



KIDNEY PRECISION MEDICINE PROJECT



KPMP Overview and Metadata Approach

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Goals of the Kidney Precision Medicine Project

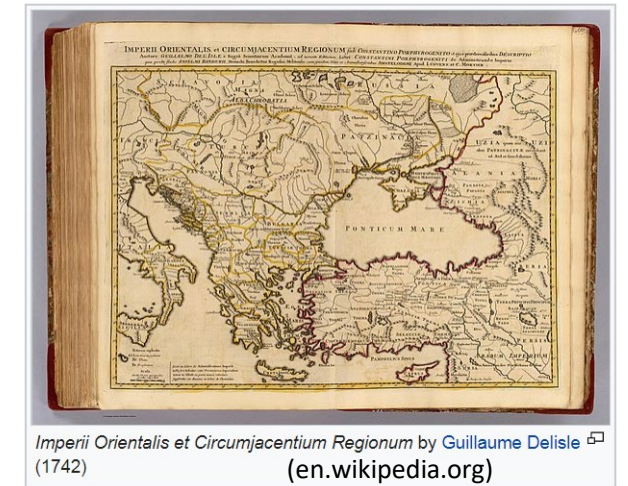
Understand and treat *human* kidney disease

- Ethically and safely obtain **kidney biopsies** from participants with AKIs or CKDs
- Create a **kidney tissue atlas**
- Identify critical cells, **pathways and targets** for novel therapies
- Find disease subgroups to **stratify patients**
- Devise **individualized** treatments
- Improve scientific knowledge base
- Improve pipeline



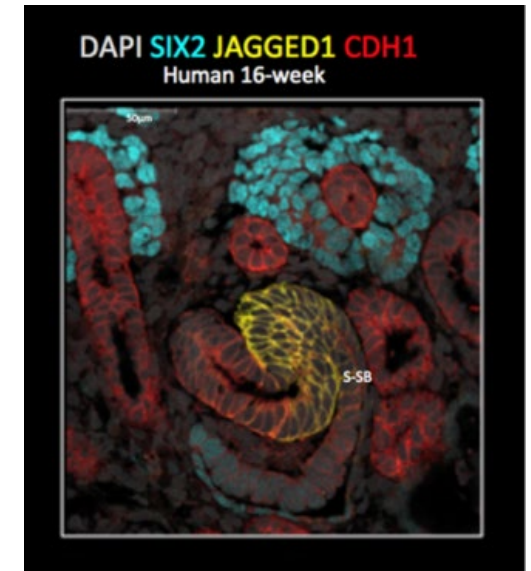
What is an Atlas?

An **atlas** is a collection of **maps**; typically a bundle of maps of the Earth or a region of the Earth. **Maps** show **geographic features** and political boundaries, but can show **geopolitical, social, religious, and economic statistics**.



KPMP **Kidney Tissue Atlas** will have multiple **maps**

- Digital Histology images
- 2D-3D tissue architecture markers (kidney/immune cells, vasculature, *extracellular matrix*, etc.)
- Consensus tissue diagrams
- Cell state markers, pathway markers
- Cell structures (transporters, receptors)
- Cell-cell interactions
- Physiologic characteristics (metabolites, etc.)



Using 4 markers, want 30-40 markers
Tracy Tran (McMahon lab)

How to construct the Kidney Tissue Atlas

Needs to be: Multi-dimensional, Organized / Tagged (Ontology), Open, Accessible, Query-able

Discovery
Validation

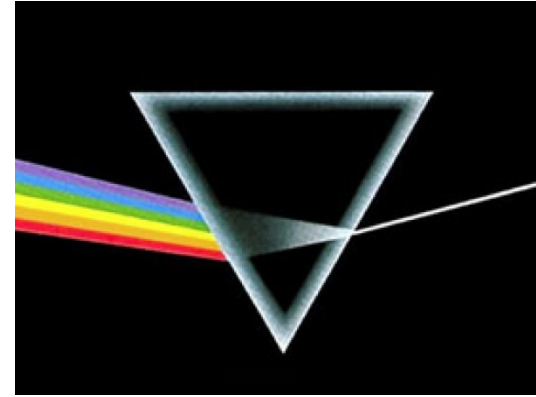
Tissue



What is there?
What is where?
GUDMAP
HuBMAP
Human Cell Atlas

What changed?

