Electronic Medical Record Workflow Management:
The Workflow of Workflow

White Paper

By

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Introduction

How can medical practices increase their practice productivity and user satisfaction on one hand, while generating electronic patient documentation on the other? EMR (electronic medical record) systems are evolving from mere documentation systems into workflow and workflow management systems in order to accomplish both sets of goals.

However, many people—providers and vendors—confuse workflow with workflow management, and EMR workflow systems with EMR workflow management systems. Users usually interact with the workflow system, not the workflow management system used to design and implement it. However, it is the underlying workflow management system that allows a workflow system to be flexibly adapted to local processes and user preferences, and to be easily monitored and maintained. Thus, potential users need to understand and ask about both workflow and workflow management issues.

I will cover the following topics: how workflow management systems are different from mere workflow systems; the workflow definition (at the heart of workflow management); multi-specialty, multi-site, and multi-encounter workflow management; results of a workflow management usability and productivity study; a survey of workflow management system terminology; and how to shop for a workflow management system (questions to ask, answers to watch out for).

Workflow Management versus Mere Workflow

First of all let me clear up a misconception that some EMRs have workflow and some do not. Actually, all EMRs have workflow, some good and some bad. In fact, every software application has workflow, even MS Word. However, to say an EMR has workflow, even good workflow, is not the same as saying it is a workflow management system.

A useful analogy is between database management systems and workflow management systems. A database usually comes with a database management system, which is used to execute and manage the database. For example, in order to access the data in a database one also needs Access or SQL Server or Oracle, etc. The database management system creates, executes (creates, retrieves, and updates data), manages, and edits the database (but is not itself the database). Similarly, a workflow management system creates, executes, monitors, and edits a workflow system, but is not itself a workflow system.

However, when you buy an EMR workflow management system, it is not necessary for you to create a EMR workflow system from scratch. The EMR workflow management system vendor has already created the workflow system for you. The main advantage of getting both a workflow system and a workflow management system—together—is that you can easily further customize the EMR workflow system to reflect your clinical needs, personal preferences, and business requirements.

What is it, exactly, that the vendor provides (and that you can customize further)? The vendor supplies "workflow definitions," which are (deep breath…) sequences of user-editable instructions that determine EMR behavior. In the very next section I will illustrate these in a before-and-after patient encounter scenario. We'll see an EMR in action; we'll edit a workflow definition; we'll see the effect of the edit on subsequent

EMR behavior.

Workflow Definitions: The Heart of a Workflow Management System

The following illustration shows two views of workflow. On the left side is the sequence of screens actually presented to a nurse and physician: (1) Get the Patient, (2) Take Vitals and a Chief Complaint, (3) Review Allergies, (4) Review Medications, (5) Review of Systems (the nurse's favorite), (6) Examination Screen (from which the physician can kick off additional optional workflows), (7) Evaluation and Management (reviewing automatically calculated E&M level codes), and (8) Billing Approval.

The large screen on the right is the workflow definition tool used to create and edit the workflow definition (steps 1-8) that drives EMR behavior. The picklist items correspond to screens selected out of an inventory of over a hundred such screens. The reader should be familiar with the idea of an EMR picklist, which usually concerns such things as symptoms, diagnoses, or orders. In this case, the picklist represents the sequence of screens that will be presented to EMR users.
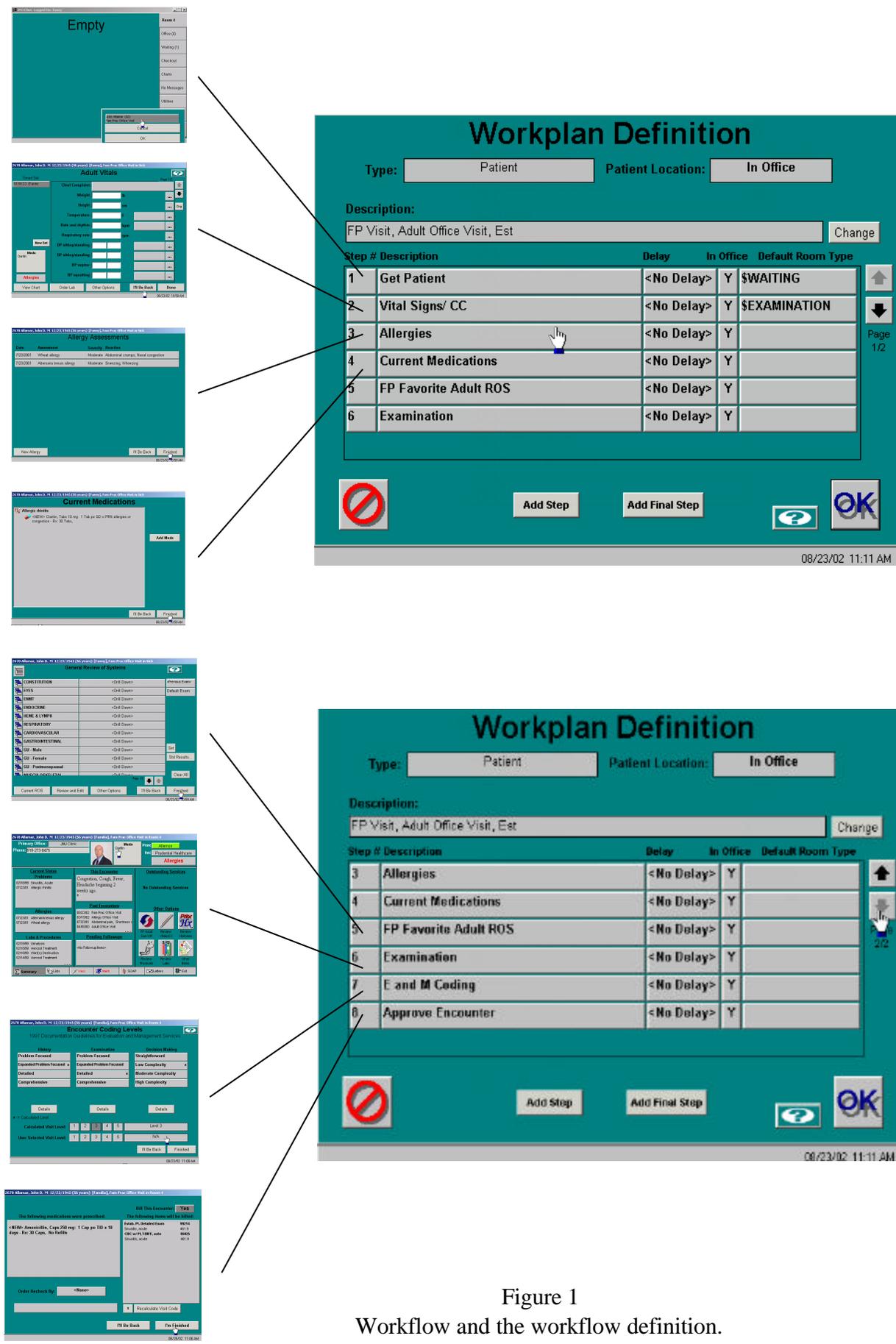
Figure 1
Workflow and the workflow definition.

