

# LSU Integrated Musculoskeletal Biobank (LIMB)

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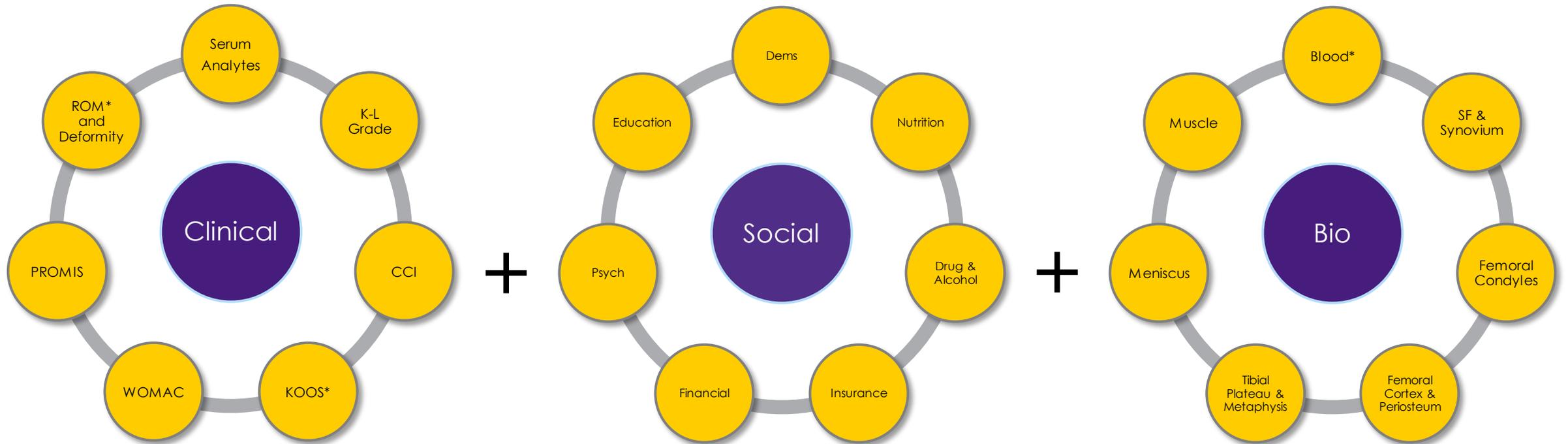
# Objectives

- ▶ Integration of clinical measures, social parameters, and medical history with blood and tissue samples collected from affected anatomical sites in patients afflicted with musculoskeletal disease
- ▶ Answer clinical and basic science questions that account for biological and environmental variables in relation to:
  - ▶ Disparities in disease severity and progression
  - ▶ Disparities in surgical outcomes
  - ▶ Effectiveness, efficiency, and safety of novel interventions
    - ▶ Biologicals
    - ▶ Surgical techniques
    - ▶ Pre- and post-operative therapeutic strategies

# What is the LIMB?

- ▶ Central repository of de-identified samples and data currently approved by the IRB for sample collection from patients with osteoarthritis (OA) undergoing total knee arthroplasty (TKA).
- ▶ Standardized collection and preservation of most knee components during TKA by fellowship-trained arthroplasty surgeons
- ▶ Comprehensive collection of clinical data and validated questionnaires for storage in an encrypted database (RedCAP)
  - ▶ Complete demographics and medical records
  - ▶ Clinical lab results and metrics of knee function
  - ▶ Health indices and surveys
  - ▶ Results from assays executed in various research labs

# Three comprehensive buckets



\* Collected pre- and post-op

Collection target:  
1000 patients

Patient Characteristics		N
Sex	Female	199
	Male	95
Race/Ethnicity	Black	107
	White	166
	Hispanic	8
	Asian	2
	Other	11
Age	<50	9
	50-65	193
	>65	92
BMI	<25	22
	25-35	151
	>35	121
K-L Score	1-3	56
	4	238
Deformity	Normal	30
	Varus	188
	Valgus	76

