OPTN

Public Comment Proposal

Standardize Kidney Biopsy Reporting and Data Collection

OPTN Kidney Transplantation Committee

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Contents

Standardize Kidney Biopsy Reporting and Data Collection

Sponsoring Committee:	*Kidney Transplantation*
Data Collection Affected:	*DonorNet℠ Donor Summary Organ Data, Deceased Donor Registration (DDR) Form*
Policy Language Affected:	*2.11.A: Required Information for Deceased Kidney Donors*
Public Comment Period:	*January 27, 2022 – March 23, 2022*

Executive Summary

A renal procurement biopsy is a diagnostic examination of tissue sample taken from a deceased donor kidney during procurement. An Organ Procurement Organization (OPO) performs procurement biopsies to identify chronic or acute organ damage and estimate potential risk to graft function.[1] Procurement biopsies are increasingly prevalent, and more than half of all deceased donor kidneys procured for transplant are biopsied.[2] Despite this, there is an absence of standardization in biopsy reporting, with variation in the specific parameters reported and how this information is shared with evaluating transplant programs.

In 2020, the OPTN Policy Oversight Committee's Biopsy Standards and Practices Workgroup identified that "the interpretation and analysis of biopsy results can vary in quality and comprehensiveness based on geography as well as the experience of the pathologist… this often results in the surgeon requesting to perform their own examination of the biopsy, slowing down efficiency."[3] Developing a standard pathology report form that identifies "characteristics and data points that are most useful to inform offer acceptance, and thereby increase allocation efficiency" can reduce inconsistencies in quality and comprehensiveness and improve efficiency.[4]

This proposal aims to standardize biopsy reporting by establishing a required set of biopsy parameters and appropriate responses to be reported when a procurement kidney biopsy is performed. The standardized parameters are characteristics critical to inform offer acceptance, and the response options balance the granularity of information required by organ offer-evaluating surgeons and the level of detail that pathologists of varying levels of expertise are able to provide.[5] This will reduce inconsistencies in comprehensiveness and improve reproducibility and reliability, and therefore increase allocation efficiency. This standardization will be operationalized in DonorNet℠ with the addition of new, discrete data fields for each parameter. This proposal was developed in conjunction with the *Establish Minimum Kidney Donor Criteria to Require Biopsy* proposal, which aims to standardize when biopsies are performed.

[1] 1 Lentine et al. "Procurement Biopsies in Kidney Transplantation," *Journal of the American Society of Nephrology*, 32 (2021): 1835-1837
[2] Carpenter et al. "Procurement Biopsies in the Evaluation of Deceased Donor Kidneys," Clinical Journal of the American Society of Nephrology, 13 (2018): 1876-1885
[3] OPTN Policy Oversight Committee Project Recommendations Memo: Local Recovery and Biopsy Standards & Practices Workgroups. September 9, 2020.
[4] OPTN Policy Oversight Committee Biopsy Standards Workgroup Meeting Summary. July 22, 2020. https://optn.transplant.hrsa.gov/media/3934/20200722_poc_biopsywg_summary.pdf
[5] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, August 3, 2021. https://optn.transplant.hrsa.gov/media/hydnvomr/20210803-biopsy-best-practices-meeting-summary.pdf

Background

Current OPTN Policy requires[6] that host OPOs provide kidney biopsy information in deceased donor kidney offers if a biopsy is performed, but otherwise does not prescribe what parameters or types of biopsy information should be reported. The *OPTN Guidance on Requested Deceased Donor Information* recommends that a biopsy sample capture a minimum of 25 glomeruli, and suggests sending the biopsy material along with a kidney when transported.[7] This proposal standardizes the data that must be reported by the OPO if a biopsy is performed, but does not change the policy requirements for when a biopsy must be performed.

More than 50 percent of all deceased donor kidneys are biopsied upon procurement, though recent literature has shown that the quality and reliability of procurement biopsy varies considerably. With biopsies reported as the main reason for non-utilization for 37 percent of non-utilized deceased donor kidneys, many point to procurement biopsies as a possible driver of the nearly 20 percent rate of kidney graft non-utilization in the United States. [8,9] Many others believe these procurement biopsies provide information critical to understanding organ quality and appropriate placement of the organ.[10] The literature itself faces a number of limitations, including selection bias, limited data, and lack of consistency and standardization in histological assessment. [11,12] In particular, it can be difficult to point to biopsy itself as the main cause of non-utilization, as many donors from whom biopsies are requested have a number of risk factors that could lead to increased odds of offer decline.[13] However, wide variation in biopsy practices, the absence of accessible, large-scale biopsy data, and resulting limitations to the literature have led to calls for increased standardization. The *2018 Consensus Conference to Decrease Kidney Discards* report from the National Kidney Foundation recommended increased standardization of deceased donor biopsies.[14] Carpenter et al. challenge the utility of procurement biopsies "in absence of greater standardization of the process across organ procurement organizations," encouraging "standardization of evaluation of procurement biopsies and subsequent reporting."[15]

In 2020, the OPTN Policy Oversight Committee established the Biopsy Standards and Practices Workgroup to evaluate biopsy practices, their use and efficiency in the current system, and the potential need for rules or guidance regarding biopsy practices.[16] The Policy Oversight Committee's Biopsy

