Estimation of Natural Rate of Disease Progression (Under Medical Therapy)

The probability of transition to a more severe functionally dependent state was estimated from analysis of individual OA patient data obtained from a study [23] (I. Wright personal communication 5 November 2010), measuring changes in the Harris Hip Score (HHS), in patients on a waiting list for THR during 1998-2000 in the north of England. The HHS is a clinical outcome tool commonly used to evaluate pain, mobility and function dimensions of hip disease in routine clinical practice and research [24]. Chang, Pellisier and Hazen, [1], suggest that a HHS <40 maps into the ACR class IV, the severe OA, functionally dependent state, while a HHS between 40 and less than 70 corresponds to ACR class III, the functionally independent, severe OA state [1]. A total of 167 consecutive patients were scheduled for surgery in a single hospital and had the HHS measured at the time of joining the waiting list and two weeks before surgery. A longitudinal linear growth curve, random intercept model using all available repeated measurements (n=442) for those individuals with an initial HHS <70 and ≥ 40 (n=96, median waiting time 360.5 days), i.e., in ACR III, yielded an estimated 5.8 point decline from a mean baseline score of 53. Random normal distribution of individual patient scores using implies that the predicted rate of transition to HHS <40 after one year was 0.062. An estimated geometric mean annual rate of transition of 0.041 may be derived from the 0.333 cumulative 10-year rate of transition (by raising it to the power of 1/10) from a functionally independent to a dependent state reported by Danielsson et al., [25] for a group of 91 hip OA patients, in a study conducted in 1952-1962. The estimate derived from the north of England study was the base case, despite the unlikely representativeness of its sample and the risk of it being biased by informative censoring on those undergoing THR before progression. It had the advantage, however, of including a larger, more recent sample than the alternative source, even if its usefulness is limited by its shorter follow-up. Both values were used as reference for extensive sensitivity analyses of uncertain parameters (results based on the lower rate of progression are available upon request), and while the lower rate tended to favour THR in general, and delayed THR relative to early THR, the conclusions were robust to all of these variations in parameter values.