		Client Need Statement														
Our client is Dr. Corinne Henak, the principal investigator or eventually delivering real-time knee tissue health informat																
		List of client needs (in their words)														
The manikin must be anatomicaly correct, spanning from m PCL, ACL and meniscus should be included/removed as nu knee. This will ensure the bones to have the proper cartilag																
The ligaments/tendons should function to exist and hold int																
The project should be split into divisions: oxygen control sy																
Hard anatomical elements, like bone, should be 3D printed																
Cartilage from the femoral side should be included, however																
The manikin is intended to be reusable, however reusability																
As patient variability impacts the anatomy of the knee whic year old small woman to a large 40 year old man																
Specifically, the proximal tibia and the distal femur will be in attached to the bones.																
The attachment mechanism of cartilage to bone is currently typically come with parts of bone attached, therefore, stapli The staples must consistently puncture into one hole within																
The hone-cartilage attachment mechanism will resemble th																
to research and find a stainless steel supplement that both																
PBS is corrosive toward brass and copper materials, there biocompatible and supportive toward the system, but is mo																
Mechanical loading of the cartilage is not part of the design	-															
Inadverdent loading during handling of the cartilage is to be	avoided a	s it can damage the samples			1											
		Engineering Specifications														
Specification description Targe	t Unit	Test method	Rank	Met												
		Enclosure														
PBS/irrigating synovial fluid: Media contained																
within the knee model should remain inside and avoid leakage	-	Visual inspection	Must		You could dye th	e fluid and quanti	fy leaks as visual	area of dyed fluid	on some substr	ate (simple case i	s paper towels) ou	tside of the maniki	n			
		Protractor for accuracy, visual inspection - will														
Knee model flexion: the enclosure should permit		serve to determine if the knee model														
the knee to contract and expand according to the		flexes/extends the way a typical healthy knee														
procedure 0-130	degrees	does	Should		Can you use opt	ical methods to tra	ack this? Would	be more quantitat	ive than holding	up a protractor. A	lso, any requireme	ent for holding a po	sition (not sure if	that goes here or i	Inder joint/mounti-	ng)
Reusable			Preferred													
The enclosure mechanism will involve a silicone- lined polyurethane foam structure that will promote structural support and containment of		Visual inspection - collapsing of model will be evident of poor structural support and leakage of PBS fluid will be evident of poor media														
internal media.		containment	Must		Any specs on we	eight or amount of	material?									
		Pump														
The pump system should maintain the oxygen																
concentration of the media in a healthy range for the chondrocytes 2-10	percent	Oxygen monitoring sensor	Must		How will you dro	p the O2? How w	ill you measure?	(We currently bu	bble N2 to drop	O2, and use a dis	solved O2 sensor	to measure. Note	that dissolved O2	is not the same a	s air percent O2.)	
The pump should maintain a flow pressure similar																
to that which is used in arthroscopic knee procedures 40-80	mmHg	Flow meter/orifice plate	Should													
The pressure gauge should be made out of a					1											
stainless steel material in order to prevent					1											
corrode when exposed to PBS fluid		Visual inspection	Must		1											
		loint/Mounting	1 10050	1	1											
No mechanical stress should be applied to	1	Comparison between health of mounted and son														
cartilage inserted to the model which would cause a difference in the health of the tissue	?	mounted cartilage by measurement of autofluorescence	Must		I would check th	is using pressure-	sensitive film (fuj	film)								
The knee joint should be anatomically correct to the rough dimensions of an average weighted 50 year old		Visual Inspection	Must		You can quantify	differences betwe	een surfaces.									
Each joint model should be reproducible between fabrication attempts	?	Measurement using calipers, tape, etc.	Should		Suggest a 3D ar	pproach such as la	iser scanning the	printed parts								
Stainless steel staples should be used for the	1				335555 50 4											
attachment mechanism to ensure both biocompatibility and structural support		Visual inspection - cartilage maintains attachment to bone and minimal cell death	Must													
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