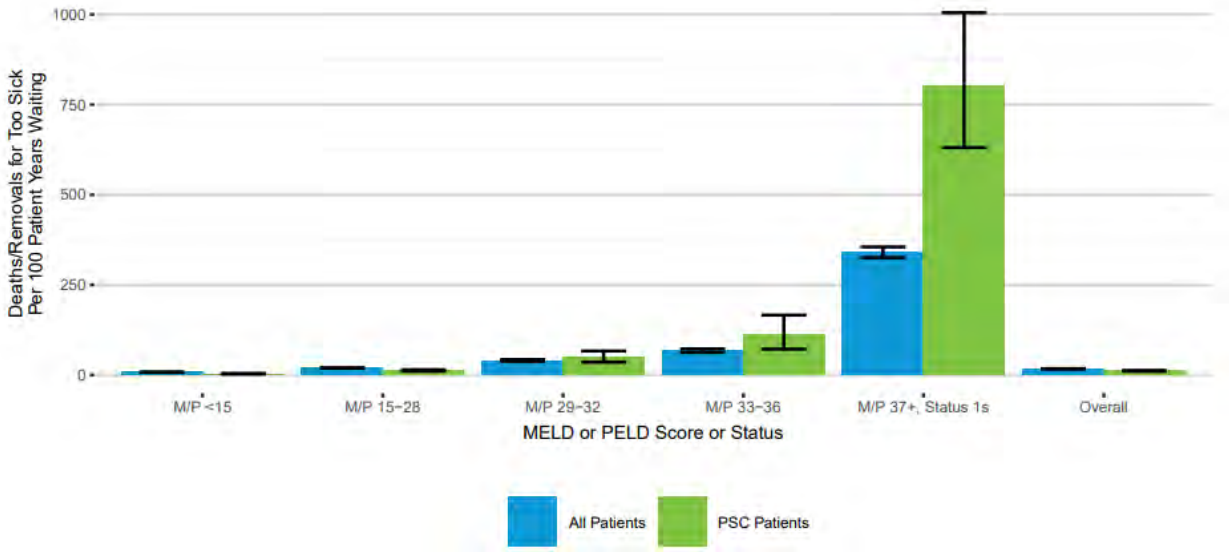

Table 2: Liver Waitlist Dropout Rates Per 100 Patient-Years Waiting, Patients Ever Waiting During 1/01/2015 to 7/31/2020 by PSC Diagnosis and Overall

MELD or PELD Score or Status	Patient Diagnosis Group	Patients Ever Waiting	Dropouts per 100 Patient-Years	95% CI
M/P <15	All	40192	7.57	[7.29, 7.86]
	PSC	1978	3.36	[2.58, 4.31]
M/P 15-28	All	43764	19.18	[18.59, 19.78]
	PSC	2332	12.37	[10.51, 14.45]
M/P 29-32	All	16250	40.31	[37.90, 42.83]
	PSC	821	49.41	[35.75, 66.55]
M/P 33-36	All	9493	67.34	[62.56, 72.39]
	PSC	468	111.61	[71.51, 166.06]
M/P 37+, Status 1s	All	10594	339.93	[325.39, 354.94]
	PSC	387	801.61	[630.52, 1004.83]
Overall	All	66437	17.15	[16.83, 17.48]
	PSC	3083	11.20	[10.08, 12.41]

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Figure 4: Number of Deceased Donor, Liver-Alone Transplant Recipients with PSC Diagnosis during 1/1/2018-7/3/2020