Stratify patients
Implementation



Individualized:
Diagnosis
Prognosis
Treatment

Disaggregation
Anchors / Markers
Map to tissue

Correlate with
Clinical outcomes
Model systems

Visual display of spatial data

Stratification markers for clinical decisions

KPMP Sites and Organization

Participant Collaborators

Recruitment Sites (RS)

AKI

Columbia University
John Hopkins - Yale
University of Pittsburgh

CKD

Cleveland Clinic
UT Southwestern
Harvard University

Tissue Interrogation Sites (TIS)

Indiana-OHSU – 3D tissue cytometry & LCM

Broad-Michigan-Princeton– single cell transcriptomics

UCSF-Stanford – tissue mFISH and cytof

UTHSA-PNNL-EMBL – tissue metabolomics

UCSD-Wash U– single nucleus RNAseq & DART-FISH

Central Hub (CH)

Data and sample Coordinating Center (DCC)

- Clinical protocol development and statistical calculations
- Standard clinical assessments
- Collect, curate, aggregate, store, distribute, and ensure quality control

Data Visualization Center (DVC)

- Digital pathology
- Kidney tissue atlas to classify and locate different cell types and interstitial components in health and disease
- Website for sharing

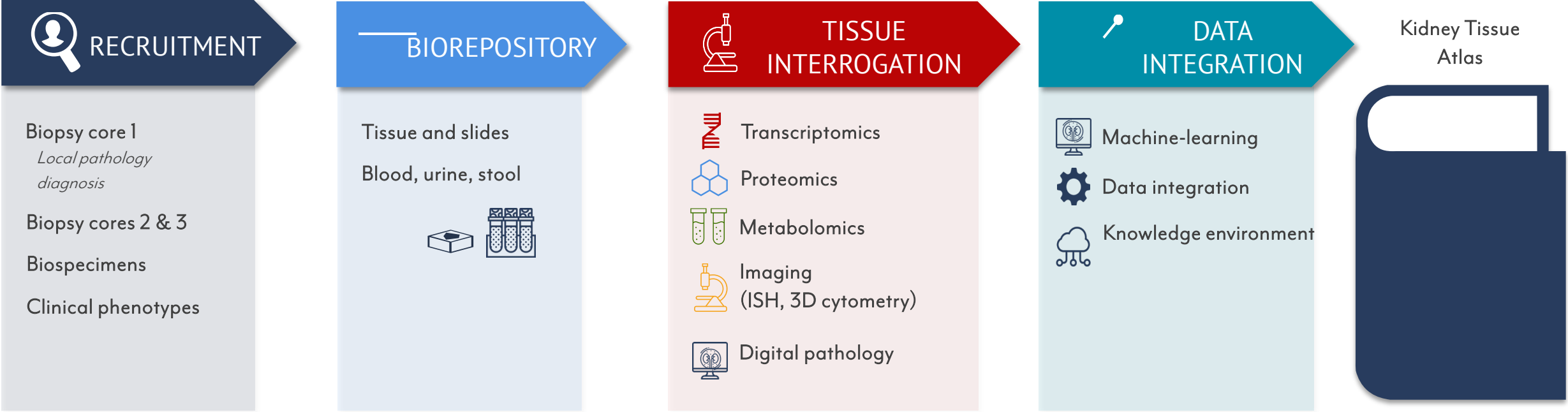
Administrative Core (AC)

- Administrative and meeting support
- Establish working groups
- Patient input and feedback
- Opportunity Pool to form new partnerships

