General Questions Homework 4

1. The Mako Robotic System for total joint replacement is another major advancement of robotic assisted surgeries. Some of the pros of the system are that it allows surgeons to make fewer cuts and are guided when making cuts by the system. Also, patients that went to a surgeon who used the Mako system had better satisfaction scores than those who received conventional TKAs. Unfortunately, Mako also has cons/drawbacks. Due to the robot, surgery time is most likely longer than traditionally, and any robotic system is limited to the strength of it inputs so we can only have superior success if the inputs are strong.
2. A patient would want a large-diameter femoral head in a THA because the larger head has shown to improve stability and range of motion of the hip. The large-diameter femoral head also provides the benefit of a larger jump distance, the distance needed to travel before subluxation/dislocation occurs. (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7877256/>)
3. The advantages and disadvantages of different motion capture methods for gait analysis is in the following table:

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| --- | --- | --- |
|  | Advantages | Disadvantages |
| Fluoroscopy | Can study and see bone movement/tracking with high accuracy | Limited to a lab setting with multiple radiographic/x-ray resources |
| RSA | Highly accurate way to tell how an implant is performing because beads are easily detected in x-rays | Beads have to be inserted into the bone during surgery and can only be used to track post-surgery |
| Visual Marker | Can be used with most video capturing systems (marker-less) and is accurate with little post-processing (marker-based) | Limitations with skin stretch and unable to confirm if points line up with the joint |

1. The advantages and disadvantages of rigid body modeling vs finite element methods are below:

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| --- | --- | --- |
|  | Advantages | Disadvantages |
| Rigid Body Modeling | Can model any body or part of a body as rigid and can be described by no more than 6 degrees of motion | Not all bodies can be accurately modeled with rigid bodies |
| Finite Element Methods | Helps reduce the need for physical prototypes | Complex calculations are needed to describe the body and can result in long computation times |

Rigid body modeling and finite element methods can be used together to make more accurate models of implants and joint relationships between rigid bodies.

1. The differences between the following knee braces are in the table below:

|  |  |
| --- | --- |
| Prophylactic | Used to protect the knee and ligaments during contact and noncontact sports with a large amount of quick cutting |
| Functional | Reduce translations and rotations of the knee following ACL surgery |
| Rehabilitative | Used to allow for early motion of the knee post-surgery or injury |
| Unloader | Designed to reduce pain and provide relief to people with arthritis in their knee |