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Synopsis

Changing the paradigm for Computer-based Patient Records

Reading the four papers that are included in this year's Computer-based Patient Record (CPR) section of the Yearbook, it becomes apparent that there are two diametrical perspectives on the current status of CPRs. Three of the papers (Stair [1], Archbold et al. [2], and Tange et al.[3]) make the underlying assumption that current models of CPRs are appropriate and accurately reflect the needs of practitioners involved in patient care. These papers seek to further the cause of CPRs by providing evidence that such systems can after clinical benefits. Conversely, the paper by Berg [4] rejects the assumption that current CPR models are adequate, citing the fact that there are few, if any, fully integrated CPRs in routine use. Berg argues that the problem with current implementations of CPRs lies in the incorrect model of medical work that is inscribed in them. His study, based on participatory observation, describes medical work from a sociological perspective and examines the consequences of this perspective on current and future CPRs.

Stair's brief paper entitled "Reduction of redundant laboratory orders by access to computerized patient records" studied the effect of an existing CPR used in an Emergency Department (by a single physician) for 500 consecutive patients. Not surprisingly, Stair found that for 120 (24%) of the 500 patients, redundant laboratory tests were avoided as a result of the physician having access to the CPR. Patient care was improved by access to inpatient discharge summaries in 85 (19%) of cases. This enabled the physician to eliminate imaging, laboratory testing, specialty consultations and hospital admissions, and instead concentrate on other tasks such as history and physical examination, instruction to patients, adjustments to medications, and scheduling of follow-up visits. As a result of recent results being made available in the CPR, laboratory tests did not have to be ordered in 34 (7%) of cases, and imaging studies in 19 (4%) of cases. Access to pharmacy records improved care in 30 (6%) of cases, particularly with respect to identifying allergies or potential drug interactions. Previous electrocardiograms assisted diagnosis in 11 (2%) of cases. Stair estimates that (in the context of his study) given that laboratory tests cost $20, and imaging $50, then the value of the CPR is $2.88 per patient in reduced tests alone. In the discussion section of this paper, Stair points out that several published reports have already demonstrated the savings in fewer tests and better patient care when CPRs are made available during the clinical encounter.

The second paper, by Archbold et al. (also very brief) is entitled "Evaluation of a computer-generated discharge summary for patients with acute coronary syndromes". The study aims to overcome the deficiencies of manually prepared discharge summaries (i.e., low completion rates, low quality of information, incomplete content, and delays in preparation) with the design of a structured, computer-generated summary integrated with a coronary care database for patients with myocardial infarction and unstable angina. One hundred and forty-seven GPs were sent a six-point questionnaire, together with twinned examples of computer-generated and dictated discharge summaries. The dictated summaries were actual summaries selected at random, while a senior house officer blinded to the purpose of the study prepared the dictated summaries. Of the 127 questionnaires returned (response rate 86%), 87 (69%) preferred the computer-generated summary and 36 (28%) the dictated summary. When asked what they liked most about each format, respondents stated that the computer-generated summary contained all relevant details (n=23), was concise (n=22), information was easy to find under subheadings (n=200) and it was quick to read (n=14). Features of the dictated summary that respondents valued were its personal nature (n=26), and ease of reading (n=13). However, respondents found that the computer-generated summary was impersonal (n=150), whilst the dictated summary contained less Information (n=20), which needed to be extracted (n=17), and took longer to read (n=14). The majority of respon-

dents 85 (67%) favored the computer-generated summary as providing a clearer management plan. When asked what was an acceptable delay for receiving discharge summaries, 112 (84%) of the respondents answered 7 days or less. The authors of this paper go on to discuss that fact that in 1996, 83`% of the discharge summaries dispatched by their CPR system were received within 7 days. They also state that "data entry takes about 10 minutes" which raises the question of who enters these data, given that a comprehensive CPR would be expected to already hold this data. One presumes that these 10 minutes are used to input additional data that supplements that already held in the coronary care database. However, there is no indication that 10 minutes is less, or more than the time needed to dictate a discharge summary. The results of this evaluation study are again, not surprising. Context specific information, which is legible, clearly expressed, structured appropriately, and delivered on time, is preferred by clinicians. However, the personal aspects of dictated summaries were valued by many clinicians. Thus, the ability to customize the format of a computer-generated summary and add free text where appropriate is important. Further work in the area might attempt to gains insights into the effects of the different formats of summary on clinical practice and even clinical outcomes.

