

Title of Project:

REACT: A decision-support system for medical planning

Principal Investigator:

Prof. John Fox (with Dr. David Glasspool)

Aim(s) of Project:

REACT is exploring new ways of understanding and managing risk, specifically in the field of cancer care. The research side of the project is addressing questions concerning the understanding and communicating of risk information to patients; accompanying software development activities are focused on the design of advanced software to advise on treatment planning (see also <http://www.acl.icnet.uk/lab/react.html>).

Please provide a summary of the project proposal (max 1 page):

Developing a care plan for a patient with a complex medical condition is a difficult task, requiring an understanding of interactions and dependencies between procedures, and of their possible outcomes for an individual patient. The REACT graphical planning system allows effective communication of this information to both clinicians and patients, with immediate feedback of constraints, interactions and dependencies on and between actions, and of the possible outcomes of proposed plans.

Many decision support systems support only a single, isolated decision - for example, what drug to prescribe, or whether to refer a patient to a specialist. Most decisions, however, are made in the context of plans of action, where they may interact or conflict with other planned actions or anticipated events. For example, the planning of medical interventions over a patient's lifetime is a complex proposition with many sources of information, interactions and dependencies between interventions. REACT (Risk, Events, Actions and their Consequences over Time) provides effective communication through a natural representation of the risks and implications of planned actions in uncertain domains, to support the understanding of both clinicians and patients.

REACT is a "logical spreadsheet" that allows a user to manipulate objects representing potential events and clinical interventions on a graphical timeline

interface (Figure 1). It propagates their implications (both qualitative and quantitative) to displays of risk (or other parameters) and displays of logical arguments and counter-arguments for clinical options. While the user creates a plan, a knowledge-based decision support system analyses it according to a set of definable rules and provides immediate feedback on the predicted effects of actions. Rules may specify, for example, that certain events are mutually exclusive, that certain combinations of events are impossible, or that events have different consequences depending on prior or simultaneous events). Global measures (for example the predicted degree of risk or predicted cost or benefit of combinations of events) can be displayed graphically alongside the planning timeline.

Qualitative arguments for and against each individual action proposed in the plan can be reviewed. This allows considerably more information to be taken into account in each planning decision than a simple assessment of its impact on overall risk. For example, the implications of bilateral mastectomy for carriers of a breast cancer predisposing gene range far beyond the effect of the procedure on risk of cancer. Logical arguments may also be combined to provide overall recommendations for or against specific actions when specified combinations of plan elements occur.

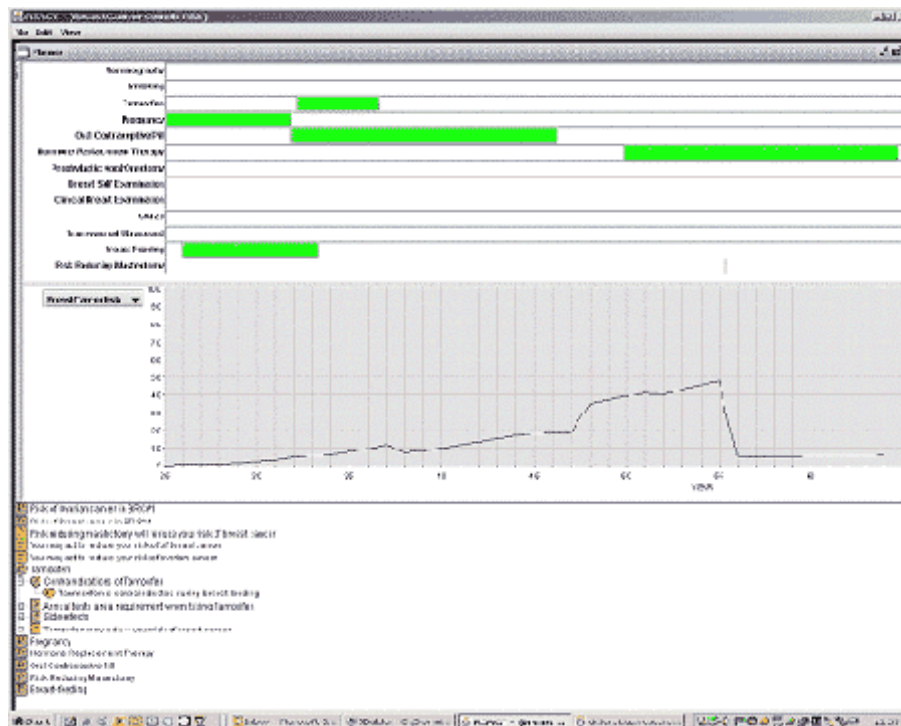


Figure 1: The REACT graphical interface being used to plan interventions to reduce risk for a carrier of a breast cancer predisposing gene. The horizontal blocks represent planned events or actions, and can be manipulated by the user. Below the timeline the additional risk of death due to carrier status under the plan is shown; the display reacts immediately to changes in the plan by highlighting the effect on the risk curve and the relevant arguments for the clinical options.

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

1. REACT software package, incorporating risk management, for planning treatment in cancer care.
2. Evaluation of the package in cancer and non-cancer domains.
3. Investigation of novel methods of representing and communicating information about clinical risks.

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

- Standard java design tools and components

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

- REACT software is available for research use by others
- Evaluation results will be published in open literature

Contact details for liaison person should further information be required:

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