

Title of Project:

PROforma: Formalising clinical protocols and pathways

Principal Investigator:

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Aim(s) of Project:

PROforma is a formal knowledge representation language that can be used to model clinical protocols, care pathways, guidelines and so on, in a form that can be executed by a computer. The aim of this research is to understand how to model clinical processes in formal logical terms, and to use this knowledge as a basis for creating safe and reliable decision support, workflow and knowledge management systems which can support best clinical practice at the point of care. The language is well established and stable¹ and appears to be having considerable influence in developing international standards in this field.

The *PROforma* technology

PROforma is a formal specification language (as that term is used in software engineering), a knowledge representation language (as understood in artificial intelligence) and a practical programming language for building decision support and protocol management systems which have well understood mathematical foundations yet use concepts which are intuitive for healthcare professionals.

PROforma is essentially a logic-based formalism that has been extended to support reasoning under uncertainty, decision making and planning. It also makes use of a number of ideas from theoretical work in “non-classical” logics (e.g. logics of time, argument and action) and incorporates an ontological system for modelling clinical “tasks”.

¹ The language was first described in 1996 at a conference of the European Federation of Medical Informatics in Copenhagen, when the work was awarded the Federation’s 20th Anniversary Gold Medal.

The Tallis development environment is a suite of PROforma authoring and delivery tools, written in Java. Tallis provides a comprehensive development environment for the complete life-cycle of web-based clinical applications. Arezzo® is a commercial development environment also based on the language which is supplied by InferMed Ltd. (www.infermed.com). The language, technology and illustrative applications are described in detail by in *Safe and Sound: Artificial Intelligence in Hazardous Applications*, J Fox and S Das, AAAI and MIT Press, 2000.

PROforma has proved to be a valuable platform for a number of clinical applications developed by CRUK (including LISA, HOMEY and REACT described below) and InferMed Ltd. Despite the maturity of the system it remains a focus for substantial ongoing research at Cancer Research UK, e.g. in supporting multidisciplinary patient care (see Credo project below) and research in advanced logic programming systems.

Please list 3 deliverables that the project will contribute to the UK and/or international cancer informatics community

- A formal definition of the syntax and semantics of the PROforma language has been published (<http://www.jamia.org/cgi/content/abstract/M1264v1>). This is the first such publication to our knowledge and establishes PROforma as a potential standard for modelling clinical processes in oncology.
- The Tallis development environment is available for research use by the cancer informatics use.
- The technology has successfully demonstrated important new ways of delivering the benefits of clinical research into clinical practice: BMJ Publishing will shortly announce *Clinical Evidence Interactive*, a version of their CE publication which incorporates decision support based on PROforma technology.

Please describe how the project will incorporate and/or re-use existing informatics infrastructure and/or resources. If the project will not use any existing infrastructure or resources (e.g data standards or ontologies) please explain why this is the case

- HL7 Reference Information Model
- Standard medical terminologies (e.g. SNOMED, GALEN)

Please describe the plans for the sharing of data and dissemination of knowledge that arise from the project:

- The Tallis development environment is publicly available for research use.

Contact details for liaison person should further information be required:

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