

The Use of Problem-Knowledge Couplers in a Primary Care Practice

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In the Summer 2009 issue of *The Permanente Journal*, Lawrence Weed, MD,¹ outlined the philosophy behind the development of the problem-oriented medical record and the subsequent development of the clinical decision tool called problem knowledge couplers. In this article, I describe how my associates and I have integrated the use of problem knowledge couplers into our Internal Medicine practice.

Background

Our practice consists of two full-time physicians and one nurse practitioner with the equivalent of 3.5 support staff per clinician. A family therapist is integrated into our practice, although she also maintains an independent practice. We are located in Bangor, ME, and are part of Martin's Point Health Care, a diversified health care company offering both health plans and health care centers.

I was introduced to the problem-oriented record and system developed by Dr Weed as a second-year medical student. It is useful to remember that Dr Weed's first article in the US—"Medical Records that Guide and Teach," published in the *New England Journal of Medicine*²—did not appear until 1968, so I had the opportunity to live through the revolution that that innovation in recordkeeping and thinking caused.

In 1971, after a residency in Internal Medicine and two years in the US Army, I joined Harold Cross, MD, and John Björn, MD, in their revolutionary practice in Hampden, ME. Both of these men had been trained by Dr Weed. It is impossible to overstate the contribution these men made to the acceptance and spread of the problem-oriented system. At that time, this was a revolutionary concept and was heartily resisted by the medical establishment. Besides the fact that it required clinicians to be clear and explicit about their thinking, it was thought to be impractical and

not applicable in a practice setting. Drs Cross and Björn showed it could be done. The success of that practice put that straw man to rest, and the monograph they wrote about their experience became a medical best seller.³

By 1984, I had established my own practice, and I began working with computerized problem knowledge couplers in a minor way. By 1993, my associates and I had begun using our own problem-oriented electronic medical record (EMR), and with a local area network in place, we extended our use of the couplers into all aspects of the practice.

We currently use the Centricity EMR (GE Healthcare, Fairfield, CT).

The Problem Knowledge Coupler System

The Problem Knowledge Coupler system was developed by Dr Weed to help overcome the inherent limitations of the human mind in decision making when faced with a complex set of data, the norm in most medical situations. Cognitive psychologists have long recognized this deficiency when the number of variables exceeds about seven. Since 2000, there has been a flurry of books in the popular press discussing our limitations in this regard (eg, *The Black Swan*,⁴ *How We Decide*,⁵ *Predictably Irrational*,⁶ *Everyday Irrationality*⁷). They point out that subconscious biases distort our decision-making processes and occur instantly in all situations of everyday life. We know, for example, that left to our own devices, clinicians will form a hypothesis within 30 seconds of listening to a patient. From then on, we tend to exclude information that discredits that hypothesis and seek information that confirms it. So much for the scientific method!

The coupler principle is simple: gather a large number of variables (medical history findings, physical examination findings, laboratory data) and use a computer to sort them into all the diagnostic or treat-

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ment possibilities for that patient's unique clinical situation. The logic is combinatorial rather than probabilistic or algorithmic. Probabilistic logic would cause us to miss the rare possibility, and algorithmic logic forces an either-or decision, but in fact, there may be two simultaneous choices (migraine *and* muscle contraction headache).

The current list of couplers covers the majority of clinical problems and functions in a primary-care office: wellness, screening, diagnosis, and management. They are meant to be used routinely, not just with difficult cases. Routine use of couplers provides a critical standardization of input.

Coupler content is reviewed and updated every six months and downloaded electronically into our system. All current guidelines are incorporated, but their application is tailored to each unique patient situation. Feedback from users is encouraged.

Getting Started: Leadership, Vision, and Quality Management

The implementation of this computerized technology in our practice, as with any major technologic innovation, required a clear statement of purpose from the practice leadership, mobilization of the entire staff to that end, and adequate training and practice time. Accepting this way of thinking about medical problems is a truly transformational experience.

All staff members have to understand the principles of couplers, and workflow has to be changed to use the software most effectively. The greatest source of failure for any software implementation is to not change workflow to take advantage of the new software. Because process improvement and workflow redesign are constants in our practice, we have found it useful to first train our staff in the principles of quality management (systems thinking, continuous improvement, customer focus, and understanding variation) to help them absorb these changes and implement them quickly.

Getting Couplers Done

The process for diagnostic couplers starts with our triage coupler. This is a custom coupler that I have been developing since the late 1980s for use by our patient service representatives. When a patient calls with a new medical problem, the patient service

representatives use this coupler to review a series of questions that will allow them to determine 1) whether the patient needs to be seen in the office, and if so, how soon; 2) how much time should be allowed for the visit; and 3) whether any testing should be done before the visit. In many cases, patient service representatives can provide advice and treatment to be followed at home, saving the patient an office visit. Patients with life-threatening symptoms may be told to go directly to an Emergency Department.

This tool is a perfect example of continuously updating and refining knowledge that then is made available to all users. It allows the patient service representative to act directly to assist patients without having to pass through the filter of the clinicians.

