This letter to the New York Time's editor about the adoption of traditional EMR systems in primary care sums up the problem:

“A high-volume, low-margin business like primary care medicine simply cannot support the costs. These include both the very high dollar cost of buying and maintaining a system and the huge drop in productivity that initially accompanies implementation.”

However, EHR workflow management systems, EMR workflow systems, and business process management technologies are ideal for high-volume, low-margin businesses such as ambulatory pediatric, family medicine, and obstetrics and gynecology practices. They can be more quickly and inexpensively deployed than traditional EMRs and they dramatically increase, not decrease, productivity.

My 2003 white paper “Electronic Medical Record Workflow Management: The Workflow of Workflow,” which includes results from a survey of primary care practices documenting a workflow automation-induced productivity surge, has garnered a lot of web traffic over the years. With all of the published news articles and conversations on the Web about productivity and usability and workflow being major obstacles to EMR adoption, I decided to update that 2003 white paper by adding a companion titled “Pediatric and Primary Care EMR Business Process Management: A Look Back, a Look Under the Hood, and a Look Forward,” co-authored with Mark Copenhaver (CTO at EHRI). Everything in the original “Workflow of Workflow” paper is still true and even more relevant today. However EncounterPRO and the HIT industry have evolved a lot in the past six years. Portions of this twelve page white paper are unavoidably somewhat technical in places, so this post is a shorter and less technical summary of its major points.

There is also the recent related post, “The Cognitive Psychology of Pediatric EMR Usability and Workflow,” about human perceptual and decision making information processing constraints that motivate use of pediatric EMR workflow systems. That post is about why EncounterPRO is designed the way it is; this post (and white paper) is about how EncounterPRO works in response to that why.

I’ll start with the abstract, quote or summarize the most interesting material, throw in a few screen shots, and voila: the Reader's Digest version of “Pediatric and Primary Care EMR Business Process Management: A Look Back, a Look Under the Hood, and a Look Forward.”
Pediatric and Primary Care EMR Business Process Management:
A Look Back, a Look Under the Hood, and a Look Forward

Abstract. We describe an ambulatory electronic health record (EHR) workflow management system (WfMS)—employed to create a high-usability pediatric electronic medical record (EMR) workflow system—that is currently in use by 4000 users at 300 medical offices and has been deployed since 1995. WfMS features and functionality include a workflow engine, workflow process definition editor, and a universally viewable annotated worklist that represents patient location and task status in real time. Clinical data flow into and out of the EncounterPRO Pediatric EMR Workflow System via the EncounterPRO Health Information Exchange (EPHIE, HIE) automatically and inexpensively due to coordinated workflow management across EMR and HIE subsystems. Business process management (BPM) add-on modules address the three most important dimensions of ambulatory EMR value: clinical performance, patient satisfaction, and practice profitability. Written physician comments about the resulting electronic medical record (EMR) workflow systems (two pediatric and one obstetrics, gynecology and family medicine) from three award winning case studies support the importance of workflow or process-aware EMRs to successful EMR deployment.

We distinguish between EHR workflow management systems (WfMSs) and EMR workflow systems. Just as a database management system is used to create and manage a database system, the EncounterPRO EHR Workflow Management System is used to create and manage the EncounterPRO Pediatric EMR Workflow System (and the Family Medicine EMR Workflow System and Obstetrics and Gynecology EMR Workflow System, and so on).

When business process management (BPM) functionality is used to systematically optimize EMR workflow processes with respect to clinical performance, patient satisfaction, and practice productivity, we will speak generally about EHR business process management. However, during day-to-day EMR operation, users do not interact directly with either EHR WfMS or EHR BPM functionality (which are chiefly intended for use by EMR workflow system designers). When pediatric or other primary care EMR workflow system users access, rely upon, or benefit from BPM system functionality, we refer to that as EMR business process management (hence the title of this white paper).
EMR workflow systems are more usable than EMRs without workflow management capability. Consider these usability principles: naturalness, consistency, relevance, supportiveness, and flexibility.

- Pediatric (for example) EMR workflow systems more naturally match the task structure of a pediatrician’s office through execution of pediatric-specific workflow process definitions.
- These definitions consistently reinforce user expectations. Over time this leads to fast and effective interleaved team behavior.
- On a screen-by-screen basis, users encounter more relevant data and order entry options.
- A pediatric EMR workflow system tracks pending tasks in real time—which patients are waiting where, how long, for what, and who is responsible—and this data can be used to support a continually updated shared mental model among users.
- Finally, to the degree to which a pediatric EMR workflow system is not natural, consistent, relevant, and supportive, the flexibility of the underlying EHR workflow management system can be used to mold workflow system behavior until it becomes natural, consistent, relevant, and supportive.