[6] OPTN Policy 2.11.A *Required Information for Deceased Kidney Donors*
[7] OPTN Organ Procurement Organization Committee: Guidance on Requested Deceased Donor Information, (2018): https://optn.transplant.hrsa.gov/media/2504/opo_guidance_201806.pdf
[8] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, May 24, 2021. https://optn.transplant.hrsa.gov/media/4685/20210524_kidney_biopsy_best_practices_-wg_summary.pdf
[9] Kasiske et al. "The Role of Procurement Biopsies in Acceptance Decisions for Kidneys Retried for Transplant," *Clinician Journal of the American Society of Nephrology*, 9 (2014): 562-571.
[10] Angeletti et al. "Making Procurement Biopsies Important Again for Kidney Transplant Allocation," *Nephron*, 142 (2019): https://www.karger.com/Article/Pdf/499452
[11] Leninte et al. "Procurement Biopsies in Kidney Transplantation: More Information May Not Lead to Better Decisions," *Journal of the American Society of Nephrology*, 32 (2021): https://jasn.asnjournals.org/content/32/8/1835
[12] Wang et al. "The Donor Kidney Biopsy and Its Implications in Predicting Graft Outcomes: A Systematic Review," *American Journal of Transplantation*, 15 (2015): 1903-1914.
[13] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, May 24, 2021.
[14] National Kidney Foundation, "Report of the National Foundation Consensus Conference to Decrease Kidney Discards," (2018). https://www.kidney.org/news/report-national-kidney-foundation-consensus-conference-to-decrease-kidney-discards
[15] Carpenter et al. "Procurement Biopsies in the Evaluation of Deceased Donor Kidneys," *Clinical Journal of the American Society of Nephrology*, 13 (2018): 1876-1885
[16] OPTN Policy Oversight Committee Meeting Summary, June 3, 2020. https://optn.transplant.hrsa.gov/media/3871/20200603_poc_biopsywg_summary_final.pdf

Standards and Practices Workgroup identified inconsistencies in biopsy practices and the quality of biopsy analysis as a major hurdle to greater allocation efficiency. This Workgroup found that the quality and comprehensiveness of analysis of biopsy results vary significantly based on geography and pathologist experience, resulting in transplant hospitals that accept deceased donor kidney offers performing their own biopsy reading, ultimately slowing allocation efficiency. Furthermore, there is variation in the reporting of the results themselves, with inconsistencies in the parameters and response options reported and the format in which the results are recorded.

The Policy Oversight Committee provided the Kidney Transplantation Committee (the Committee) with several directives, including the development of a standard pathology form, with the rationale that the form could "identify those characteristics and data points that are most useful to inform offer acceptance and thereby increase allocation efficiency." This standardized reporting would also reduce inconsistencies in comprehensiveness of pathology reports based on geography and pathologist experience.[17] This proposal is presented with a sister proposal from the Kidney Committee, *Establish Minimum Kidney Donor Criteria to Require Biopsy*, which aims to standardize when a biopsy is performed and reduce inefficiency.

A multi-disciplinary workgroup (the Workgroup) was formed with representation from the following OPTN committees and a subject matter expert in renal pathology:

- Kidney Transplantation
- Organ Procurement Organization
- Liver and Intestinal Organ Transplantation
- Data Advisory

Purpose

The purpose of this proposal is to improve biopsy reporting and data collection by establishing a standard set of biopsy parameters for OPOs to provide to transplant programs and the OPTN. Standardization of reporting will be operationalized in DonorNet℠, with discrete data fields for each parameter. This proposal will require OPOs to provide these specific biopsy characteristics, which are critical to inform offer evaluation and appropriate acceptance practices for individual potential transplant recipients to transplant programs evaluating those offers. This project manages and maintains information about organ donors by standardizing and streamlining the reporting of biopsy results, which provide key kidney donor information used in kidney allocation and offer evaluation. Standardization of biopsy reporting will reduce inconsistencies in quality and comprehensiveness of biopsy analysis among OPOs, minimize the need for transplant hospitals that accept deceased donor kidney offers to perform their own biopsy analysis, and streamline reporting of biopsy results, and thus improve allocation efficiency. This proposal was developed and released in conjunction with the *Establish Minimum Kidney Donor Criteria to Require Biopsy*, which aims to standardize when a biopsy is performed, streamline communication between OPOs and transplant centers, and increase allocation and offer acceptance efficiency.

[17] OPTN Policy Oversight Committee Project Recommendations Memo: Local Recovery and Biopsy Standards & Practices Workgroups. September 9, 2020.

Overview of Proposal

The OPTN Kidney Committee proposes the required reporting of several biopsy parameters when reporting biopsy results, which will include modifications to DonorNet® donor data collection, the Deceased Donor Registration (DDR) in TIEDI®, and related data definitions.

Standardized Pathology Report

Table 1 outlines the proposed standardized pathology report, including the proposed biopsy parameters and respective response options.

Table 1: Proposed Standardized Pathology Report Data Fields

Data Element	Response Options				
Biopsy Type	Wedge	Core Needle			
Tissue Preparation Technique	Frozen	Formalin-Fixed Paraffin Embedded			
Number of Glomeruli	_____				
Number of Globally Sclerotic Glomeruli	_____				
Percent Globally Sclerotic Glomeruli	_____%				
Nodular Mesangial Glomerulosclerosis	Absent	Present	Unknown		
Interstitial Fibrosis and Tubular Atrophy (IFTA)	<5%	5-10%	11-25%	26-50%	>50%
Vascular Disease (Percent Luminal Narrowing of the Most Severely Involved Vessel)	None: <10%	Mild: 10-25%	Moderate: 26-50%	Severe: >50%	
Cortical Necrosis	Absent	Present: _____%			
Fibrin Thrombi	Absent	Present: _____%			

The Workgroup developed the proposed Standardized Pathology Report with critical input from subject matter experts in both renal and general pathology, clinical expertise of transplant physicians and surgeons who evaluate these reports, OPO personnel who complete and share the reports, and extensive literature and data review.

