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Using an Open Source Observational Tool to Measure the Influence of the Doctor's Consulting Style and the Computer System on the Outcomes of the Clinical Consultation

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Abstract. Computerization of general practice is an international phenomenon. Many of the Electronic Patient Record (EPR) systems have developed organically with considerable variation in their interface and functionality. Consequently they have differing impact on the clinical consultation. There is a dearth of tools available to study their impact on the consultation. The objective is to use ALFA to film and analyze a simulated clinical consultation. We used the ALFA (Activity Log File Aggregation) open source toolkit, to make video based observation and analysis of the computer mediated consultation. ALFA enables precise comparison of core elements of EPR systems. It allows multiple video channels including screen capture, data about computer use, and verbal interactions to be synchronized, timed and navigated through for analysis. The toolkit is free and can be downloaded under an open source license from www.biomedicalinformatics.info/alfa/. Its outputs, which include Unified Modelling Language (UML), provide the evidence-base for assessing the impact of the computer on the consultation the designing of EPR systems. ALFA has been used to compare different brands of primary care computer systems; nurse case-load selection and consultation in psychiatry.

Keywords. attitude to computer, professional-patient relations, general practice, family practice, decision modeling, process assessment, video recordings, direct observation, medical records systems

1. Introduction

Electronic Patient Record (EPR) systems are ever more widely used in healthcare [1]. In many countries, Information Communication Technology (ICT) is a core strategy component in health service improvements [2]. Many factors make primary care a more appealing candidate for introducing ICT into health services: being the primary

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point of contact, large numbers of encounters with patients, and the patient benefits, research and decision creating advantages of routinely collected clinical data. In many countries general practitioners largely conduct computer mediated consultations. Computerization has improved efficiency of consultation tasks, data recording has become comprehensive [3], computerized prescribing reduces errors [4], improves patient safety [5] and have optimized the chronic disease management role [6]. Notwithstanding the information management advantages introduced by EPR systems, the presence of the computer will change the doctor-patient relationship [7]. Clinicians are often fearful that the use of the computer during the consultation may detract from their ability to communicate effectively with the patient [8].

Most of commonly used EPR systems have generally developed organically and often have their origins in the design preferences of an individual doctor who was instrumental in the development. Although they perform similar tasks, variations in the functional components, their usability features and usefulness for the intended tasks mean they are performed in dissimilar ways. Furthermore, these differences in the EPR system features have varying level of impacts to the consultation work flow [9].

Video recording based observation is an established method for consultation analysis, evaluation and as an educational tool. They are commonly used for skills assessment of newly trained clinicians [10]. They also provide insight into the sociological aspects of computer mediated consultations [11] and used as a data source for qualitative studies of behaviors associated with doctor-computer information exchange [12]. Isolation of the cognitive effects of the EPR systems enables linking them to the changes of the clinician's work flow and prediction of usability problems [9]. However, the personal style of the doctor also has a strong influence on computer use. Some prefer a “systematic” style – also described as form lead; working through the data entry forms or templates provided by the EPR systems, while others adopt a “personalized” style recording data as it emerged naturally in the consultation.

Very few medical schools have extensive training options in the use of ICT and there are opportunities for ALFA to be used to assist in medical education – both for communication skills training as well as in how to make best use of an EPR system.

2. Background

The ALFA toolkit was developed because other methods for observing the interaction of the computer had limitations, primarily because they were not designed for use within the clinical setting. We recognized the need to combine a number of monitoring devices. At the time we identified the following requirements: (1) Video channels which provided: an overview of the process, screen capture and the body language from participants; (2) Precise automated time-stamping of computer use; (3) Time stamping of speech so that we could match the transcript to the computer use; (4) Automate the capture of body language using pattern recognition software and other change recognition technologies [13]; and (5) We also wanted to future proof the system so that we could aggregate log files from techniques we could not anticipate at this stage.

We started the work to develop ALFA nearly a decade ago using single channel video recording for the formative evaluation of a new screening software for nurses; but found without detailed view of the clinical system it was impossible to interpret the video [14]. Our next development was to record three video channels using

professional video equipments, and although this produced useful output; the expense and set up time meant that this was not a readily deployable technique [15]. More recently we released the 2008 method as an open source tool-kit, though up to this point it had only been used in primary care [16]. More recently we have conducted studies of psychiatric consultations, and observed how community matrons select cases.

