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Commentary

The Added Value of the EMR

Reflections on G.O. Barnett's paper:
COSTAR – A Computer-Based Medical Information System for Ambulatory Care

It is always a delight to re-read a seminal paper such as this. Octo Barnett has gone on to become one of the leaders in the field of medical informatics. Not surprisingly, this paper from 1979 contains much that is still relevant today. Although it concentrates on the details of the implementation of COSTAR, in doing so it describes many fundamental issues relating to the implementation of Electronic Medical Records (EMRs). We are still trying to resolve some of these same issues today. Equally interesting are the elements of the paper that show aspects of EMRs we now regard as flawed. As one would expect, the passage of time has changed our views on many things.

The problems of manual records are well described. What is surprising is that these problems are still so relevant today. Why, if there are such problems, has the EMR not moved forward more rapidly? We are making progress but it is slow [1]. The statement that most commercial systems are designed for billing, accounts and third party insurance forms could be made today. This is even more surprising when the reason given for clinicians needing to move to electronic information systems are just as relevant today. These include the increasing complexity and volume of medical data, recorded for each pa-

tient, and the shift in emphasis in ambulatory care from treatment of episodic illness towards preventative medicine and continuity of care in the management of chronic disease.

Even the description of the difficulties caused by changes in health care administration is still recognisable. The statement that the manual record has proven grossly inadequate to meet the needs of health maintenance types of organisations is extremely topical in many countries.

The design goals are still valid:

1. Facilitate patient care by improving the availability, accessibility, timeliness of arrival, legibility and organisation of medical information.

Goal 1 concentrates on some aspects we would take for granted now. Legibility is no longer seen as a major problem. It is just accepted as a by-product. Today, one would have enhanced this goal by adding elements designed to improve patient care using decision support techniques supplementing better organisation of medical data [2].

2. Enhance the financial viability of the medical practice by providing comprehensive billing systems with accounting reports.

This Goal is still as valid but has

proved to be a hindrance in developing systems that meet clinicians needs.

3. Facilitate medical practice administration by providing the data retrieval and analysis capability required by management.

This seems straightforward, but has also proved a problem. Too much emphasis on administration has failed because the systems have not supported the collection of the underlying data to drive administrative processes.

4. Provide data processing support for administrative and ancillary services.

Goal 4 reflects on the concept that data management is handled centrally within an organisation. There has been a tendency to move away from central control via data management departments towards local control on users' PCs, but this trend seems to be reversing. A plea is made for industrial support for the wider implementation of COSTAR. This is stressed due to the lack of computer-skilled staff in a practice. Unfortunately, such limitations still survive today and the overall cost of ownership of current systems is too high for many health-care systems. We now know that training of all staff is an absolute pre-requisite for effective implementation of a system into any health-care facility. In 1979 this was not so well recognised.

Provide the capability to generate standardised management reports.

We would now call this enabling medical and administrative audit but it is otherwise little changed.

6. Support programs of quality assurance by monitoring the content of the database according to user specified rules.

Goal 6 is remarkably far sighted. User-specified guideline or electronic protocol support is growing in fashion throughout the world. It is seen as one of the most effective ways to improve the cost effectiveness of medical care, which is trying to meet an ever-increasing demand. The paper was assuming that most of this activity would be off line. However, in 1979 this was not usually recognised as an issue for computer records.

COSTAR was written in MUMPS. Many legacy systems benefited from the flexibility and power of MUMPS but few would start a new system using it in these days of relational databases, object orientation and document-based records.

Perhaps one of the most far-seeing elements of COSTAR is its sophisticated mechanisms for handling a dictionary of terms. Today we would favour using standardised national or international term sets to allow consistency and data transfer across organisations. However, much of the detail on how such term sets should be handled was first described in COSTAR. Although the term set used within a COSTAR system would have been particular to that system, it could have had many of the elements we now know are needed to ensure that clinical data can be collected in a useful and reliable form. Poorly structured term sets and a reliance on excessive amounts of free text have dogged attempts to replicate a useful electronic

medical record. Equally impressive is the ability for the user to program specific responses to specific coded entries. This allows both for data-entry validation routines but also more sophisticated responses.

The arguments described for not using the International Classification of Diseases (ICD) still stand today. For example: "In particular the ICD-CM is not particularly suited for common health problems and ill-defined conditions that are common in primary care." The statement that "there has been little success in using computer technology to process narrative text." is only a little unchanged today. Perhaps the most appealing statement that still runs true is: "there is considerable disagreement within the medical community on appropriate taxonomy systems".

Modular design still remains a major criterion for successful implementations; yet, it is one often forgotten by suppliers who tend to favour monolithic systems as they are easier to build and maintain. However, they are much less flexible in the constant battle to persuade clinical users to use systems.

Confidentiality is catered for by password and specific terminal restrictions. This would be regarded as too little today. A transaction log that records each transaction enhances security. Today, we would expect details of a secure audit trail that would allow the use of the record in a court of law.

Clinician Acceptability

The paper talks a great deal about the administrative information produced from the system. This was the main driver for electronic records at the time. It is now being recognised that it is this concentration on secondary ad-

ministrative uses which has caused much of the problems currently experienced with trying to introduce such systems to clinicians. Clinicians are not willing to use systems that are only designed to provide off-line results from entering data. It is now recognised that the primary function of the EMR is for direct patient care [3]. Thus, clinicians need information at the point of care [4].

Professional acceptability is put forward as the main reason for sticking to manual entry for physicians. Inevitably, COSTAR is limited by the display and interface technologies available at the time. This made it more difficult to persuade clinicians to use it. Such limitations plus the desire to avoid interfering with clinical practice caused COSTAR to work on the basis of data being recorded onto encounter forms which were then transcribed onto the computer. This produces the need to run manual and computer systems in parallel, increasing the overheads and often a cause for failure. It is interesting that the paper describes the transcription error rate as being very small (<1 in 400 transactions) This may be because the type and quantity of data being collected was limited. However, some of this must have been because of the effort put into the design of the data entry worksheets. This aspect receives much emphasis, which is not surprising considering the importance of collection of data onto paper prior to transcribing it onto the computer. However, subsequent work has shown that the greater the distance in time or space between the collector of the data and the person entering the same data, the greater the chances that the data is less suitable for any purposes other than serving as an aide memoire [5].

One of the features that would be regarded important these days, but which is missing, is the concept of

different views on the data to suit both different users and to extract greater value from the record [6]. This is not surprising as COSTAR was designed to be used by recording on paper rather than on screen. This means that the essential elements of data presentation are not relevant.

Another element we would regard as essential today is the concept of a "story". The medical record, if to be used in a real-time environment, has to be able to show its data elements in a way which fits with the clinicians thinking. This is one of the major requirements if one is going to overcome the professional resistance to electronic medical records described in the paper [7]. The other major feature in meeting this challenge is to ensure that the EMR provides "added value". This can be in the form of displaying the data in a form which returns more than the individual elements recorded. It can also be in the form of prompts, alerts and watchdogs, which provide the clinicians with information they may not otherwise have known [8]. Unfortunately, although much more is known about "clinician-friendly" EMRs we have yet to implement them in a widespread enough fashion to achieve better uptake.

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