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Motion analysis using skin mounted optical motion capture systems and floor mounted force measurement systems have been identified as objective measures by which clinical diagnoses can be made and interventions can be evaluated. The number of research studies that utilize and improve motion capture technology has increased with advances in camera accuracy and software usability. More effective methods for transferring the knowledge gained in the research setting to clinical applications can make quantification of human motion more accessible and accurate.

Recommendation 1: To facilitate the transfer of innovations in motion measurement techniques to clinical testing settings, develop a framework to match testing protocol with:
-subject pathology
-subject physical limitations
-necessary sensitivity, accuracy and repeatability of measurements
-necessary motion fidelity
Numerous methods and protocols have been proposed for increasing the accuracy of human motion measurements including marker sets that aim to minimize soft tissue motion, and methods for accurately identifying joint center positions. Most of these advancements increase the time and complexity involved with motion measurements and data processing, and many times it is unclear which testing populations would benefit the most from these techniques. These factors make it difficult for a clinical lab to apply these innovations.
Assessing the strengths and weaknesses of each method with respect to specific subject populations and measurement goals would enable transfer of motion measurement methods from the research setting to a clinical setting. For example, different measurement sensitivities are needed to evaluate differences in the flexion/extension range of motion between healthy and OA populations, and internal/external rotation differences that have been found in ACL deficient knees when compared with intact knees; therefore, different measurement techniques could be used.

Recommendation 2: Combine experimentation and simulation to interpret and understand causes of joint disease.
Studies that integrate computer simulation with experimentation would make it possible to investigate the sensitivity of the measured performance to variations in the underlying musculo-skeletal structure and control. This could lead to the identification of specific factors that are indicative of disease progression and the development of guidelines for the sensitivity needed to measure them. Facilitating collaborations between experts in both of these areas of biomechanics or establishing databases of experimental data may be a step toward encouraging these types of studies.

In summary:
In order to understand the causes of joint disease and treat those affected by them, I believe that there must be support for the development and evaluation of measurement techniques that are designed to answer specific clinical questions, and that disease initiation and progression must be investigated using a combination of approaches including experimentation and simulation.