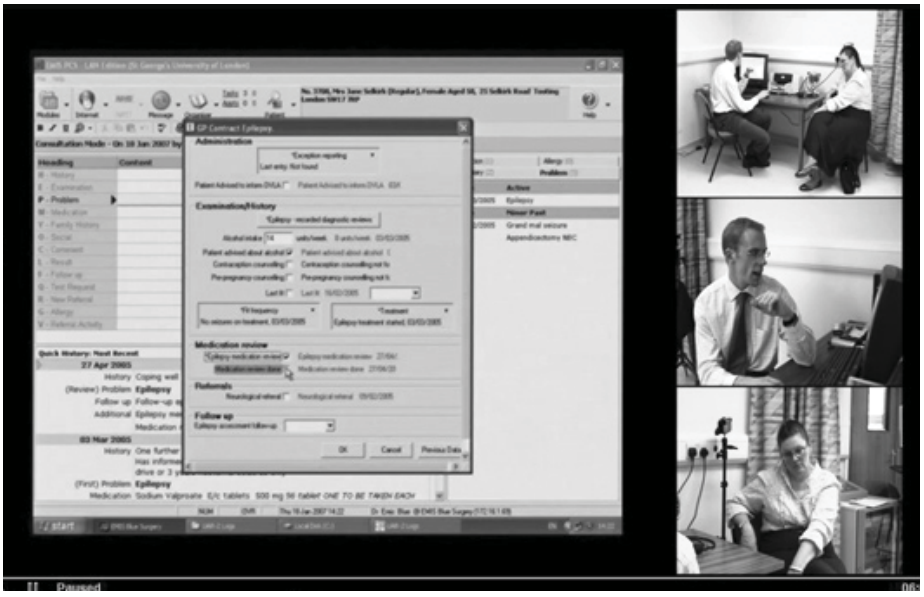
3. Workshop Objectives

This workshop intends to highlight the complexity of computer mediated consultations, a novel technique developed to analyze it and the main determinants of the impact the computer has on the consultation.

3.1. Learning Objectives

1. To observe that clinicians tend to predominantly have personalized or systematic styles of computer use; and its implications for EPR system design.
2. To make precise measurement of the impact of EPR system features on the clinical consultation
3. To be familiar with observation and assessment techniques for computer mediated consultations
4. To be aware of methods for rationally selecting or developing EPR systems features, modifying existing implementations and educating system users.

Figure 1. Consultation filmed using ALFA. The large screen captures the EPR system and the three smaller windows provide consultation, doctor, and patient views.



Methodology: The ALFA Method (An Open Source Toolkit)

ALFA (activity Log File Aggregation) toolkit is a new, open source, video based technique developed for assessing the impact of the computer on the doctor-patient interactions. It can be downloaded free from the development website [17].

This tool comprehensively captures the doctor-computer and doctor-patient interactions using multitude of data recording techniques. It then aggregates information from these disparate observational tools into a single format. ALFA consists of several observational components: (1) four-channel video recording using three cameras; one provides an overview of the consultation capturing both doctor and patient; the second and third views capture verbal and non-verbal interactions of the patient's and doctor's respectively to allow precise observation, fourth video channel is from a software that captures what happens on the computer screen; (2) User Action Recording (UAR) software to automatically capture doctor's use of computer keyboard and mouse; (3) Voice Activity recording (VAR) software creating a log file for verbal interactions; (4) Observational Data Capture (ODC) utility to assist in rating the interactions in the consultation video. All the video channels are mixed into a single screen to allow them to be viewed simultaneously. ALFA is capable of combining the video channels with other interactions log files and displays them in different presentation layouts; tabular outputs provide searchable interaction logs, graphical outputs produce histograms for different consultation interactions or a vertical 'bar code' like occurrence graphs showing the sequence of occurrences for multiple activities and their durations. It can also produce XML output of these observations and datasets for generating UML models of consultation; both output formats provide much useful feedbacks for clinical system developers. This may identify principles for developing EPR systems to be proficient but less intrusive.

3.2. Workshop Content

1. Introduction to the functional layout of the computer mediated consultation: the doctor-computer and patient and their interactions
2. Group discussions about the use of ICT in clinical consultations, their variations within the health system and existing studies about their impact of consultation work flow
3. Rationale for the ALFA tool kit, its components, aggregation of observations and analyzable outputs
4. Results from real and simulated consultation: impact of different EPR system features, doctor's style of computer use
5. Group discussions about how to integrate the computer to the consultation, educational feedback to clinicians about their computer use, and defining a "good" computer mediated consultation.

4. Expected Results

By the end of the workshop delegates will understand the principles observing computer mediated consultations and challenges around analyzing the doctor-patient and doctor-computer interactions. Attendees will also be familiar with all the components of ALFA and how they work. They will have seen demonstrations and

been introduced to the use of the equipment. Delegates will gain practical experience of how to rate video footage using relevant software. Finally, they will understand the process of creating the sequence diagrams to capture the interaction between actors in the consultation.

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