

An investigation of display methods of laboratory (biochemistry and haematology) data in chemotherapy information systems and their effect on clinical interpretation and decision-making.

Penny Ross, PhD Student

University of Portsmouth

Department of Information Systems & Computer Applications

Working with Portsmouth Hospitals Oncology Department

Supervisors: Dr David Prytherch at Portsmouth University & Dr Tim Gulliford Medical Oncologist.

Abstract:

We believe that clinical information systems should be viewed as 'Critical Systems' as healthcare data is different from other data because it is more complex and more sensitive. The environment and culture within which the system has to operate is also significantly different to that of other information systems.

We are investigating the factors that affect a clinicians' ability to recognise critical data buried amid less critical data. This is especially the case when working in situations where their attention may be divided, or they may be interrupted in the middle of a task. We are examining the key issues facing the decision-making process when clinicians are affected by fatigue, stress and difficult concentration contexts.

There is a wealth of research that shows cognitive strategies use working memory. However, working memory is easily disrupted. To minimise the implications of disruption all the information required to make one decision should be displayed at the same time and attention directed to the information that is required to make the decision. However, if a user has to refer to more than one type of information, the data being displayed may be sufficiently different to be best displayed in different formats.

A particular problem with medical data is that processing of a data item or an observed change in the data item may depend on contact with a variety of other information derived from checking or remembering the state of the other data. The user must acquire or remember the context for interpretation along with the associated possibilities for incompleteness or error.

The display design of the data's visual appearance does not define what it is representing. This depends on how the visual form influences the information extraction by the observer. It is how the data is mapped, finding methods to make disparate data comparable by setting a scale resolution and identifying reference and boundary conditions as a function of the context.

To further investigate these concepts we are developing a series of experiments to see if the format in which information is presented may influence clinical judgement.

The experiments present test result data in a number of formats. They are specifically looking to answer the following questions;

- Which test results should be presented together?
- Does the order of presentation of the results have any effect?
- How many test results should be shown at once before the display becomes confusing?
- If abnormal test results are presented within the context of the patients' condition will critical abnormalities be easier to detect
- Does pattern recognition work, how long does it take for patterns to be learnt and how many patterns can easily be remembered?
Which is the best method for displaying test results, charts, graphs, patterns, temporal or trends?

We believe it is possible to improve patient safety by altering the presentation of critical medical information to clinicians. We hope to provide empirical evidence that when designed carefully IT systems can improve patient safety and operate within the clinical environment.