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# The theoretical development, validation and practical implementation of an X-ray viewing tool for the assessment for arthroplasty in terminal knee osteoarthritis

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**Title of Project**: The theoretical development, validation and practical implementation of an X-ray viewing tool for the assessment for arthroplasty in terminal knee osteoarthritis

# Abstract

Purpose of the thesis:
The essence of this submission is to present a validated tool to improve the identification of the suitable recipient for unicompartmental knee arthroplasty (UKA) and thereby facilitate the improvement of the clinical assessment and use of the UKA.

The study completed a peer-reviewed validation of the new X-ray based "Knee Osteoarthritis Grading System" (KOGS) to facilitate the accuracy/appropriateness of the arthroplasty implant required in knee surgery whether it is total knee arthroplasty (TKA) or UKA. Three studies evaluated different aspects of the system and this forms part of new empirical data that should help to facilitate the use of less invasive procedures for Kellgren and Lawrence grade 4 osteoarthritis (OA) in the tri-compartmental knee joint.

The first publication validated the KOGS as suitable to distinguish the different degenerative stages in need of a UKA (72% was selected from the cohort of KOGS Grades 1 and 2 knees) or a TKA (22.5% was selected from the cohort of KOGS Grades 3 and 4 knees).

The second publication selected the arthroplasty required and treatment implemented according to KOGS, and obtained at least the same, if not better results for the specific implants published in the literature with the distribution of TKA at 26%, medial-UKA at 59%, lateral-UKA at 13% and patellofemoral arthroplasty at 2%. The revision of TKA and UKA was no worse than the distribution in the literature with ipsilateral degeneration the most common failure mode in the UKA.

The third publication verified the authenticity of KOGS Grade 2 as a more severe degeneration with a relative 'instability' in the knee, with poorer results recorded for a unicompartmental knee implant in relation to the KOGS Grade 1, deemed to be more 'stable'. In this study, the short prospective study (P) followed a similar pattern to the retrospective larger study (R).

Further advantages of this empirical study are:

1. Recognising the different stages of pathology according to the KOGS classification, allowing empirical data accumulation.
2. The implant identification of the pathological stage is now possible e.g., UKA *versus* Bi-UKA, bicompartmental or TKA from the different stages of degeneration (different implants are used for a specific stage). Further subsets of degeneration are identifiable, relative to known results in UKA and TKA e.g., isolated single compartment OA in KOGS Grade 1 with an intact Anterior Cruciate Ligament (ACL) compared with isolated single compartment OA with ACL reconstructed knees (KOGS Grade 3A).
3. Various methods of clinical assessment and patient-reported outcome scores (PROMS) of the deteriorating KOGS Grades can be compared with different implants and as such, identify the optimal implant for a specific grade of degeneration (e.g., KOGS Grade 1 UKA *versus* Grade 1 TKA or Grade 4A Bi-UKA *versus* TKA).