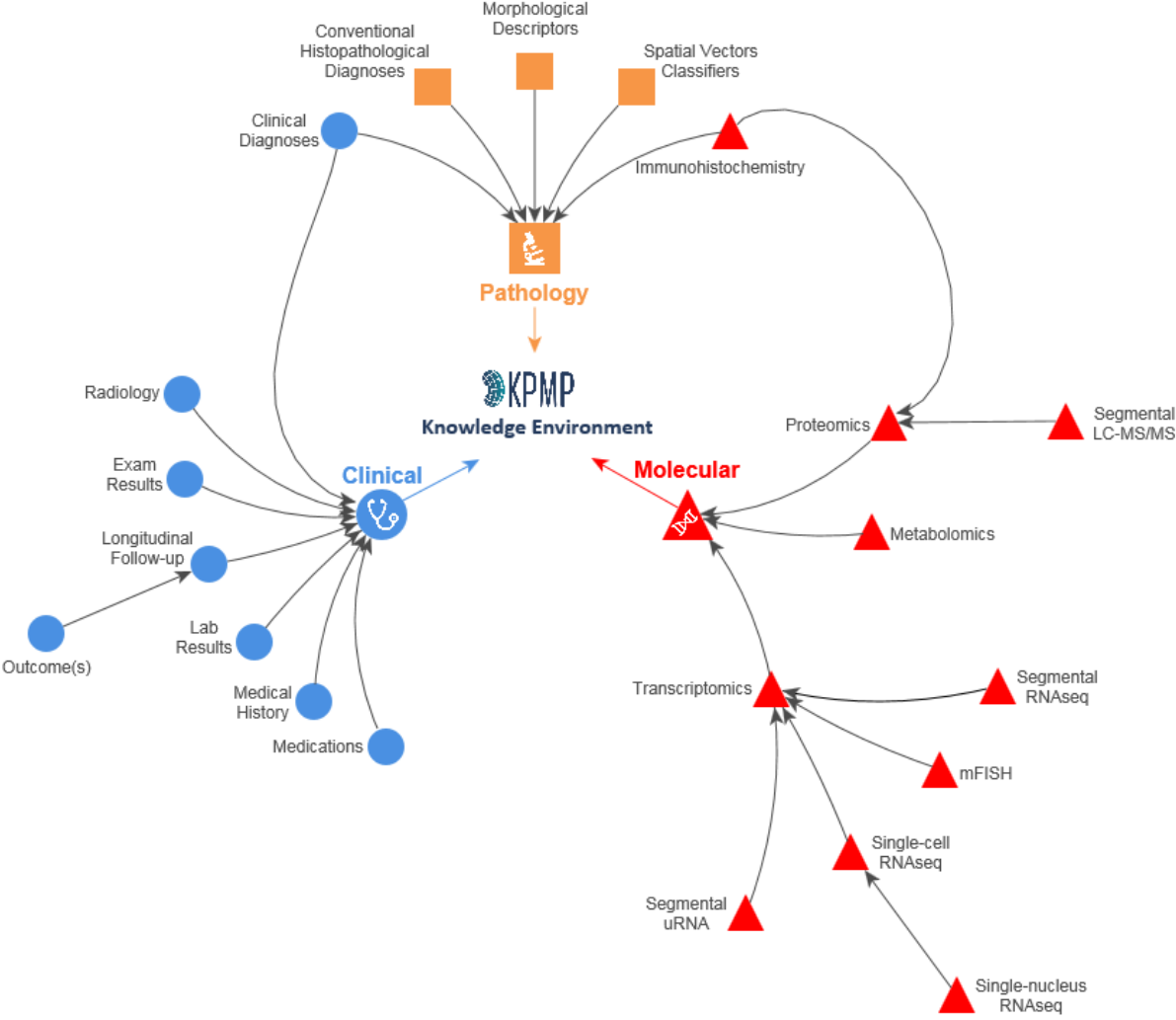
University of Washington, University of Michigan, Mt. Sinai



General KPMP Biospecimen Data Flow



KPMP Data Types



Forms Collecting Patient Related Data

- New Patient
- Eligibility Assessment
- Consent
- Contact Information
- Participant Study Status
- Demographics
- Patient Medical History
- Coordinator Medical History
- Personal History
- Physical Measurements
- AKI Hospitalization
- Patient Reported Outcomes
- Health Literacy Questionnaire
- PROMIS Global Health
- Pre-biopsy Clinical Assessment (investigator & clinician)
- Pre-biopsy Safety
- Kidney Biopsy Procedure Details
- Post Biopsy
- Follow-up Clinical Assessment
- Post Biopsy Hospitalization
- Patient Follow-up
- Laboratory Results
- 6 month Kidney Function Assessment
- Adverse Event Entry