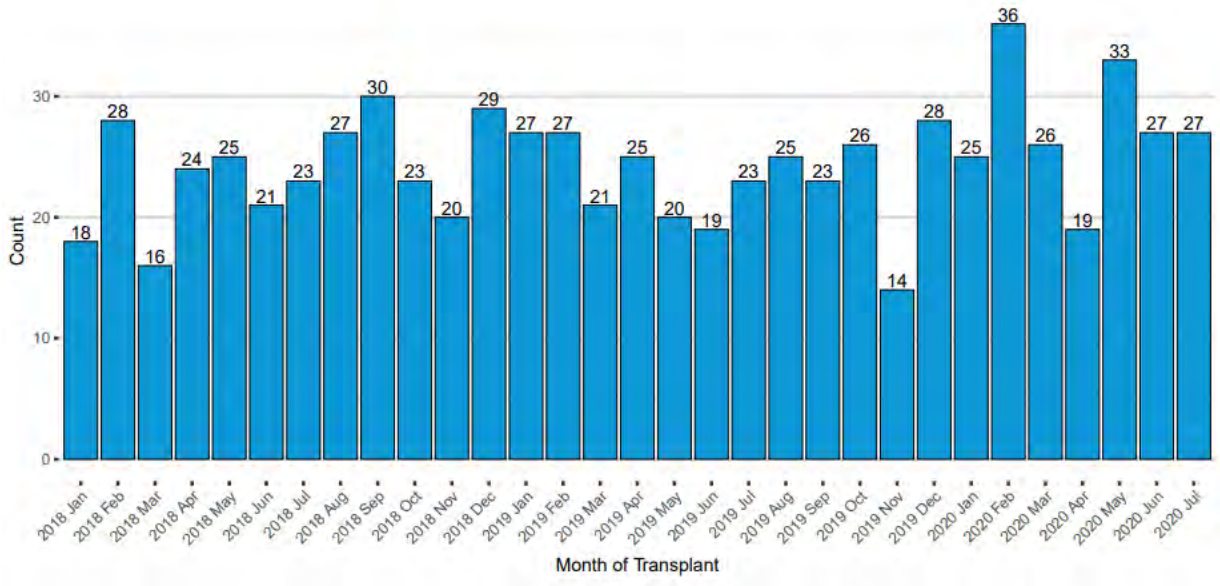

Figure 5: Percent of Deceased Donor, Liver-Alone Transplant Recipients with PSC Diagnosis during 1/1/2015 - 7/31/2020, by Month

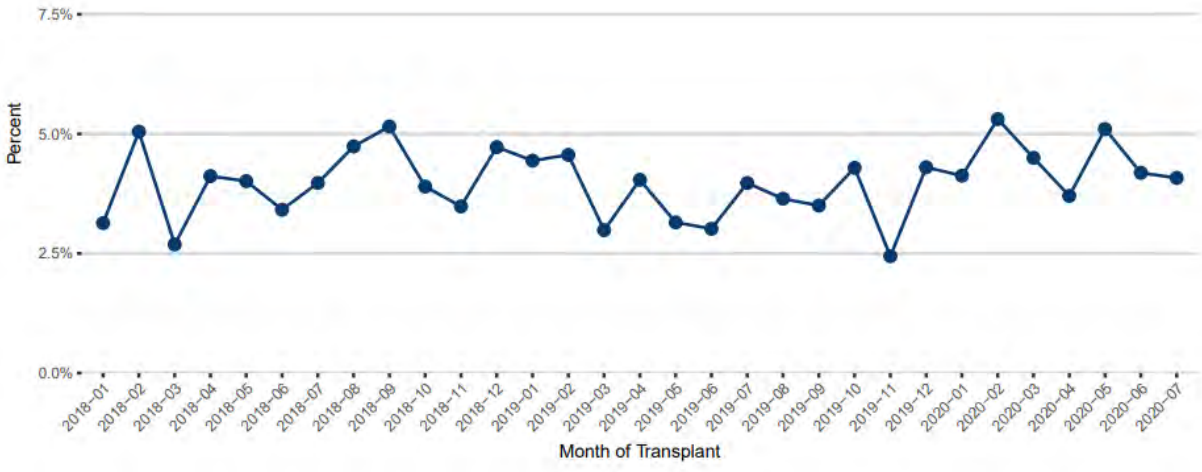

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Figure 6: Liver Transplant Rates per 100 Patient-Years Waiting, Patients Ever Waiting during 1/1/2015 - 7/31/2020, by PSC Diagnosis and Overall