The Workgroup collaborated with the OPTN Data Advisory Committee (DAC) in developing this proposal. The DAC is an operating committee of the OPTN and oversees all data-related functions, including collaboration with other OPTN committees on modifications, additions, and removals of data elements collected by the OPTN in order to improve the completeness, accuracy, and timeliness of the data.[18] Through discussion, the Workgroup evaluated each proposed data element against the DAC Data Element Standard of Review Checklist to ensure the quality, usefulness, transparency and reliability of

[18] OPTN Data Advisory Committee. https://optn.transplant.hrsa.gov/members/committees/data-advisory-committee/

OPTN data. This checklist provides a tool to ensure a consistent and systematic approach to aid OPTN Committees in the assessment of data they seek to add, modify, or remove.

In consideration of these standards, the Workgroup designed the parameters and the detail represented in the respective response options to balance the provision of clinically useful information to organ offer-evaluating clinicians and the usability to pathologists with and without renal-specific training, focusing on reproducibility, reliability, and clarity.[19,20] Those elements requiring a greater degree of interpretation, such as Interstitial Fibrosis and Tubular Atrophy (IFTA) and Vascular Disease, have categorized, less granular response options to improve reproducibility and reliability.[21,22] For those elements that are more objective and countable, such as number of glomeruli, numeric field response options are given.[23]

The Workgroup discussed extensively the advantages and disadvantages of core needle and wedge biopsy sampling. Wedge biopsy considerations included overestimation of sub-capsular scarring, relative ease to core needle biopsies, and conservative sampling effects on estimation.[24] In discussing core needle sampling, the Workgroup considered potential improvements in vessel sample size and estimations of vascular disease, as well as the relative risk of additional kidney damage, such as arterial ureteral fistula. Wedge sampling is a simpler and more accessible method for surgeons, while core needle sampling may need to be performed by a pathologist or clinician with appropriate training to ensure the needle is through the cortex, and reduce risk of damage.[25] The Workgroup determined that requiring one specific sampling method, such as core needle or wedge, would impede appropriate sampling variation, which could negatively impact access to reliable biopsy information overall.[26] The Workgroup determined that both core needle and wedge sampling methods were acceptable.[27]

The Workgroup identified that frozen sections are the most accessible and timely tissue preparation technique available for procurement kidney biopsies, though they are less reproducible and more difficult to evaluate accurately than formalin-fixed paraffin-embedded (FFPE) samples.[28,29] Frozen sections can distort certain characteristics; indication of preparation technique and sampling type can inform evaluating clinicians on biopsy quality.[30] The Workgroup determined that recommending the use of FFPE preparation was infeasible for procurement kidney biopsies, but decided to maintain the tissue preparation technique parameter in order to provide a holistic set of biopsy information and allow for differentiation if ever necessary.[31,32] However, the Workgroup recognized that the limitations of frozen

[19] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, March 22, 2021. https://optn.transplant.hrsa.gov/media/4541/20210322_kidney_biopsy_best_practices_-wg_summary.pdf
[20] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, August 3, 2021. https://optn.transplant.hrsa.gov/media/hydnvomr/20210803-biopsy-best-practices-meeting-summary.pdf
[21] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, June 28, 2021. https://optn.transplant.hrsa.gov/media/4768/20210628_kidney_biopsy_best_practices_-wg_summary.pdf
[22] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, March 22, 2021.
[23] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, June 28, 2021.
[24] Ibid.
[25] Ibid.
[26] Ibid.
[27] Ibid.
[28] Ibid.
[29] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, October 25, 2021. https://optn.transplant.hrsa.gov/media/a0ubydx1/20211025_kidney_biopsy_best_practices_-wg_summary.pdf
[30] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, March 22, 2021
[31] Ibid.
[32] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, June 28, 2021.

samples can also be mitigated by creating clearly defined, categorized response options to allow pathologists to more easily and reliably define characteristics into data points.[33]

Though the Workgroup determined recommendations on biopsy type and tissue preparation technique were not appropriate, several surgeons and physicians expressed that both biopsy type and tissue preparation technique can influence biopsy results.[34] These external characteristics provide valuable context to evaluating clinicians.[35] Similarly, the number of glomeruli visualized informs on sample adequacy, providing valuable context to the reliability and reproducibility of the biopsy.[36]

Proposed Data Elements and Definitions

The proposed data elements and definitions shown in **Table 2** were developed from three published consensus statements, defined in peer review publication, and are industry standard.[37] These consensus statements include Sethi et al.'s *Mayo Clinic and Renal Pathology Society Consensus Report on Pathologic Classification, Diagnosis, and Reporting of Glomerulonephritis*, Sethi et al.'s *Proposal for Standardized Grading of Chronic Changes in Native Kidney Biopsy Specimens*, and Haas's *Towards Harmony in Defining and Reporting Glomerular Disease on Kidney Biopsy*.[38,39,40]