CKD CRFs and Visit Schedule

	SCREENING	ENROLLMENT VISIT 1			BIOPSY VISIT 2	POST BIOPSY			REMOTE VISITS 6, 18, 30, 42, 54m	FOLLOW-UP VISITS 12, 24, 36, 48m
		In clinic	6w pre biopsy	6w pre to 7d post		24 Hr	2w	28d		
Screening Worksheet	X									
New Patient Form	X									
Participant Study Status	X	X			X	X	X	X	X	X
Visit Status		X			X				X	X
Eligibility Assessment		X			X					
Informed Consent		X								
Contact Information		X							X	X
Demographics		X								
Laboratory Results		X							X	X
PROMIS Global Health*		X								X
Health Literacy*		X								X (12MO)
Medical History		X								
Personal History*		X								X
Medications		X							X	X
Physical Measurements		X								X
Biosample Collection		X								X
Blood, spot urine			X							X
Screening blood labs			X							
Timed urine			X							
Stool*				X						
Pre-Biopsy Clinical Assessment			X							
Biopsy Safety Form					X					
Kidney Biopsy Procedure Details					X					
Post biopsy					X					
Tissue tracking					X					
Adverse Events					X	X	X	X		
Post Biopsy Phone Call						X	X	X		
Follow-up Clinical Assessment							X	(X)		
Medical Events							X	X	X	X
Post Bx Hospitalizations							X	X	X	X
Participant Experience Survey								X		