In other words, pediatric (and other specialty-specific) EMR workflow systems based on EHR workflow management system foundations are more usable than traditional pediatric EMRs that are not based on workflow management system foundations.

**EHR Workflow Management System Functionality**

The EncounterPRO EHR Workflow Management System includes a large number of optional data review and entry and order entry tasks. For example, Figure 1 shows the Chief Complaint screen.
A subset of these tasks are selected to create a workflow process definition, or “workplan” in EncounterPRO speak. In this example (Figure 2) the workplan is a pediatric workplan for “Standard Encounter Child Well Visit New Patient.” The Chief Complaint screen occurs as the third step in this workplan. A collection of pediatric-specific workplans configures an EncounterPRO Pediatric EMR Workflow System.
Figure 2: A Process Definition ("Workplan") Controls Presentation of Screens to Users

During workplan execution the Chief Complaint task time is automatically and continually updated in the office view (Figure 3). It can be seen as the pick item in the upper left. It has been languishing (in this demo situation) for 29 minutes. Touching the task bar brings up the Chief Complaint screen in order to complete it (back to Figure 1).
**Figure 3:** EncounterPRO Pediatric EMR Workflow System Office View

By automatically pushing the pediatric task screens to the right users (on their To Do lists) and by indicating their status in real time on the office view where all staff can see them, tasks are accomplished quickly and the occasional ignored task is ignored only briefly.

**EHR Business Process Management Functionality**

Workflow or process-aware information systems—workflow management systems, business process management, monitoring, mining, and modeling systems—have great potential to address the central issues of healthcare reform: identification of best practices, coordination of care amongst providers and patients, and consistency across healthcare delivery processes. And pediatric EMR users are increasingly asking for means to systematically improve the effectiveness and efficiency of a wide variety of pediatric EMR mediated processes. Goals include improved pediatric clinical outcomes, more satisfied patients, and increased pediatric practice profitability. With respect to each of these dimensions we are using business process management ideas and techniques to design a number of add-on BPM modules.

(The white paper also reviews the workflow management aspects of three HIMSS Davies winning applications for two pediatricians and one physician with a combined obstetrics, gynecology, and
family medicine practice. If you’re not going to read the white paper, there is a previous self contained post about the award winning use of the EncounterPRO Pediatric and Obstetrics, Gynecology and Family Medicine EMR Workflow Systems.)

That is the “Look Back,” “Look Under the Hood,” and “Look Forward.”

- Look back: Only existing ambulatory EHR workflow management system or pediatric EMR workflow system since first deployed in 1995, creation of the workflow-aware EncounterPRO Health Information Exchange, and three pediatric and primary care practices using the EncounterPRO EMR Workflow System and winning the HIMSS Davies Award.
- Look under the hood: Screen-by-screen explanation of means by which pediatric-specific workflow process definitions are created within the EncounterPRO EHR Workflow Management System in order to configure a pediatric EMR workflow system.
- Look forward: The benefits of business process management ideas and technologies applied to ambulatory care, primary care, and pediatric EMR workflow systems.

Current developments in business process management are relevant to where we intend to take the EncounterPRO EHR Workflow Management System and EncounterPRO Pediatric EMR Workflow Systems as products. A number of trends are converging. Workflow management and business process management system technologies have matured and proven their use in a variety of other industries, and are poised to diffuse throughout healthcare. Issues of EMR productivity, usability, and workflow have come to the fore: too many traditional EMR implementations have failed due to problematic workflow and decreased productivity, the rate of EMR adoption has been too slow, and EMR professionals are beginning to realize that the user isn’t the problem; it’s the usability of the technology (although we acknowledge the honest debate on this topic). And productivity, usability, and workflow are inextricably intertwined.

EMRs without sophisticated workflow automation foundations, tools, and infrastructure are not up to the job. Non-workflow-management-system-based EHRs are difficult to optimize in a business process management sense. Their workflows are highly constrained by the initial design decisions of their respective programmers. Their lack of easily changed workflow process definitions makes it difficult to systematically improve their workflows with respect to the wide variety of goals that motivate use of ambulatory EMRs.

The EncounterPRO EHR Workflow Management System (and the workflow systems it creates and manages, for pediatrics, family medicine, obstetrics and gynecology, etc.) is an example of a new class of process-aware ambulatory EHR/EMR software. This next step in the evolution of ambulatory EMRs is squarely at the intersection between two great software industries: electronic
health record systems and workflow management/business process management systems. The hybrid EMR workflow systems that result will be more usable and more systematically optimizable than traditional EMRs with respect to user satisfaction, clinical performance, patient satisfaction, and practice profitability.