Table 2: Proposed Data Elements and Definitions

Data Element	Current Definition	Proposed Changes
Biopsy	The process of removing tissue from patients for diagnostic examination	No proposed changes
Biopsy Type	No definition present in current state	The method by which tissue is removed from the patient for diagnostic examination
Tissue Preparation Technique	No definition present in current state	The method by which biopsy material is prepared for histologic examination
Number of Glomeruli	No definition present in current state	The total of all glomerular capillary tufts in the sample, include sclerotic and non-sclerotic tufts
Number of Globally Sclerotic Glomeruli	Field not present in current state	The number of glomeruli exhibiting global (complete) collapse of glomerular capillary walls and consolidation of the glomerular tuft by extracellular matrix, causing capillary luminal obliteration

[33] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, March 22, 2021
[34] Ibid
[35] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, June 28, 2021.
[36] ibid
[37] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, August 3, 2021.
[38] Sethi et al.'s Mayo Clinic and Renal Pathology Society Consensus Report on Pathologic Classification, Diagnosis, and Reporting of Glomerulonephritis
[39] Sethi et al.'s Proposal for Standardized Grading of Chronic Changes in Native Kidney Biopsy Specimens
[40] Haas's Towards Harmony in Defining and Reporting Glomerular Disease on Kidney Biopsy

Data Element	Current Definition	Proposed Changes
Percent Globally Sclerotic Glomeruli (Percent Glomerulosclerosis)	The percentage of sclerosis (or hardening) of the glomeruli calculated on biopsy. This pathology usually commences in the juxtamedullary glomeruli and gradually spreads to involve other parts of the kidney, eventually causing kidney failure	The percentage of glomeruli exhibiting global (complete) collapse of glomerular capillary walls and consolidation of the glomerular tuft by extracellular matrix, causing capillary luminal obliteration
Nodular Mesangial Glomerulosclerosis	Field not present in current state	Rounded accumulation of collagenous matrix expanding one or more mesangial areas
Interstitial Fibrosis (IF)	No definition present in current state	The accumulation of fibrous tissue between the tubules
Tubular Atrophy (TA)	Field not present in current state	Shrinkage of tubules with variable thickening of the tubular basement membrane and flattening of the tubular epithelium
Vascular Disease	No definition present in current state	Fibrous thickening and/or hyalinosis of the intima of arteries and/arterioles
Percent Luminal Narrowing	Field not present in current state	The reduction in diameter of vessel lumens owing to vascular disease
Cortical Necrosis	Field not present in current state	Deaths of cortical cells, typically affecting all three tissue compartments
Fibrin Thrombi	Field not present in current state	Capillary lumen aggregate of coagulated blood containing fibrin and platelets, with or without entrapped cellular elements

Glomerulosclerosis and Chronic Kidney Damage

Glomeruli are clusters of capillary veins and nerves that work to filter waste products from the bloodstream, while retaining blood cells and protein in the bloodstream.[41] Glomerulosclerosis is scarring (or sclerosis) of the glomeruli, which impacts the ability of the kidney to successfully filter waste and retain protein and blood cells.[42] Glomerulosclerosis, measured as percent globally sclerotic glomeruli, is the most commonly reported and referenced biopsy finding, with most offer-evaluating clinicians evaluating this parameter as the first indicator of chronic damage to kidney function.[43] Global sclerosis

[41] National Institute of Diabetes and Digestive and Kidney Diseases, "Glomerular Disease," April 2014. https://www.niddk.nih.gov/health-information/kidney-disease/glomerular-diseases
[42] Ibid.
[43] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, June 28, 2021.

of glomeruli can be caused by a number of diseases, such as hypertension and diabetes, and leads to poor glomerular filtering and reduced kidney function.[44] Glomerulosclerosis as a finding is generally presented with the number of glomeruli and the number of globally sclerotic glomeruli, as this allows the percent calculation to be checked for accuracy and provides additional context to the sample quality.[45] The Workgroup recognized that these elements are more objective and measurable, and are good indicators of graft function and survival.[46]

Nodular Mesangial Glomerulosclerosis is another pathway of chronic injury, related to long durations of hyperglycemia and diabetic kidney disease.[47] This parameter can indicate potential issues with glomerular filtering and potentially reduced kidney graft function in a recipient, often specifically related to damage caused by advanced diabetes in the donor [48] The Workgroup recognized that this information is most useful in the evaluation of donors with unknown or relatively recent diabetes histories, as disease onset can significantly precede diagnosis.[49] In considering response options, the Workgroup acknowledged that nodular mesangial sclerosis is less commonly reported on procurement biopsies, and may be difficult for general pathologists to identify and quantify.[50] The Workgroup determined that "absent," "present," and "unknown" response options were most appropriate, allowing pathologists to indicate nodular mesangial glomerulosclerosis without requiring quantification.[51]

Interstitial Fibrosis (IF), Tubular Atrophy (TA), and Vascular Disease are also terminal pathways of chronic damage to a kidney. Interstitial Fibrosis and Tubular Atrophy (IFTA) typically occur together, and are indicators of general wear and tear chronic damage. [52] Vascular disease, defined in the proposed parameter as the percent luminal narrowing of the most severely involved vessel, can inform a general sense of the risk of further scarring.[53] Chronic changes narrow lumen, and narrowed vessels lead to poor kidney perfusion.[54] The Workgroup determined that IFTA and Vascular Disease are essential to holistic understanding of chronic damage to a kidney graft and potential graft function.[55] The Workgroup chose to increase granularity at the lower end of the related response options as this is where critical differences can be detected and most clinical decision making occurs.[56] These categories also balance the level of detail pathologists of varying renal-specific experience can reliably achieve with frozen sections.[57, 58]