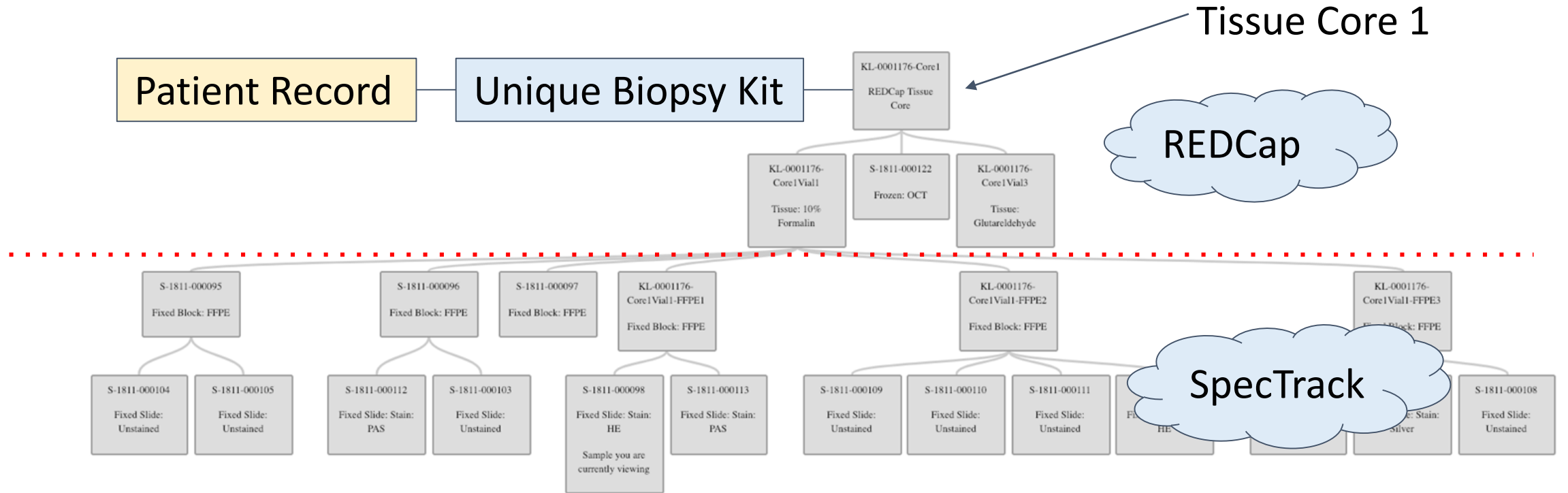
AKI CRFs and Visit Schedule

	SCREENING	ENROLLMENT VISIT #1			BIOPSY VISIT #2	POST BIOPSY			3M AKI VISIT	REMOTE VISITS 6, 18, 30, 42, 55M	FOLLOW-UP VISITS 12, 24, 36, 48M
		IN-CLINIC	48HR PRE	24HR PRE		24, 48, 72H	2W	28D			
Screening Worksheet	X										
New Patient Form	X										
Participant Study Status	X	X			X	X	X	X	X	X	X
Visit Status		X			X				X	X	X
Eligibility Assessment		X			X						
Informed Consent		X									
Contact Information		X							X	X	X
Demographics		X									
AKI Hospitalization		X				Discharge					
Laboratory Results		X							X	X	X
Biosample Collection		X							X		X
Medical History		X							X*		
Personal History		X							X*		X
Medications		X							X	X	X
Physical Measurements		X							X		X
Blood			X			72H			X		X
Screening blood labs			X								
Spot urine						X			X		X
Timed urine/Stool				X							
Pre-Biopsy Clinical Assessment Questionnaire			X								
Biopsy Safety Form					X						
Kidney Biopsy Procedure					X						
Post biopsy					X						
Tissue tracking					X						
Adverse Events					X	X	X	X	X		
Post Biopsy Phone Call							X	X			
Medical Events							X	X	X	X	X
Post Bx Hospitalizations							X	X	X	X	X
Follow-up Clinical Assessment							X	(X)			
Participant Experience Survey								X			
AKI Kidney Function Assessment									X	X (6MO)	
PROMIS Global Health									X		X
Health Literacy									X		X (12 MO)

Forms for Specimen Tracking

- Tissue Tracking
- Pathology Images Upload
- Dx Core QC
- Dx Core Disease Categories
- Central Path Quality Metrics Assessment Dx Core
- Central Path Quality Metrics Assessment Interrogation Core
- Biosample-Blood
- Biosample-Spot Urine
- Biosample-Time Urine
- Biosample-Stool
- Biosample-Blood AKI

