

# Healthcare Gateway

## INSIGNED: Personalising health care using virtual models

### Partners

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**Dr Keith McCormack,**  
INSIGNED,  
Department of Mechanical Engineering,  
University of Sheffield  
[www.insigneo.org](http://www.insigneo.org)

### Overview

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Collaboration between Sheffield Teaching Hospitals Trust and the University's Faculties of Engineering and of Medicine, Dentistry and Health is leading the way in innovative in silico methods. INSIGNED is the result: an institute that brings together over 90 academics and clinicians to develop computer-based models of human physiology. It unites the disciplines of medicine and engineering, applying engineering techniques to the human body.

### Integrative approach

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Traditional research in medicine has focused on understanding individual parts of the human body in isolation. Contemporary approaches, on the other hand, appreciate the body's complexity and look at how the parts function within the whole system. Having a virtual integrative model of the whole human body is an ambitious challenge.

But increased computing power means that the sophisticated engineering models used in other fields can now be applied to medicine. These in silico models are contributing to the European Virtual Physiological Human Initiative research programme, which aims to create a complete personalisable multi-scale simulation of the human body. This will improve the prediction, diagnosis and treatment of disease. INSIGNED is at the forefront of this work, and has already developed sophisticated models of parts of the cardiovascular and musculoskeletal systems.

### Contact the Healthcare Gateway

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T. 0114 271 1634  
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## Applications

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In silico research is paving the way for individualised predictive medicine that will help to solve intractable health problems. It offers sophisticated risk assessment tools for clinicians, and will help them to make decisions about when and how to intervene in individual cases. Computer-based models will lead to improved design and personalisation of medical devices, and enable virtual clinical trials.

Whole populations of virtual patients can be involved in testing new pharmaceuticals and medical devices. There is the potential to remove the need for animal testing and reduce the testing cycle. Such trials could also identify exactly who a treatment would and would not work for, and when a treatment might be beneficial for a different condition than originally intended. Chronic conditions could be remotely monitored so clinical intervention is based on need and at optimum points, not just when the patient is next able to get to clinic.

## INSIGNEO

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Academic work has more weight when grounded in clinical reality, and INSIGNEO's multidisciplinary expertise presents many opportunities for new ways of working. Engineering funding body EPSRC, for example, is supporting (with a £6.7 million grant) a complete computational model of the musculoskeletal system. Partnerships with industry personalise and refine existing products, and bring a new dimension to research. Biotechnology, medical devices and medical imaging will benefit from access to this cutting-edge technology. Though still at an early stage, collaborative research and the sharing of tools and techniques means this transformative technology is developing fast. As momentum continues to gather, development will be rapid. At present, INSIGNEO is the largest operation in Europe entirely dedicated to this field of research. The combined clinical and academic excellence of Sheffield Teaching Hospitals NHS Foundation Trust and the University puts INSIGNEO in a strong position to be a global leader.

For more information visit [www.insigneo.org](http://www.insigneo.org)

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