

Summary of: A preliminary model of work during initial examination and treatment planning appointments

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FULL PAPER DETAILS

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Objective This study's objective was to formally describe the work process for charting and treatment planning in general dental practice to inform the design of a new clinical computing environment. **Methods** Using a process called contextual inquiry, researchers observed 23 comprehensive examination and treatment planning sessions during 14 visits to 12 general US dental offices. For each visit, field notes were analysed and reformulated as formalised models. Subsequently, each model type was consolidated across all offices and visits. Interruptions to the workflow, called breakdowns, were identified. **Results** Clinical work during dental examination and treatment planning appointments is a highly collaborative activity involving dentists, hygienists and assistants. Personnel with multiple overlapping roles complete complex multi-step tasks supported by a large and varied collection of equipment, artifacts and technology. Most of the breakdowns were related to technology which interrupted the workflow, caused rework and increased the number of steps in work processes. **Conclusion** Current dental software could be significantly improved with regard to its support for communication and collaboration, workflow, information design and presentation, information content, and data entry.

EDITOR'S SUMMARY

There is no escaping the fact that technology permeates nearly every area of our modern world, and will continue to do so. The extent to which this is true in dentistry can be seen by a quick flick through the 'Product News' pages in any issue of the *BDJ*: from digital radiography to CAD/CAM systems, there are few, if any, areas of dentistry that remain unaffected by technological developments over the past 20 years. In many ways, these advances have been beneficial, speeding up previously lengthy processes and enabling once complex paper filing systems to be stored electronically and accessed at the touch of a button. However, anyone who has ever felt like screaming with frustration while trying to perform a seemingly simple task on their home computer will know that sometimes, technology can make our lives more, not less complicated!

This study models and describes in detail what many dentists have probably felt on more than one occasion. The

authors' aim was to understand the processes of interaction and communication involved in initial dental examinations and treatment planning and how technology was integrated into this workflow. What they found was that in many cases, far from helping the process to run more smoothly, existing computer technology actually made it more complicated, causing interruptions to workflow and increasing the number of steps needed to carry out an activity.

As the authors point out, clinical dental work is highly collaborative, involving many different team members performing roles that may overlap and tasks that are complex and require many different pieces of equipment. Taking all these factors into account and allowing for the myriad potential outcomes and occurrences is a tough task for any computer system and this study suggests that existing technology is not quite up to the challenge. The detailed investigations and models in the paper are extremely useful for future dental software

development: by clearly identifying the problems, the authors have taken the first step towards solving them.

There is no doubt that computers will continue to play an increasingly large part in general dentistry. We must get used to the fact that technology is here to stay and indeed, it is already making some aspects of dentistry much easier. Current software may not yet reach its full potential, but research such as this paves the way for the significant improvements that are required. You can be sure that at least some beneficial advances are just around the corner...

The full paper can be accessed from the *BDJ* website (www.bdj.co.uk), under 'Research' in the table of contents for Volume 206 issue 1.

Rowena Milan,
Journal Editor

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IN BRIEF

- Dental team members have multiple, often overlapping roles. They use a large and varied collection of equipment and technology to complete complex tasks.
- Technology often interrupts the workflow, causes rework and increases the number of steps in work processes.
- Current dental software could be greatly improved with regard to its support for all areas of the workflow process.

COMMENT

If one agrees, as I do, that the adoption and use of dental software, both clinical and administrative, can improve the efficiency and efficacy of dental care, then such software must be designed in ways that will not only meet, but exceed the current information, communication and workflow requirements of the dental team. This research takes a large step forward in helping better define these software requirements based on formalised observations of the generalist dental team, whether in the US, UK or elsewhere.

Twenty-three comprehensive initial exam and treatment planning appointments were observed in twelve general dental practices in the USA. Eight used clinical dental software chairside, whereas the remaining used only administrative practice management software.

Using contextual inquiry analysis as a methodological framework from which to evaluate their observations, the authors identified 27 'breakdowns' (ie interruptions to workflow) that impacted the efficiency and efficacy of the dental visits. Sixty percent of the breakdowns were associated with technologies. Recommended solutions to technology 'breakdowns' as well as suggestions for improvements in communications, workflow, and collaboration are discussed in the paper. Dental teams, dental software developers and practice management consultants will benefit from the researchers' comments.

Information design, presentation and content were also examined, demonstrating that the unique richness of

textual, graphical and symbolic data incorporated in the paper record has not yet been duplicated or enhanced within the clinical computing environment. Transition from paper to digital dental clinical records will require developing a much better fit between the requirements of a task and how the needed information is presented, capability to accommodate a specific type of data (eg DiagnoDent readings), and improved interfaces to allow direct and straightforward data entry by clinicians that accommodate the flexibility with which clinicians enter data.

The time has come for more effective and useful clinical computing in dentistry. Despite noted limitations, this research takes a critical and well organised look at the gaps between how information, communication, technologies, and workflow interact. In doing so, the authors have begun to inform the specifications for the design of a new clinical computing environment.

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AUTHOR QUESTIONS AND ANSWERS**1. Why did you undertake this research?**

The long-term goal of our research is to improve patient outcomes by providing better computer-based tools to support the work of dental clinicians. Like others, we believe that a thorough and comprehensive understanding of work processes, tasks, goals, participants and context is necessary to design useful and usable information systems. This study is important because it is the first systematic investigation of the work environment and clinical care process in general dentistry. Our findings provide rich data for the design and development of improved dental software and tools.

2. What would you like to do next in this area to follow on from this work?

We are using the results of this study to inform the design of multiple computer-based tools for clinical dentistry. Currently, we are developing a speech interface for electronic dental records that allows dentists to dictate using natural language rather than specific commands. We are also exploring the feasibility of a three-dimensional interface for charting and patient information review in general dentistry. We are designing these projects with ardent attention to the workflow that dentists and auxiliary personnel engage in during patient care.