Project Worksheet - 1

Group Number: 4?

Group Members: Janroy Caraan, Jason Chen, Pierre Zimmerli

# OVERVIEW & PURPOSE

This worksheet is aimed at preliminary discussion on group project topics. Groups must undertake the tasks together and provide a response with consensus among all group members.

# Topic Selection

1. List 3 human tissues, in order of preference, which are of interest to you for the project.
2. Renal tissues
3. Musculoskeletal (Knee)
4. Cardiovascular tissues

2. For each of the above tissues, which medical problem (disease or deformity) or procedure (surgical or non-surgical) is your group interested in exploring in this project? You can mention up to 2 problems/ procedure per tissue.

A.1. Glomerulonephritis (disease, non-surgical): this is a kidney disease where the glomerulus in the kidney is damaged. This may occur as a biproduct of other issues with the immune system, which may cascade into protein and blood content in the urine and potential kidney failure. Treatment is provided through the use of different medicines: blood pressure medicines, corticosteroids and Immunosuppressant.

A.2. Polycystic kidney disease (disease, non-surgical/ surgical): this is a severe disease that causes cysts to form all over the kidneys leading to extreme pain and potential renal failure. Treatment is mainly focused on the slowing of the disease and the alleviation of pain in the patient. Surgery is an option for large cysts, but this is a short-term treatment. Most cases end up needing dialysis and kidney transplants.

B.1. Anterior cruciate ligament injury (deformity, surgical): This is a common physical injury caused by over extension, partial tearing or full tearing of the ACL and will require reconstructive surgery if the latter occurs. During reconstructive surgery, the damaged or torn ligament is grafted back together using donated tissue from a separate section of the body, a donor’s tissue or a synthetic graft.

B.2. Knee arthroplasty (replacement) (deformity, surgical): this procedure is required if osteoarthritis in the knee has progressed to a severe enough point (most common cause), if there is a deformation in the knee, or if there is damage in the knee. The surgery requires that sections of the shinbone, thighbone and kneecap are removed and modified so that implants can be attached.

C.1. Patent ductus arteriosus (deformity, surgical/nonsurgical): This is a genetic defect where the ductus arteriosus does not properly close in the patient after birth and leads to abnormal blood flow between the Aorta and the pulmonary artery. This defect is often a biproduct of other heart problems and may even be beneficial in the short term, however it needs to be treated eventually. It may naturally close on its own with treatment, or in more severe cases require surgery to close it.

C.2. Coronary heart disease (Disease, surgical): This is the narrowing of a small blood vessel that is used to supply oxygen to the heart. It is caused by a build up of plaque and considered the number 1 cause of death in the US. Treatment usually starts off with medication and the recommendation of a lifestyle change but can lead to surgery if severe enough. Procedures include the insertion of a heart stent, a coronary artery bypass, or minimally invasive heart surgery.

References:

<https://medlineplus.gov/ency/article/001560.htm> (**Patent ductus arteriosus)**

<https://medlineplus.gov/ency/article/007115.htm> (**Coronary heart disease)**

[**https://medlineplus.gov/ency/article/001074.htm**](https://medlineplus.gov/ency/article/001074.htm)(**Anterior cruciate ligament (ACL) injury**)

<https://www.nhs.uk/conditions/knee-ligament-surgery/what-happens/> (**Anterior cruciate ligament (ACL) injury**)

<https://medlineplus.gov/kneereplacement.html> (**Knee Replacement**)

<https://www.hopkinsmedicine.org/health/conditions-and-diseases/polycystic-kidney-disease#:~:text=Treatment,failure%20require%20dialysis%20and%20transplantation>. (**Polycystic Kidney Disease**)

<https://medlineplus.gov/ency/article/000484.htm> (**Glomerulonephritis**)

# Expertise:

The project requires delegation of tasks to members who will ensure their successful completion. It is preferred that tasks are assigned based on member(s) skillset and interest. For each of the following skills, please assign up to 2 members.

(Note: Your project may not require some of these tasks. Your answers will assist us in determining right topic for you. If you do not have anyone in your group with a particular skill, leave it blank).

1. CAD: Pierre Zimmerli, Janroy Caraan
2. Radiology Image Processing: Jason Chen, Janroy Caraan
3. MATLAB: Janroy Caraan, Jason Chen
4. Python: Jason Chen, Janroy Caraan
5. Mesh generation: Pierre Zimmerli ,Janroy Caraan
6. Background scientific research: Pierre Zimmerli, Jason Chen
7. Analytical solution of mechanical problems (e.g. beam): Jason Chen, Janroy Caraan
8. Data Analysis (including graphs and tabulation): Janroy Caraan, Jason Chen