Acute Damage

Cortical necrosis and fibrin thrombi are measures of acute and irreversible damage to the kidney. Cortical necrosis is the presence of necrotic material in the cortex, and can indicate acute damage with

[44]Ibid.
[45] Ibid.
[46] Ibid.
[47] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary August 3, 2021.
[48] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, June 28, 2021.
[49] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary August 3, 2021.
[50] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, October 25.
[51] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, August 3.
[52] Sethi et al. "Proposal for Standardized Grading" (2017): 787-789
[53] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, June 28, 2021.
[54] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, June 28, 2021.
[55] Ibid.
[56] Ibid.
[57] Ibid.
[58] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, August 3, 2021.

no expectation of recovery.[59] Cortical necrosis can also indicate the damage sustained by the kidney through the death and procurement processes[60]. Both cortical necrosis and fibrin thrombi can signal potential worsening of kidney function upon reperfusion.[61] These two parameters were recognized by the Workgroup as essential to evaluating irreversible, acute damage to the kidney and related impacts to potential graft function.[62] The Workgroup determined the percentage field response option was appropriate for both parameters, as fibrin thrombi can be counted and cortical necrosis is a typically conspicuous finding that can be easily estimated.[63]

Biopsy in Organ Offer Evaluation and Placement

The Committee believes that a biopsy should be considered in context with other donor and organ information as part of a holistic review and evaluation of an organ offer.[64] As such, biopsies themselves should not be utilized to determine an organ's viability, but instead to help determine whether a patient will receive the most benefit from that organ.[65] The Workgroup believes that standardization of practices and reporting will support this practice through reduced inconsistency, more reproducible reporting methods, and improved efficiency.

In keeping with this principle, the Workgroup opted not to include any kind of scoring system in standardized biopsy reporting, as a biopsy should provide characteristic information, not determine organ quality.[66] After review, the Workgroup chose not to base the standardized report on the Banff Histopathological Consensus criteria, as they determined these criteria were established to standardize histological assessment in terms of organ viability, not to provide baseline graft characteristics.[67] The Workgroup determined the Banff criteria variables in context of this assessment for rejection are not applicable to standardization of biopsy reporting focused on baseline characteristic information.[68] However, the Workgroup did opt to include several parameters included in the Banff criteria.[69]

Modifications to the DDR

The Deceased Donor Resignation (DDR) form is part of the Transplant Information Electronic Data Interchange (TIEDI®), which is part of the OPTN data entry system UNet℠. The DDR is a data collection tool for OPOs to electronically submit deceased donor data, providing a record of donor information for all deceased donors. The deceased donor data includes information about donor OPO, donor demographics, organ recovery and preservation, donor serology, intended recipients, and other information. The donor information is utilized to evaluate post-transplant outcomes, monitor potential disease transmission, and evaluate metrics for research and reporting purposes.

[59] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, June 28, 2021.
[60] Ibid.
[61] Ibid.
[62] Ibid.
[63] Ibid.
[64] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, September 14, 2021. https://optn.transplant.hrsa.gov/media/xyab1tvw/20210914_kidney_biopsy_best_practices_-wg_summary.pdf
[65] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, January 25, 2021. https://optn.transplant.hrsa.gov/media/4399/20210125_kidney_biopsy_best_practices_summary.pdf
[66] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, March 22, 2021.
[67] Liapis et al. "Banff Histopathological Consensus Criteria for Preimplantation Kidney Biopsies," *American Journal of Transplantation*, 17 (2017): 140-150
[68] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, June 28, 2021.
[69] Liapis et al. "Banff Histopathological Consensus Criteria for Preimplantation Kidney Biopsies," *American Journal of Transplantation*, 17 (2017): 140-150

In the development of the standardized pathology report, the Workgroup identified misalignment between biopsy data collection in DonorNet and the DDR, which reduces efficiency and could potentially lead to inaccurate or incomplete reporting. [70,71] Acknowledging this, The Committee decided to incorporate the collection of this data into the standardization of reporting in DonorNet and TIEDI.[72] Therefore the Committee proposes several modifications in the DDR that will align biopsy data collection for future use.

Table 3 outlines the proposed modifications to the DDR.

Table 3: Proposed Modifications to the DDR

Data Element	Current State	Proposed Changes
Biopsy Type	Type of biopsy – Needle, Wedge, or Other Specify (open text field)	Biopsy Type – Needle, Wedge
Tissue Preparation Technique	Field not present in current state	Tissue Preparation Technique – Frozen Section, Formalin-Fixed Paraffin-Embedded Section (FFPE)
Number of Glomeruli	Number of Glomeruli Visualized – Numeric field response	Number of Glomeruli – numeric field response
Number of Globally Sclerotic Glomeruli	Field not present in current state	Number of Globally Sclerotic Glomeruli - Numeric field response
Percent Globally Sclerotic Glomeruli	Glomerulosclerosis percentage – 0-5%, 6-10%, 11-15%, 16-20%, greater than 20%, indeterminate	Percent Globally Sclerotic Glomeruli – percentage field response
Nodular Mesangial Glomerulosclerosis	Field not present in current state	Nodular Mesangial Glomerulosclerosis – absent, present, or unknown
Interstitial Fibrosis	Interstitial Fibrosis – absent, minimal, mild, mild-moderate, severe, unknown	Interstitial Fibrosis and Tubular Atrophy – less than 5%, 5-10%, 11-25%, 26-50%, greater than 50%
Vascular Disease (Percent Luminal Narrowing of the Most Severely Involved Vessel)	Vascular Changes – absent, minimal, mild, mild-moderate, severe, unknown	Vascular Disease (Percent Luminal Narrowing of Most Severely Involved Vessel – None (<10%), Mild (10-25%), Moderate (26-50%), Severe (>50%)
Cortical Necrosis	Field not present in current state	Cortical Necrosis – Absent, Present with numeric percentage field
Fibrin Thrombi	Field not present in current state	Fibrin Thrombi – Absent, Present with numeric percentage field

