

P.C. Tang

Palo Alto Medical Foundation,  
Los Altos CA, USA

## Commentary

### *Postscript on the Non-Perfectibility of Man*

Reflections on C.J. McDonald's paper:  
*Protocol-based Computer Reminders, the Quality of Care  
and the Non-Perfectability of Man*

Dr. McDonald's seminal paper from 1976 on computer-based reminders stands as the classic reminder of man's fallibility – and of the computer's capability to help humans overcome their natural limitations in memory and attention. McDonald implemented 390 protocols derived from the medical literature in the Regenstrief Medical Record System [1]. When triggered by the appropriate conditions, the computer system provided reminders to the clinician. These reminders were classified into three types: (1) suggestions to gather data (e.g., symptom, physical finding), (2) suggestions to order a diagnostic test, and (3) suggestions to initiate or change a therapeutic regimen. Relevant reminders were printed on a "Surveillance Report" and included on a preprinted encounter form. Using a controlled crossover experimental design, one group of residents was exposed to the reminder system during their clinic for approximately two months and another group served as controls. The roles of the groups were switched during the second half of the study. Encounter forms from each visit were analyzed for compliance with applicable protocols. McDonald found that physicians at all training levels responded to all three types of suggestions about twice as many times

as they did during the control periods. From this, he concluded that human frailty, not ignorance or greed, caused intended behavior to be overlooked, and that computer-based reminders can be used to change physician behavior.

In this study, Dr. McDonald demonstrated that relatively simple rules, triggered by commonly available data elements, can produce a profound change in physician behavior. Importantly, the computer was primarily functioning as a reminder system rather than a consultant. The positive results also demonstrated that physicians accepted the computer in this role easily. This is probably due to the fact that physicians were complying with guidelines that reflected their own intentions. Defining an acceptable role for computer-based decision support was a significant contribution to medical informatics at the time. Even today, social, cultural, and organizational factors play more of a role in implementing computer applications in health care than technical limitations [2].

The importance and benefits of computer-based clinical reminders remain just as valid today as they were 20 years ago; many investigators have since confirmed the salutary effects of clinical reminders [3,4]. Interestingly,

Dr. McDonald lamented that one of the justifications for a reminder system was that primary-care physicians' time was already "saturated." Pressures to increase physicians' productivity have certainly escalated since 1976, making the need for this tool even more compelling today.

It is a tribute to the findings from this paper that developers have begun to implement clinical reminders as part of commercial systems. Providers using commercial systems have also realized similar gains in adherence to clinical guidelines when reminded of them during the encounter [5]. At the time Dr. McDonald wrote his paper, the computer-based reminders were communicated to the physicians via paper-based encounter forms. In the ensuing years, both his group and others have incorporated reminders and other decision-support aids in physician order-entry systems. Providing decision support to physicians during order entry has been shown to be highly effective [6-10]. In addition, by capturing orders automatically, researchers can record and easily analyze the efficacy with which interventions like reminders affect physician behavior. This should simplify the conduct of studies such as the one reported here, since Dr. McDonald had to rely on manual analysis of the paper-based encounter

forms.

Dr. McDonald's study led the way to a highly productive area of research and practical application of medical informatics to patient care. Since 1976, the demands of the health care practice environment have become more onerous and health professionals have proven to be no more perfect, but fortunately, tools to help providers cope with their non-perfectibility are becoming more widely available.

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Address of the author:  
 Paul C. Tang, MD  
 1270 Carmel Terrace  
 Los Altos, CA 94024  
 USA  
 email: tang@smi.stanford.edu