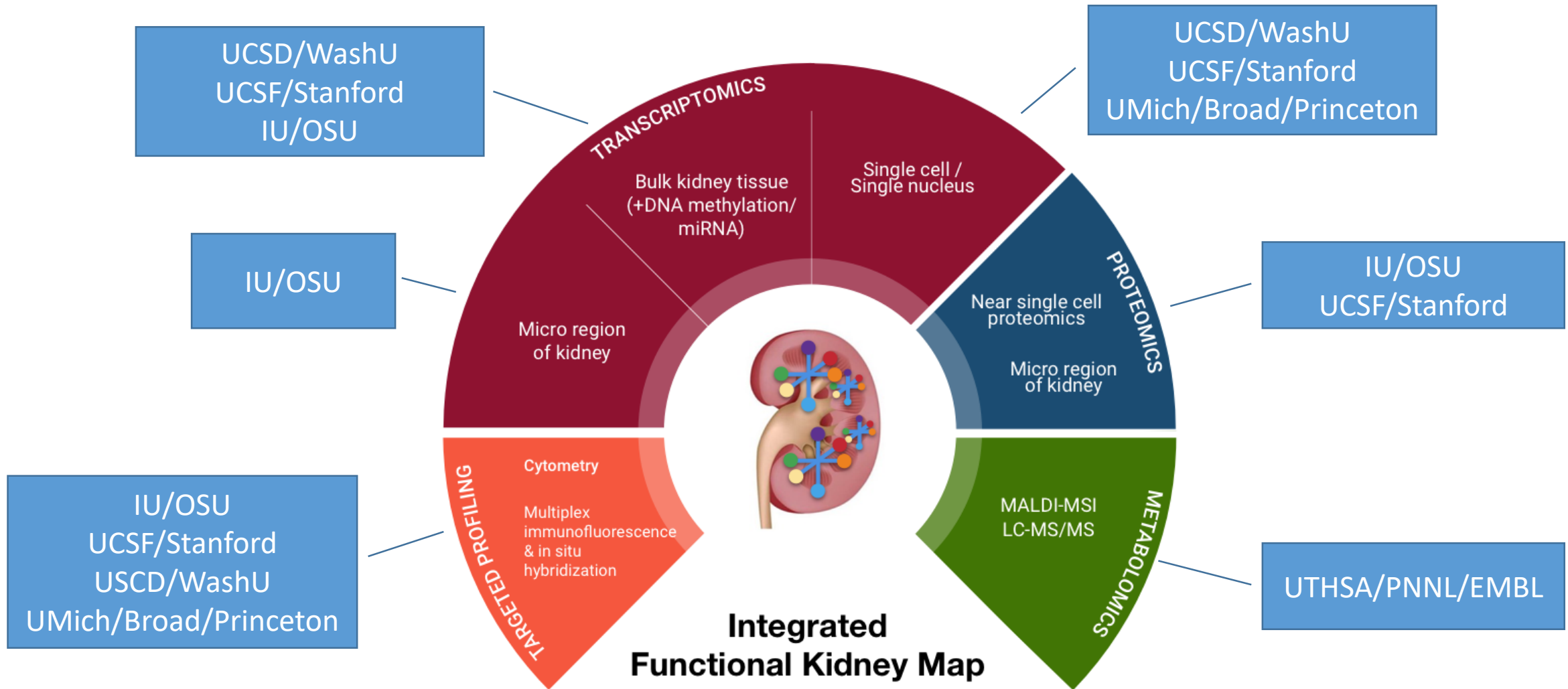
KPMP Sample Tracking