[70] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, April 20, 2021. https://optn.transplant.hrsa.gov/media/4608/20210420_kidney_biopsy_best_practices_-wg_summary.pdf
[71] OPTN Kidney Committee Meeting Summary, November 15, 2021.
[72] OPTN Kidney Committee Biopsy Best Practices Workgroup Meeting Summary, October 25, 2021.

Compliance Analysis

NOTA and OPTN Final Rule

The OPTN Kidney Committee submits this project for consideration under the authority of NOTA 42 USC 247(b)(2)(E), which requires that the OPTN shall "adopt and use standards of quality for the acquisition and transportation of donated organs" as well as under the authority of OPTN Final Rule §121.6(a), which states that those OPTN members procuring organs are responsible for "laboratory tests and clinical examinations of potential organ donors… to determine any contraindications for donor acceptance, in accordance with policies established by the OPTN." This project sets a standard of quality for the acquisition of donated organs by standardizing information provided in biopsy results to include information regarding both biopsy sampling quality and pathologic organ characteristics. This project will also standardize reporting of biopsy data, which provide critical donor, organ, and offer evaluation information.

Furthermore, NOTA authorizes the OPTN to "collect, analyze, and publish data concerning organ donation and transplants,"[73] and the OPTN Final Rule, which states that the OPTN shall "(i) Maintain and operate an automated system for managing information about transplant candidates, transplant recipients, and organ donors… "(ii) Maintain records of all transplant candidates, all organ donors and all transplant recipients; [and] (iii) Operate, maintain, receive, publish, and transmit such records and information electronically…"[74] The Final Rule also requires OPOs and transplant hospitals "as specified from time to time by the Secretary, to submit to the OPTN...information regarding transplantation candidates, transplant recipients, [and] donors of organs…"[75] " This project manages and maintains information about organ donors by standardizing and streamlining the reporting of biopsy results, which provide key kidney donor information used in kidney allocation and offer evaluation.

OPTN Strategic Plan

This proposal aligns with the following strategic goals:

- *Increase the number of transplants:*
- *Promote the efficient management of the OPTN*

The primary strategic goals for this project are to promote the efficient management of the OPTN and increase the number of transplants through efficient donor and recipient matching. This proposal will standardize biopsy reporting, and therefore reduce inconsistencies in quality and comprehensiveness of biopsy analysis and improve reproducibility and reliability, increasing both allocation and offer acceptance efficiency. Improvements in donor and recipient matching efficiency and quality of offer information can improve placement of organs and decrease organ discards, resulting in an increase in the number of transplants. This proposal promotes the efficient management of the OPTN by reducing inconsistencies in analysis and reporting and aligning biopsy data collection across UNet systems.

OPTN Data Collection Principles

This proposal aligns with the following OPTN Data Collection Principles:

- Develop transplant, donation, and allocation policies

[73] 42 U.S.C. §274(b)(2)(I)
[74] 42 C.F.R. §121.11(a)(1)(i)-(iii)
[75] 42 C.F.R. §121.11(b)(2)

- Ensure patient safety when no alternative sources of data exist
- Fulfill the requirements of the OPTN Final Rule
- Determine member-specific performance

This proposal will standardize and formalize biopsy reporting to improve donor information used to inform offer evaluation and appropriate recipient placement, thereby aligning with the development of transplant, donation, and allocation policies. This proposal also addresses the current absence of centralized, uniform, and granular biopsy results reporting, which will provide information that could impact recipient placement and clinical care post-transplant. This data will also be used to inform member-specific performance, as the Scientific Registry of Transplant Recipients adjusts OPO and transplant program outcomes for biopsy findings.

Implementation Considerations

Member and OPTN Operations

Operations affecting Organ Procurement Organizations

OPO staff will need to ensure their pathologists report biopsy results per the standardized report, through request or the provision of sample forms. There could be an increase in administrative burden with additional data fields required on the DDR and in DonorNet. However, some of this administrative burden may be mitigated by the alignment of biopsy reporting on the DDR and in DonorNet, as OPO staff will not need to interpret the results of a biopsy read to determine which parameters and responses should be reported via the DDR biopsy fields. Implementation time may be necessary to train and educate staff.

Operations affecting the OPTN

This proposal will require programming in UNet℠. Feedback received on the proposed data elements will be taken into consideration for final decisions on programming efforts.

This proposal requires the submission of official OPTN data that are not presently collected by the OPTN or collected in a different format. The OPTN Contractor has agreed that data collected pursuant to the OPTN's regulatory requirements in §121.11 of the OPTN Final Rule will be collected through OMB approved data collection forms. Therefore, after OPTN Board approval, the modifications to the DonorNet data collection and DDR forms will be submitted for OMB approval under the Paperwork Reduction Act of 1995. This will require a revision of the OMB-approved data collection instruments, which may impact the implementation timeline.

The OPTN plans to distribute educational materials, and is seeking to release a sample pathology report for OPO use and integration into current procurement kidney pathology practices.