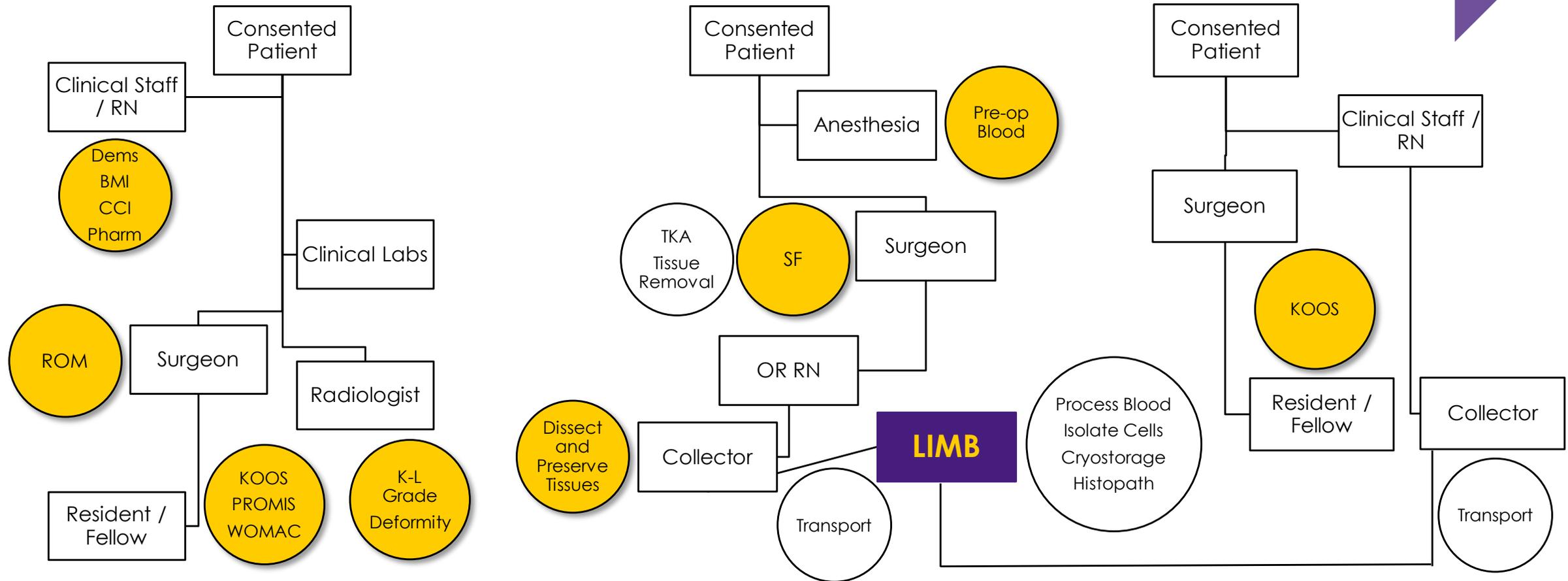


# Seamless flow by a dedicated team

Pre-op visit

TKA

3-month post-op



# Standardized sample processing and storage

Compartment	Sample Type	Status
Pre-op Systemic	Blood Serum	Frozen*
	Blood Plasma	Frozen*
	Blood PBMCs	Frozen**
3m Post-op Systemic	Blood Serum	Frozen*
	Blood Plasma	Frozen*
	Blood PBMCs	Frozen**
Articular	Medial Femoral Condyle	Formalin-fixed, Paraffin Block, Frozen*, Frozen**
	Lateral Femoral Condyle	Formalin-fixed, Paraffin Block, Frozen*
	Tibial plateau	Formalin-fixed, Paraffin Block, Frozen*
	Anterior Meniscus	Paraffin Block, Frozen*
	Posterior Meniscus	Paraffin Block, Frozen*
Near Bone Shaft	Femoral Cortex	Frozen*
	Femoral Periosteum	Frozen**
	Tibial Metaphysis / Marrow	Frozen**
Joint Capsule	Synovial Fluid	Frozen*
	Synovium	Formalin-fixed, Paraffin Block, Frozen*, Frozen**
Intra-articular	Articularis Genu	Formalin-fixed, Paraffin Block, Frozen*

\*cryopreserved at -135°C in LN<sub>2</sub> (vapor phase)

\*\* cryopreserved in freezing media at -135°C in LN<sub>2</sub> (vapor phase) for tissue culture



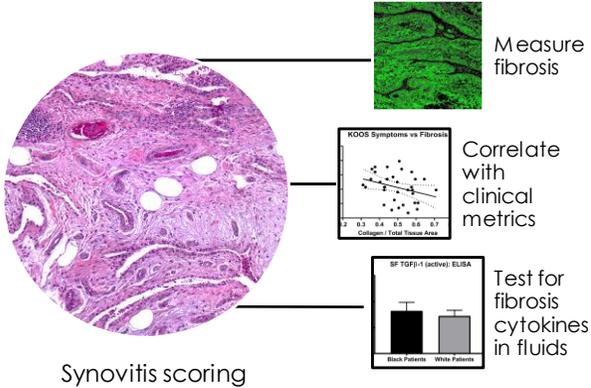
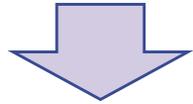
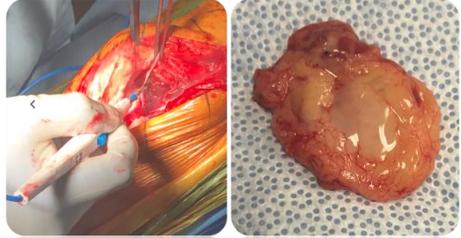
Analysis Target	Assay	Output
Cartilage / Synovium / Periosteum	Tissue culture	Cells for profiling and testing biologicals
Tissue / Cells - Pathology	H&E stained tissue sections Safranin O stained tissue sections Picrosirius Red stained tissue sections	Semi-quantitative OA severity scores Semi-quantitative OA severity scores Semi-quantitative synovitis scores Fibrosis measurements
Tissue / Cells - Microscopy	Immunoperoxidase (tissue) Immunofluorescence (tissue/cells)	Qualitative protein detection in situ Qualitative and quantitative protein detection
Bone	Brightfield Deconvolution Confocal Laser Capture Microdissection	Semi-quantitative Quantitative detection of proteins Quantitative detection proteins Contactless tissue isolation for RNA extraction
Synovial Fluid / Serum	$\mu$ CT Reference point indentation	Mineral density measures Strength measures
Tissue / Cells - Molecular	Protein multiplex against ~17 analytes	Quantitative protein analysis
	RT-PCR Next generation sequencing In-gel near infrared western blot	Quantitative gene expression Quantitative gene expression Quantitative protein expression

