Self designing clinical trials

TakeAIM Winner 2016:
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Over the last 100 years, discoveries of molecules to use as drugs in medicine resulted in a large number of new medical treatments, helping improve average life expectancy from 47 to 77. The low hanging fruit of medical research has now been harvested, and more efficient methods of research are required in order to discover new treatments with the potential to save and improve lives. To address this, new industry regulations implemented in 2006 allow cautious changes to the trial design during the development of treatments. However, these changes must not increase the probability of incorrectly concluding that an ineffective treatment is effective.

My research aims to develop new 'self designing' clinical trials which automatically make intelligent changes to the trial design. In these, decisions such as recruiting more patients, or concentrating on a particular form of treatment, are governed by 'Bayesian decision theory'. This works by reacting to all the data observed in the drug development program so far and automatically making decisions that mathematically maximise the possibility of discovering a treatment. Preliminary computer simulations of these new designs have shown exciting benefits compared to using traditional methods that consider the development process in a series of separate trials.

The performance of the designs will be applied in specific areas such as cancer research. I am working in collaboration with industry to get my designs used in practice more quickly, potentially leading to discoveries of effective new drugs and treatments, helping you, your friends, and your family live longer.