Operations affecting Transplant Hospitals

Transplant hospitals and offer-evaluating clinicians and staff should review and understand the information provided in the standardized biopsy report. The standardized, streamlined form should improve efficiency in offer evaluation, as biopsy information is provided in a more consistent fashion. Minimal implementation time is necessary to educate staff.

Operations affecting Histocompatibility Laboratories

This proposal is not anticipated to affect the operations of Histocompatibility Laboratories.

Potential Impact on Select Patient Populations

This proposal is not expected to have impact to any specific patient populations. Impacts from improvements in allocation efficiency and streamlined communication are expected to affect patient populations in equal measure.

Projected Fiscal Impact

This proposal is projected to have a fiscal impact on the OPTN and transplant hospitals and organ procurement organizations, but it is not anticipated to have any fiscal impact on histocompatibility laboratories.

Projected Impact on Organ Procurement Organizations

Many OPOs have biopsy reporting in donor EMRs, and there could be IT implementation costs associated with reformatting donor EMRs. There may be nominal implementation costs to re-program additional fields for data capture. The data fields are located directly in UNet, and some OPOs upload into UNet via API. These OPOs may need to work to get data captured properly in their primary system so it migrates directly for data capture.

This will have ongoing effects on work flow by requiring additional data entry into DonorNet and the DDR on biopsy results. OPOs will need to supplement communication with pathologists to provide the appropriate standardized form and/or include the required information. OPOs may need to rework received pathology reports that do not incorporate the standardized elements at initial release.

The OPTN Financial Impact Group believes this proposal will take approximately 6-12 months to implement depending on the donor EMR and interfacing utilized. It is challenging to approximate an ongoing annual cost impact as access to pathology services vary, with no standard or system-wide format, process, or EMR for reporting biopsies.

This proposal may produce standardized values that can prevent additional biopsies and potentially rework needed to obtain follow-up additional information, leading to potential long-term cost savings. This process may result in a long-term savings of staff time if data is consistent and easily readable with standardized documentation requirements.

Projected Impact on Transplant Hospitals

There will be implementation costs associated with education of transplant center staff on the standardized biopsy data elements, what they capture, and related education on biopsy in holistic review of donor kidney organ offer.

Standard documentation can improve offer evaluation efficiency by ensuring that all necessary and relevant information is conveyed to the transplant team.

Projected Impact on the OPTN

Preliminary estimates indicate that this will be a large effort, and more than 1,100 hours may be needed for IT programming, communications, educational efforts, and post-implementation monitoring.

Projected Impact on Histocompatibility Laboratories

There is no projected impact on Histocompatibility Laboratories.

Post-implementation Monitoring

Member Compliance

This proposal will not change current routine monitoring of OPTN members. Site surveyors will continue to review a sample of deceased donor medical records, and any material incorporated into the medical record by reference, to verify that data reported in UNet℠ on the DDR are consistent with source documentation.

Policy Evaluation

The policy will be monitored six, 12, and 24 months post-implementation. The following metrics, and any subsequently requested by the committee, will be evaluated as data become available. Appropriate lags will be applied, per typical UNOS conventions, to account for time delay in institutions reporting data to UNet and compared to an appropriate pre-policy cohort to assess performance before and after implementation of this policy.

- Counts and percents of biopsied deceased donor kidneys by:
    - Biopsy type
    - Tissue preparation technique
    - Number of glomeruli observed
    - Percent glomerular sclerosis
    - Interstitial fibrosis
    - Tubular atrophy
    - Vascular disease
    - Cortical necrosis
    - Fibrin thrombi

Conclusion

This proposal addresses one aspect of the Policy Oversight Committee's priority to improve standardization of procurement kidney biopsies by standardizing biopsy reporting. This proposal will standardize biopsy reporting by establishing a standard set of biopsy parameters and appropriate responses required to be reported when a procurement kidney biopsy is performed.

The proposed biopsy parameters are critical to inform organ offer evaluation and appropriate placement, balancing the granularity required by evaluating clinicians and that which pathologists of varying renal-specific experience are able to provide, focusing on reproducibility, reliability, and clarity.

The proposed standardization will reduce inconsistencies in comprehensiveness and reporting, and help improve reliability, and so help increase allocation efficiency.

This proposal will update DonorNet® Organ Data information collection and the DDR in TIEDI®, to improve biopsy information reporting and biopsy data collection, respectively.

The Committee submits this proposal under the principle that procurement renal biopsies should be utilized to help determine whether a patient will receive the most benefit from an organ, in context with other donor and organ information. The Committee believes that standardization of biopsy practice and reporting will support this practice through reduced inconsistency, more reliable reporting methods, and improved efficiency.

The Committee encourages all interested individuals to comment on this proposal in its entirety, but specifically asks for feedback on the following:

1. Is the form universally understandable and sufficiently useable?
2. Is aligning biopsy data collection in the DDR with updates in DonorNet sensible and appropriate? How will this impact administrative data burden?
3. Is Nodular Mesangial Glomerulosclerosis an appropriate parameter to include? Should this parameter be quantified, or is simple indication of Nodular Mesangial Glomerulosclerosis appropriate?
4. Are the response categories for each parameter sufficiently granular to provide adequate, reliable information to evaluating clinicians?
5. How can this form best be operationalized for OPO use? Would provision of a PDF sample form ease implementation?

Proposed Changes to Biopsy Data in DonorNet and the DDR.

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.