# Multiple assays and analyses



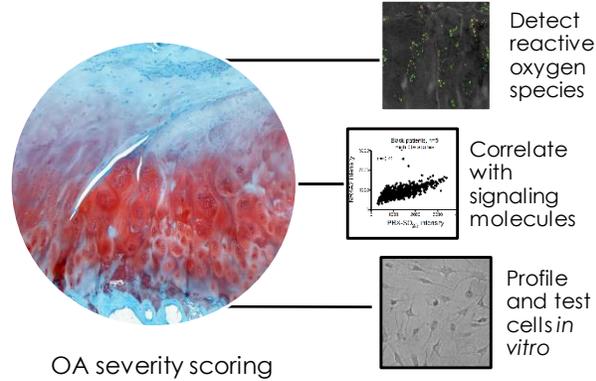
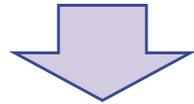
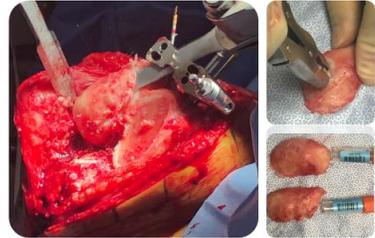
# Sample studies

## Medial suprapatellar synovium



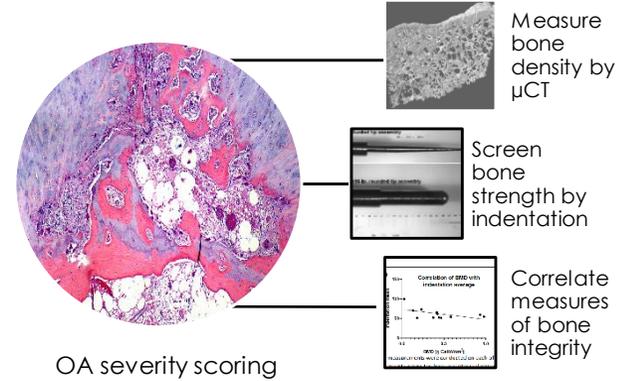
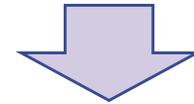
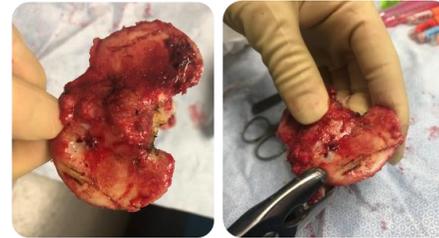
Hodgeson et al. Racial differences in severity of synovial fibrosis in patients with knee osteoarthritis. Submitted to JOR 10/2020.

## Femoral condyles



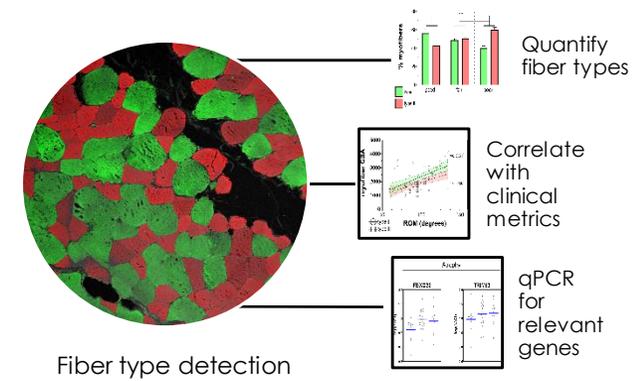
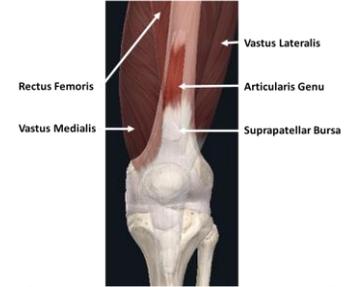
Mix et al. Oxidative stress induces nuclear receptor 4A2 in human articular chondrocytes. OA and Cartilage. 2019

## Tibial plateau



Valentino et al. Is Poor Bone Quality Associated with Pain after Total Knee Arthroplasty (TKA)? ORS 2020

## Intra-articular muscle



Crawford et al. Using the Articularis Genu to test peri-articular muscle health during knee osteoarthritis. ORS 2021

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