

A Three State Markov Model Devised to Evaluate Progression of Northern Ireland Chronic Kidney Disease Patients

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This research aims to develop a model to represent progression of Chronic Kidney Disease (CKD) in Northern Ireland. Demand for such a model is necessary considering CKD is now recognised as a common condition and is associated with End Stage Renal Failure, which costs over 2% of the total National Health Service budget. A patients kidney function is categorised into internationally recognised stages by a Nephrologist. Markov modelling enables the identification of such stages while also facilitating the flow of patients within the system. A three state Markov model has been developed comprising of No CKD, CKD and the absorbing state Death. It is based upon a large dataset consisting of 77,615 patients with blood samples amounting to 312,120 obtained from Northern Ireland laboratories in 2001-2002. This particular Markov model introduces compartments into its states in order to capture the two-term mixed exponential flow of patients. Computational methods for the combined solution of ordinary differential equations and least squares have been exploited using the software package Matlab to obtain transition rates. Simulations were carried out in order to validate the resulting model which was further refined using Nisra 2001 death rates for age and gender subcategories. The model was built in TreeAge in order to compare costs and utilities for different patient management strategies.