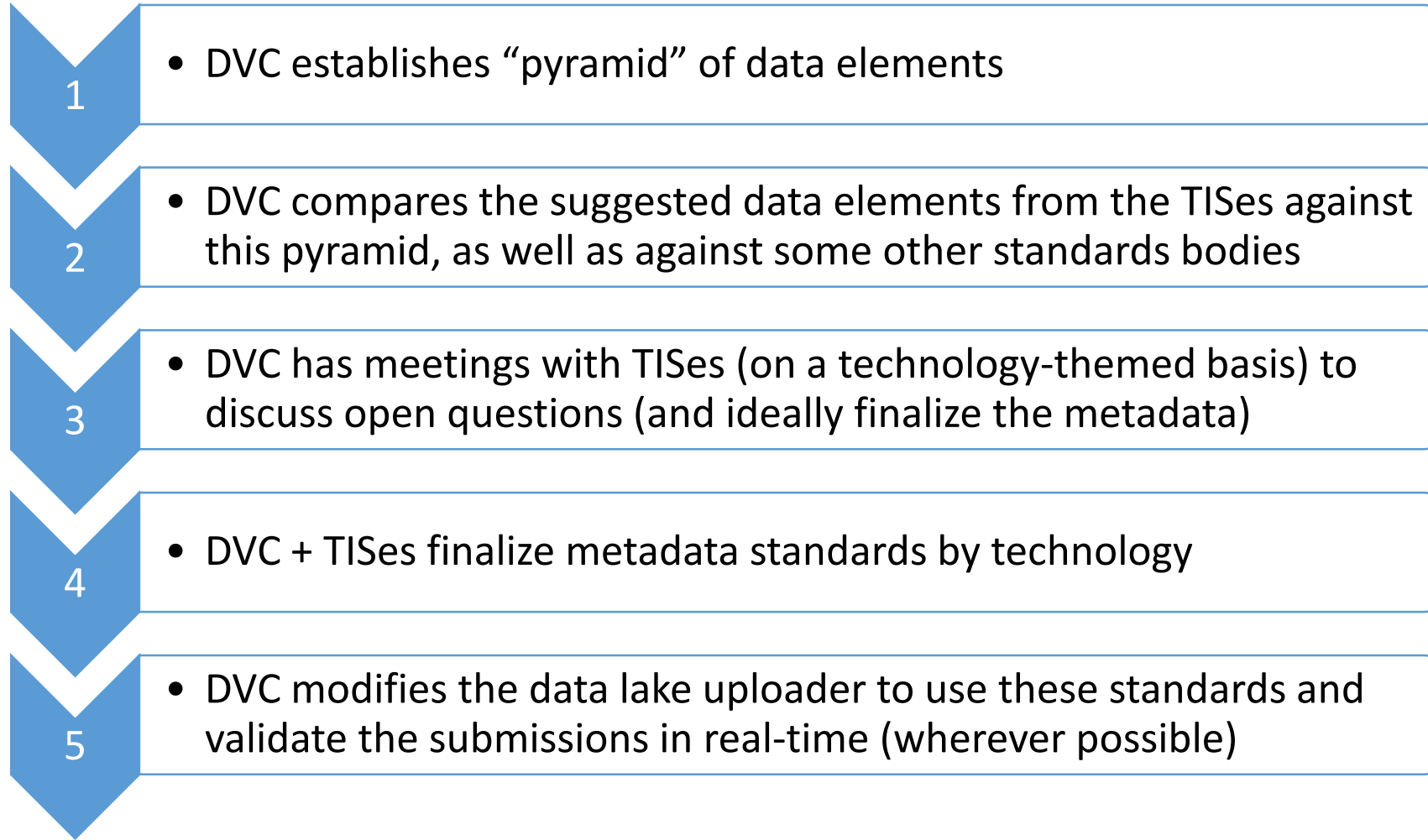
SpecTrack Role:

- Track all specimens/derivatives/aliquots created and maintain hierarchical relationship back to patient
- Track common sample metadata for derivatives such as sample type and creation date and type specific metadata: level (slide) volume (aliquot)
- Track shipment and receipt information as specimens move from site to site including shipment and sample QC (temp, damage)

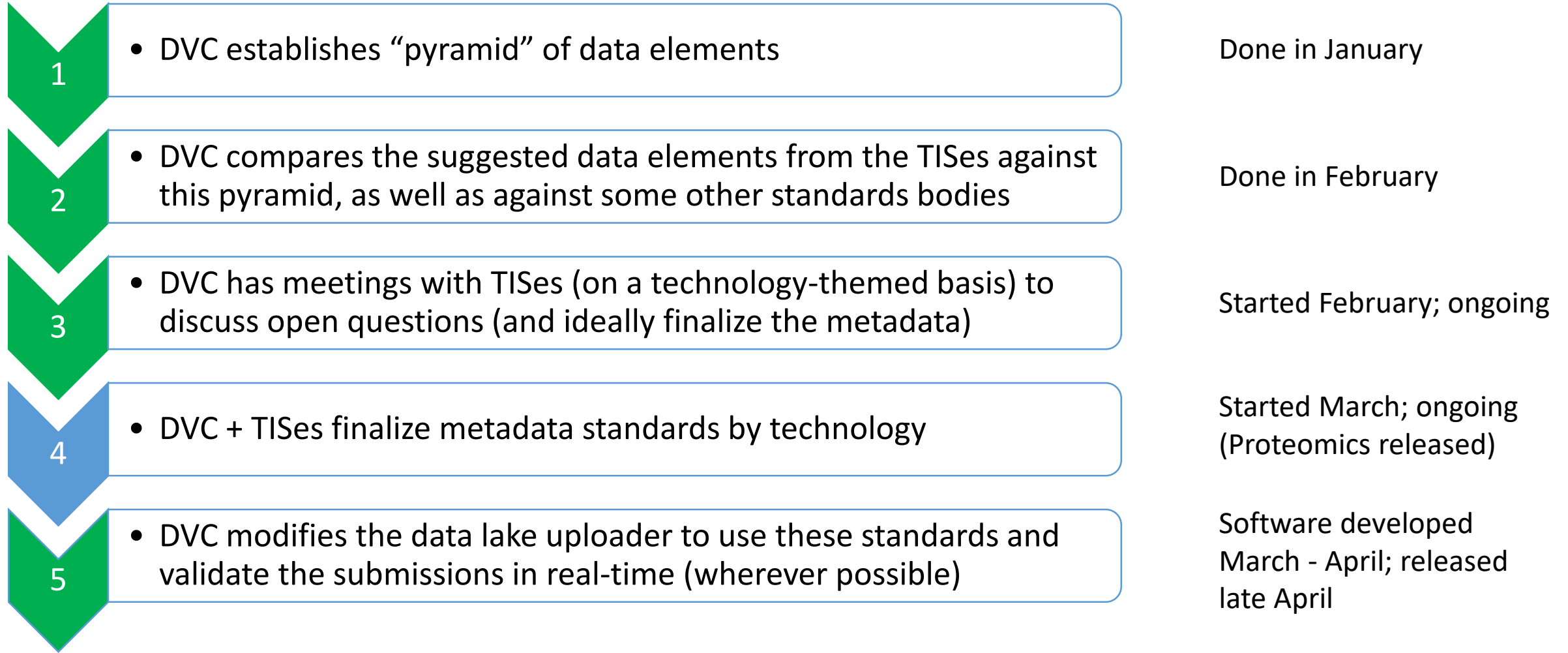
Tissue Interrogation Site Data Types



Process Overview



Details on Current Status



Data Lake Uploader Tie-in

Metadata Module	Property	Bulk Proteomics	Sub-segmental Proteomics	Near-single-cell Proteomics	Property Type	Required?	Validations?	Linked With	Display When
Tissue Processing	Type of Tissue Sectioned	N	Y	Y					
Tissue Processing	Tissue Sectioning Date	N	Y	Y					
Tissue Processing	Tissue Processing Instrument	N	Y	Y					
Tissue Processing	Tissue Processing Instrument Software / Version	N	Y	Y					
Tissue Processing	Tissue Segmentation / Dissociation Date	N	Y	Y					
Tissue Processing	Marker Used for Dissection	N	Y	Y					
Tissue Processing	Area Dissected / Processed (Square Microns)	N	Y	Y					
Tissue Processing	Calculated Volume Dissected / Processed	N	Y	Y					
Tissue Processing	Calculated Volume Dissected / Processed Units	N	Y	Y					
Tissue Processing	Tissue Processing Comments	N	Y	Y					
Protein Extraction & Digestion	Tissue Protein Extraction Date	Y	Y	Y					
Protein Extraction & Digestion	Was Digestion Standard Used	Y	Y	Y					
Protein Extraction & Digestion	Digestion Enzyme	Y	Y	Y					
Protein Extraction & Digestion	Digestion Buffer	Y	Y	Y					
Protein Extraction & Digestion	Protein Yield	Y	Y	Y					
Protein Extraction & Digestion	Protein Yield Unit	Y	Y	Y					
Protein Extraction & Digestion	Protein Reduction Agent	Y	Y	Y					
Protein Extraction & Digestion	Alkylation Agent	Y	Y	Y					
Protein Extraction & Digestion	Was Automation Used	Y	Y	Y					
Protein Extraction & Digestion	Automation Method	Y	Y	Y					
Protein Extraction & Digestion	Sample Clean-up Method	Y	Y	Y					
Protein Extraction & Digestion	Protein Extraction & Digestion Comments	Y	Y	Y					
Mass Spectrometry	Spectrometry Center	Y	Y	Y					
Mass Spectrometry	MS Instrument	Y	Y	Y					
Mass Spectrometry	MS Instrument Software / Version	Y	Y	Y					
Mass Spectrometry	Spectrometry Date	Y	Y	Y					
Mass Spectrometry	Ionization Method	Y	Y	Y					
Mass Spectrometry	LC Instrument	Y	Y	Y					
Mass Spectrometry	LC Column	Y	Y	Y					
Mass Spectrometry	LC Column Flow Rate	Y	Y	Y					
Mass Spectrometry	Internal Calibration Standard	Y	Y	Y					

Tissue Processing

Type of Tissue Sectioned *

Tissue Sectioning Date *

Tissue Processing Instrument *

Tissue Processing Instrument Software / Version *

Tissue Segmentation / Dissociation Date *

Marker Used for Dissection *

Area Dissected / Processed (Square Microns) *

Calculated Volume Dissected / Processed *

Calculated Volume Dissected / Processed Units *

Tissue Processing Comments

Protein Extraction & Digestion

Tissue Protein Extraction Date *

Was Digestion Standard Used *

Digestion Enzyme *

Digestion Buffer *

Protein Yield *

Protein Yield Unit *

Protein Reduction Agent *

Alkylation Agent *

Was Automation Used *

Immediate Next Steps

- Continue finalizing metadata standards for each technology
 - Requires working through some sticky issues
- Continuing rolling out those standards in the data lake uploader
- Publish the standards on our <https://kpmp.org/researcher-resources/> page

Questions?