If the patient has a new complaint for which there is a coupler and is to be seen in the office, s/he is directed to a Web portal to complete the medical history portion of the coupler and e-mail it back to us. That is loaded into the office coupler system. Patients who are unable to complete the medical history from home are instructed to come in before their appointment to complete their portion of the coupler in the office. Using the patient's time for this process is key to gathering the detailed, standardized database for the couplers and saves staff and clinician time. If this process fails, the medical-history portion of the coupler can be completed by clinical staff in an examining room.

As already noted, the triage coupler also defines the amount of time for the visit. Because our goal is to make quality the constant and time the variable, we want to match the amount of work with the appropriate amount of time.

Our goal is to review the appropriate management coupler for all chronic problems yearly. There are management couplers for most chronic problems (hypertension, cholesterol, chronic obstructive pulmonary disease, coronary disease, asthma, migraine, etc). The process for completing the management coupler is the same as for the other couplers: have the patient complete the history portion at home or, more often, complete the coupler in the examining room with the patient at the time of the visit. As with the diagnostic couplers, the guidance options are presented in a structured array, starting with things the patient can do and ending with medication options, including the pros and cons for each drug. In essence, we have created a complete care plan for that particular problem.

The patient leaves with rich information about each option selected.

Using Couplers in the Examining Room

In the examining room, our clinical support staff brings up the coupler with the already-entered patient input and the EMR on the computer screen. Because the coupler system is not integrated with the EMR, users are required to toggle between the two programs. Integration of couplers in an EMR is possible and essential.

The clinical support staff takes the history of the present illness and vital signs, entering the information on the latter into the coupler, along with any appropriate laboratory data. At this point, much of the work of the visit has been done, allowing the clinician to focus primarily on decision making. Collection of all of the pertinent information before engaging in clinical decision making is essential to avoiding the biases noted earlier. The clinician reviews the medical history findings for accuracy, annotates where appropriate, and then completes the coupler-specific physical examination. The program couples the data, and patient and provider are ready to consider the options for that problem in this unique patient situation.

All diagnostic possibilities suggested by a positive finding in the coupler are displayed, even if uncommon or rare. They are grouped into broad categories that help guide the analytic process. For instance, rapidly progressive or life-threatening diagnoses may be grouped first, those for which a single finding makes the diagnosis a consideration may be grouped next, and so on.

The clinician and the patient then consider the diagnostic options. The final decision can be made with the patient, considering his or her concerns and values in conjunction with the clinician's clinical judgment. The patient participates in the process to the degree s/he is able and willing. Some want to participate and some do not, but all are given the opportunity. My experience is that they are more willing to do this with the management couplers.

The options selected are then flagged and the coupler session is saved. Each patient has a coupler record that is separate from the EMR. All coupler sessions run for that patient are saved in that electronic record. If there is pertinent new information, the clinician only needs to bring up the original stored coupler, enter the new data, recouple, and review the updated options without having to repeat the entire process. This is

particularly useful for the management couplers when initial therapeutic choices may not be working and others must be considered.

Couplers and the Medical Record

When the coupler session is saved, the user is presented with a comment dialogue box. I use that to summarize my option choices and the next steps for evaluating the problem. The final document is then saved in the patient coupler record. The subjective and objective findings with the diagnostic or management options selected for consideration, plus my plan summary, may then be displayed as an encounter report. It is a simple step to copy this report into the EMR under the history of present illness and vital signs. There is no dictation, and typing is minimal. The patient leaves with a copy of that note and the printed options information that we selected.

The Straw Man of Time

The goal is to make quality the constant and time the variable. A concern might be that patient care "takes too long." This was a common complaint about the problem-oriented medical record system also. However, as the old management saying goes, there is never enough time to do it right but always enough time to do it over. All of the couplers can be completed in the context of a 15- or 30-minute office visit. The most time-consuming part of the process is completed by patients themselves, and the system redesign allows us to complete the process within that time frame. As an added benefit, most coupler sessions can be coded at a high level because they include an extensive and detailed medical history and physical examination, and complex decision making is involved in sorting through the options. One can do well while doing good!

What Have We Achieved?

We have successfully integrated a sophisticated clinical support system into our busy primary-care practice with no loss of productivity. This has been achieved by a combination of system process redesign, engagement of the patient directly in the process, and a highly trained support staff. We have standardized inputs at the front end (itself a quality gain), with the variation occurring in the outputs (options) generated by each unique patient situation. We have minimized the chances that the rare or unusual case will be missed, and we are able

to provide detailed, current information for the patient. We have shown that it can be done. We can finish the day knowing that in those situations where the coupler system has been used, we have given ourselves the best shot at practicing the best medicine possible. The only question is whether the profession is willing to minimize the limitations of the human mind to deal with complex data through the use of new tools. ❖

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The author(s) have no conflicts of interest to disclose.

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Progress

An able physician is more useful to a patient than the most devoted friend, and progress in medical knowledge does more for the health of the community than ill-informed philanthropy.

—Bertrand Russell, 1872–1970, *British philosopher, mathematician, logician, and historian*