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Stopping Treatment of CML

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Chronic myeloid leukemia can be very effectively treated with tyrosine kinase inhibitors like Imatinib. However, it is not clear that these drugs provide a cure to the disease and a lifelong treatment is often necessary. Recent studies show that for some patients the treatment can be stopped after several years without relapse of the disease; other patients in seemingly similar conditions experience a rapid relapse. We use a compartment based computational model of the disease to capture this disparity in outcomes. Thereby we use a multiscale approach to simulate thousands of virtual patients starting with a single mutated hematopoetic stem cell and follow each patient through clonal expansion ultimately leading to diagnosis, treatment and eventually relapse. Our analysis suggests that the speed of stem cell dynamics is crucial in reproducing the clinical observations. What is more, our stochastic simulations might help to identify factors that predict if or when it is possible to safely stop the treatment.