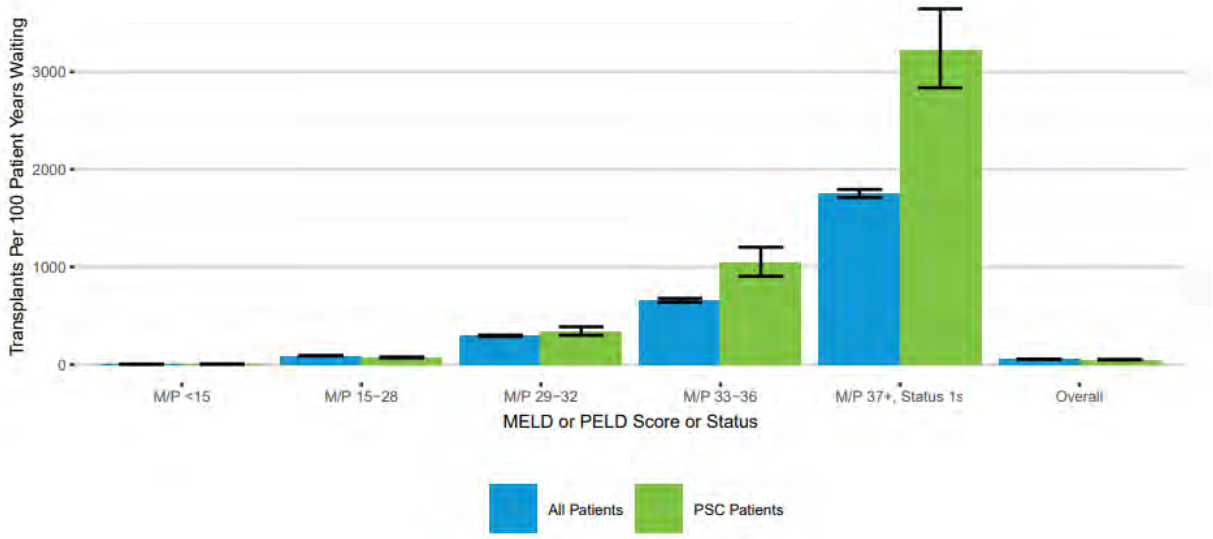

Table 3: Liver Transplant Rates per 100 Patient-Years Waiting, Patients Ever Waiting during 1/1/2015-7/31/2020, by PSC Diagnosis and Overall

MELD or PELD Score or Status	Diagnosis Group	Patients Ever Waiting	Transplants per 100 Patient-Years	95% CI
M/P <15	All	38876	4.70	[4.46, 4.96]
	PSC	1931	5.09	[4.03, 6.34]
M/P 15-28	All	43165	89.85	[88.44, 91.27]
	PSC	2317	73.00	[68.12, 78.14]
M/P 29-32	All	16136	294.09	[286.49, 301.84]
	PSC	819	341.35	[300.35, 386.39]
M/P 33-36	All	9427	658.14	[638.17, 678.57]
	PSC	466	1044.69	[903.20, 1202.06]
M/P 37+, Status 1s	All	10534	1752.77	[1712.44, 1793.80]
	PSC	386	3220.59	[2835.19, 3643.75]
Overall	All	66437	54.52	[53.94, 55.11]
	PSC	3083	49.28	[46.90, 51.75]

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Appendix 2: NET Data

In addition to the data included in the proposal, the Committee also considered the following data when discussing the proposed changes to NET guidance.

Table 4: NET Post-Transplant Patient and Graft Survival

Organ Procurement and Transplantation Network
Kaplan-Meier 1,3,5 Year Patient and Graft Survival Rates for Liver Transplants Performed in US January 01, 2000-July 31, 2015
Where Recipient Diagnosis 'Other text' or Exception Diagnosis 'Other text' had Neuroendocrine Tumor or Carcinoid
Note: Repeat and Multi-Organ transplants excluded
Note: '*' denotes values couldn't be calculated because n at risk was less than or equal to 10

Recipient Age Group at Transplant	Transplants Performed N	1 Year Post Transplant		3 Year Post Transplant		5 Year Post Transplant	
		Patient Survival Rate [95% CI]	Graft Survival Rate [95% CI]	Patient Survival Rate [95% CI]	Graft Survival Rate [95% CI]	Patient Survival Rate [95% CI]	Graft Survival Rate [95% CI]
11-17	7	*	*	*	*	*	*
18-34	21	90.48 [67.00, 97.53]	90.48 [67.00, 97.53]	80.95 [56.89, 92.39]	80.95 [56.89, 92.39]	80.95 [56.89, 92.39]	80.95 [56.89, 92.39]
35-49	50	80.89 [66.46, 89.57]	74.00 [59.47, 83.99]	69.96 [54.57, 80.99]	64.00 [49.11, 75.57]	63.40 [47.86, 75.44]	58.00 [43.18, 70.24]
50-64	73	88.22 [77.80, 93.93]	80.64 [69.50, 88.05]	68.78 [56.23, 78.40]	63.95 [51.75, 73.84]	59.63 [46.87, 70.27]	55.45 [43.23, 66.05]
65+	10	*	*	*	*	*	*
Overall	161	86.28 [79.73, 90.84]	79.43 [72.31, 84.91]	69.56 [61.53, 76.24]	65.04 [57.12, 71.87]	62.05 [53.76, 69.28]	58.02 [49.96, 65.24]

Based on OPTN data as of September 04, 2020
Data subject to change based on future data submission or correction