Generating Patient Specific Explanations in Migraine*

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Effective communication requires that both the user and the on-going dialogue be taken into account. The necessity of conveying a message effectively becomes extremely important in application areas such as medicine and patient education, where the consequences of miscommunication can be quite severe. Typically, doctors have little time to explain or justify diagnostic procedures, discuss the rationale for the prescribed therapy, describe alternative therapies, or reassure patients that are not suffering from a more serious problem. This can seriously affect the success of the therapy plan.

A possible solution to the time shortage problem is to present patients with handouts. Since a comprehensive handout detailing answers to all the possible questions that a patient might have would be too voluminous and unlikely to be read, a short, individually tailored handout emphasizing information directly relevant to the particular patient and the proposed treatment is required. However, studies show that handouts are not effective unless clinical personnel review them with patients to ensure comprehension and answer follow-up questions (Kahn 93) . Therefore handouts address only part of the problem.

We are working on a framework for generating interactive, natural language based information sheets for migraine patients. The migraine system (Buchanan *et al.* 94) consists of three main components: (a) an interactive **history-taking module** that collects information from patients prior to each visit and builds a patient model, (b) an intelligent **explanation module** that generates explanations tailored to individual patients, and responds intelligently to follow-up questions about topics covered in the information sheet; and (c) an **interaction manager** that presents the interactive information sheet on the screen and manages the subsequent interaction with the patient. Thus, the migraine system satisfies the two main requirements for an effective patient information system: the ability to (i) tailor its output, and (ii) to respond to follow-up questions.

Tailoring the output to an individual can be done through the use of an *appropriate user model*. In the migraine system the user model results as a by-product of the history taking module, as well as the doctors' entries of their diagnoses and the prescribed treatment after the visit. The second requirement for patient information systems – the ability to respond – is addressed by using a text planner that maintains a record of the structure used in producing the discourse (Moore & Paris 93). In our system, the information sheet generated is mouse sensitive. The patient can ask follow-up questions by clicking on portions of the text and by selecting available questions from menus (Moore & Swartout 90).

In addition to generating individual, customized patient information sheets, it is also important for the explanation module to incorporate information important to all migraine patients. For instance, Forsythe (1994) found that migraine sufferers are often worried about the possibility of brain tumors or strokes as the cause of their headaches. The explanation module addresses such concerns of the patients as well. Thus, the system not only tailors the explanation to the *individual* user, but also to the *class*.

At present we are evaluating the system with actual patients. The system possesses about 300 plan operators and can answer over 100 different follow-up questions. We plan to extend the system to handle user models at finer grain levels and evaluate the effectiveness of the system for different levels of detail.

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