The third paper, by Tange et al. is entitled "The granularity of medical narratives and its effect on the speed and completeness of information retrieval". The authors begin with the premise that using electronic rather than paper-based record systems improves clinician's information retrieval from patient narratives, observing that there are few studies which address how data should be organized for this purpose. The hypothesis of their study is that physicians can retrieve information better when clinical narratives are divided into many small labeled segments ("high granularity"). The authors used existing CPR software to produce three versions of the system, with different degrees of granularity; "coarse granularity", which was an exact copy of a paper record, "intermediate granularity", in which medical history and physical examination notes were divided into organ systems, and progress notes were divided into problems, and "fine granularity", where medical history and physical history were further divided into problems. These three versions of CPR were evaluated in terms of speed and completeness by 24 internists and 12 resident physicians. The participants solved predefined clinical problems concerning three voluminous inpatient case notes. These problems were solved in the ideal environment without any time pressure being exerted on the physicians. To mitigate confounding factors, participants were randomly allocated to a sequence that was balanced by patient case and learning effect. The results of the study showed that retrieval from the coarse granularity system was significantly slower than with the intermediate and fine granularity sets. Information retrieval between the intermediate and fine granularity set did not differ significantly. Whilst granularity affected the speed of retrieval, it did not affect the completeness of information referral. The authors highlight a number of important considerations in the discussion section. Firstly, whilst completeness of retrieval was not affected in this study, in daily practice, where physicians are working under time pressure, less complete answers are common. Secondly, that the problem-orientated CPR structure may be beneficial to retrieval of data but is seen as a difficult model to support data entry. Thirdly, that the generalizability of the study may not be ideal, given that a larger mix of patient cases and questions may have changed the outcome. And lastly, and most interestingly, that the physicians in the study were not familiar with the cases used. In the real world, physicians are generally very familiar with a patient's record and will have memorized a significant proportion of it. Thus, they may use the record as a prompt rather than to retrieve the full text of a data segment. Studies show that whilst a physician is in the act of retrieving one piece of information, he or she will remember another, and the larger a segment of text, the greater the number of formulations likely. Thus the authors postulate that if memorization has an effect on the preferred granularity, then a coarser CPR structure rather than finer one may be optimum. This last point is an important reminder than a CPR does not function as an isolated information source, but rather as part of a complex, social and organizational environment, and leads us into the next paper by Berg, which brings a sociological perspective to the use of CPRS.

Berg's paper provides a fascinating insight into the sociology of the CPR. As Berg rightly points out, current CPR implementations that are fully integrated are hard to find. He argues that part of the trouble getting current CPR implementations to work, lies in the inappropriate model that they embody. Current models begin with the premise that paper-based records are inadequate for reasons of illegibility, incoherent format, incomplete data and vagueness. Designers of CPRs argue that a CPR should support the diverse requirements of clinicians' problem solving and also serve as a repository of information. These requirements have prompted attempts to produce highly structured CPRs, standardize terminology and restrain the use of free text. In this way, the building blocks of medical thought can be delineated and ordered. This prescriptive view of medical thinking, which is

embodied in the hypothesize-and-test cycle, is an idealized image, and not derived from psychological research of work observed in routine practice.

Berg proceeds to discuss the results of participatory observations of medical work. He describes the physicians task as "continually struggling to make a patient's case work: to keep a patient's trajectory on tract". Historical information, examination results and medical criteria are not so much uncovered as continuously (re)constructed. Physicians realize that there is no such thing as a true picture of the patient's case, only different interpretations and perspectives at different points in time. Thus, the true picture is not of prime interest, even if it could be produced. The real problem for physicians is "what to do next?", which requires a "meaningful difference for the purpose in hand". Berg also highlights the role of organizational limitations, patient's needs and desires and financial matters, that impinge on decision making, and are interwoven with purely medical issues. Medical work is viewed by Berg as situated work. His point is that any construction of medical data is transient and undergoes a continual process of realignment, or even total rejection at some points. In light of this understanding of the nature of medical work, Berg discusses the role of medical records not as actuarial documents, but rather something to fulfill highly specific functions within that work. Thus, the medical record does not represent medical work, but feeds into it, structuring the communication between healthcare personnel, shaping medical decision making and framing relations between personnel and patients. Berg then goes on to discuss the consequences of this for CPRs, highlighting the contrast between the behavioral reality of medical work, with the prescriptive rationalized models embedded in current implementations. With these insights, it is obvious that the paper-record adequately fulfills may of the needs of physicians and is often superior to a CPR. They also reveal fundamental problems with attempts to create a complete data set which can be used for a multiplicity of purposes, such as clinical care, billing, quality control, research etc. Berg's papers concludes that an essential direction for future CPRs is user involvement. Not simply participatory or advisory, but full-blown participation form the early stages of the process. Only through participation will designers be able to provide systems which fully meet user's needs.

These four papers on CPRs demonstrate two ends of a spectrum. At one extreme we have researchers who seek to justify and prove benefits of CPRs, whilst at the other there are researchers who question the fundamental assumptions on which CPR implementations are based. The former group avoid the issues as identified by Berg, by focusing upon relatively small-scale data retrieval tasks, that are peripheral to the central task of medical work. In isolation these segments of a CPR implementation are shown to function adequately and even provide benefits. However as demonstrated by the lack of fully integrated CPRs in routine practice, these CPR components can not be successfully combined to produce the total solution. The work of Berg provides an integrating framework for these components and will inform future work in the area.

References

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