Proposed Modifications to DonorNet® Data Collection

Data Element	Current State	Proposed Changes
Biopsy Type	Biopsy type – Needle, Wedge	No proposed changes
Tissue Preparation Technique	Field not present in current state	Response options include Frozen Section, Formalin-Fixed Paraffin-Embedded Section (FFPE)
Number of Glomeruli	Glomeruli count – numeric field response	Number of Glomeruli – numeric field response
Number of Globally Sclerotic Glomeruli	Field not present in current state	Response options include a numeric field
Percent Globally Sclerotic Glomeruli	Percent Glomerulosclerosis – numeric percentage field	Percent Globally Sclerotic Glomeruli – numeric percentage field
Nodular Mesangial Glomerulosclerosis	Field not present in current state	Nodular Mesangial Glomerulosclerosis – absent, present, unknown
Interstitial Fibrosis and Tubular Atrophy (IFTA)	Field not present in current state	Interstitial Fibrosis and Tubular Atrophy – less than 5%, 5-10%, 11-25%, 26-50%, greater than 50%
Vascular Disease (Percent Luminal Narrowing of the Most Severely Involved Vessel)	Field not present in current state	Vascular Disease (Percent Luminal Narrowing of the Most Severely Involved Vessel) – None (<10%), Mild (10-25%), Moderate (26-50%), Severe (>50%)
Cortical Necrosis	Field not present in current state	Cortical Necrosis – absent, present with numeric percentage field
Fibrin Thrombi	Field not present in current state	Fibrin Thrombi – absent, present with numeric percentage field

Proposed Data Elements and Definitions

Data Element	Current Definition	Proposed Changes
Biopsy	The process of removing tissue from patients for diagnostic examination	No proposed changes
Biopsy Type	No definition present in current state	The method by which tissue is removed from the patient for diagnostic examination
Tissue Preparation Technique	No definition present in current state	The method by which biopsy material is prepared for histologic examination
Number of Glomeruli	No definition present in current state	The total of all glomerular capillary tufts in the sample, include sclerotic and non-sclerotic tufts
Number of Globally Sclerotic Glomeruli	Field not present in current state	The number of glomeruli exhibiting global (complete) collapse of glomerular capillary walls and consolidation of the glomerular tuft by extracellular matrix, causing capillary luminal obliteration
Percent Globally Sclerotic Glomeruli (Percent Glomerulosclerosis)	The percentage of sclerosis (or hardening) of the glomeruli calculated on biopsy. This pathology usually commences in the juxtamedullary glomeruli and gradually spreads to involve other parts of the kidney, eventually causing kidney failure	The percentage of glomeruli exhibiting global (complete) collapse of glomerular capillary walls and consolidation of the glomerular tuft by extracellular matrix, causing capillary luminal obliteration
Nodular Mesangial Glomerulosclerosis	Field not present in current state	Rounded accumulation of collagenous matrix expanding one or more mesangial areas
Interstitial Fibrosis (IF)	No definition present in current state	The accumulation of fibrous tissue between the tubules
Tubular Atrophy (TA)	Field not present in current state	Shrinkage of tubules with variable thickening of the tubular basement membrane and flattening of the tubular epithelium
Vascular Disease	No definition present in current state	Fibrous thickening and/or hyalinosis of the intima of arteries and/arterioles
Percent Luminal Narrowing	Field not present in current state	The reduction in diameter of vessel lumens owing to vascular disease

Data Element	Current Definition	Proposed Changes
Cortical Necrosis	Field not present in current state	Deaths of cortical cells, typically affecting all three tissue compartments
Fibrin Thrombi	Field not present in current state	Capillary lumen aggregate of coagulated blood containing fibrin and platelets, with or without entrapped cellular elements

Proposed Modifications to the DDR

Data Element	Current State	Proposed Changes
Biopsy Type	Type of biopsy – Needle, Wedge, or Other Specify (open text field)	Biopsy Type – Needle, Wedge
Tissue Preparation Technique	Field not present in current state	Tissue Preparation Technique – Frozen Section, Formalin-Fixed Paraffin-Embedded Section (FFPE)
Number of Glomeruli	Number of Glomeruli Visualized – Numeric field response	Number of Glomeruli – numeric field response
Number of Globally Sclerotic Glomeruli	Field not present in current state	Number of Globally Sclerotic Glomeruli - Numeric field response
Percent Globally Sclerotic Glomeruli	Glomerulosclerosis percentage – 0-5%, 6-10%, 11-15%, 16-20%, greater than 20%, indeterminate	Percent Globally Sclerotic Glomeruli – percentage field response
Nodular Mesangial Glomerulosclerosis	Field not present in current state	Nodular Mesangial Glomerulosclerosis – absent, present, or unknown
Interstitial Fibrosis	Interstitial Fibrosis – absent, minimal, mild, mild-moderate, severe, unknown	Interstitial Fibrosis and Tubular Atrophy – less than 5%, 5-10%, 11-25%, 26-50%, greater than 50%
Vascular Disease (Percent Luminal Narrowing of the Most Severely Involved Vessel)	Vascular Changes – absent, minimal, mild, mild-moderate, severe, unknown	Vascular Disease (Percent Luminal Narrowing of Most Severely Involved Vessel – None (<10%), Mild (10-25%), Moderate (26-50%), Severe (>50%)
Cortical Necrosis	Field not present in current state	Cortical Necrosis – Absent, Present with numeric percentage field
Fibrin Thrombi	Field not present in current state	Fibrin Thrombi – Absent, Present with numeric percentage field