In a sense, a workflow definition is a "program" that a user can write and debug in order to improve an office's workflow. The workflow definition is something that both user and programmer can understand. The user understands the relationship between picklist items and EMR behavior. The programmer understands how to use the picklist items in conjunction with a workflow engine, to make the EMR behave according to the order of picklist items.

The workflow definition saves the user from having to navigate manually through a hierarchical thicket of menus, tabs, or popup lists; the EMR presents the correct screen given the context of the user's tasks. Workflow definitions are used by the workflow engine in a similar way to rules being used by an expert system. The workflow engine reasons about who, what, why, when, where, and how in order to save the user work. Who is the user? (Dr. Jones or Dr. Smith?) What is their role in the office? (Physician, nurse, tech?) Why is the patient here? (Well child? Chronic disease management?) When is "now", relative to what has been and what remains to be accomplished? Where is the user? (Exam room? Tech station?) How does this specialty accomplish its tasks?

The simplest test of whether an EMR is built on a workflow management system is to ask for a live demonstration of the following:

> 1. Ask to see an encounter from beginning to end. Focus on the sequence of screens.
>
> 2. Ask to see the workflow definition that controls the sequence of screens just observed.
>
> 3. Ask to see a small edit in the workflow definition, such as the deletion or reordering of several steps.
>
> 4. Ask to see the same encounter again, while focusing on whether or not the changes in the workflow definition have indeed resulted in the appropriate changes in screen sequence.

If an EMR cannot demonstrate steps (1-4), then the EMR lacks the capabilities of a workflow management system. It does have workflow (because all software applications have workflow). It may even have workflow that is good for a particular task and context. But it is not an EMR workflow management system. (By the way, customizing a picklist of symptoms, diagnoses, or treatments is not workflow management. The picklist has to represent task sequence in order to be a workflow definition.)

Multi-Specialty, Multi-Site, Multi-Encounter Workflow Management

Suppose you find an EMR that can pass the "Edit the Workflow Definition" test. What are some useful criteria for comparing EMR workflow management systems? Consider the three "Multis" of workflow management. Ask: Do you have multi-specialty workflow management, in which different specialties and specialists can rely on different workflow definitions? Do you have multi-site workflow, where medical practice sites in different parts of town can share in workflow definitions? Do you have multi-encounter workflow, especially important for chronic disease management?

Think of multi-specialty workflow in terms of analogy to rail mass transportation in a major city such as London or New York. Subway lines start in different places, end in different places, stop in different (but also similar) places along their way, but work together in a globally coherent system. Each specialty has its own collection of workflow definitions, whose constituent tasks may or may not be shared with each other (sort of like subway stops, to continue the analogy). Patients enter one workflow (subway line) but may switch to another workflow during the course of consultation between specialists. Specialty workflows start and stop in different places while sharing resources and working together in a globally coherent system.

Consider multi-site workflow management. The same specialist may be at one medical practice location one day but at another the next. Can specialty workflow definitions be shared across sites, eliminating the need for creating separate, basically identical, workflow definitions for each site? Alternatively, can different sites create their own site specific workflow definitions? Can each site track its patients in its local office layout, but can a supervisor also easily see what is happening at another site? ("Hey! I'm calling from the Eastside office to ask why Mr. Smith has been waiting an hour for his vitals?") Can workflow definitions span sites, so that a patient can be seen in one office but show up at another office for testing that is only available there.
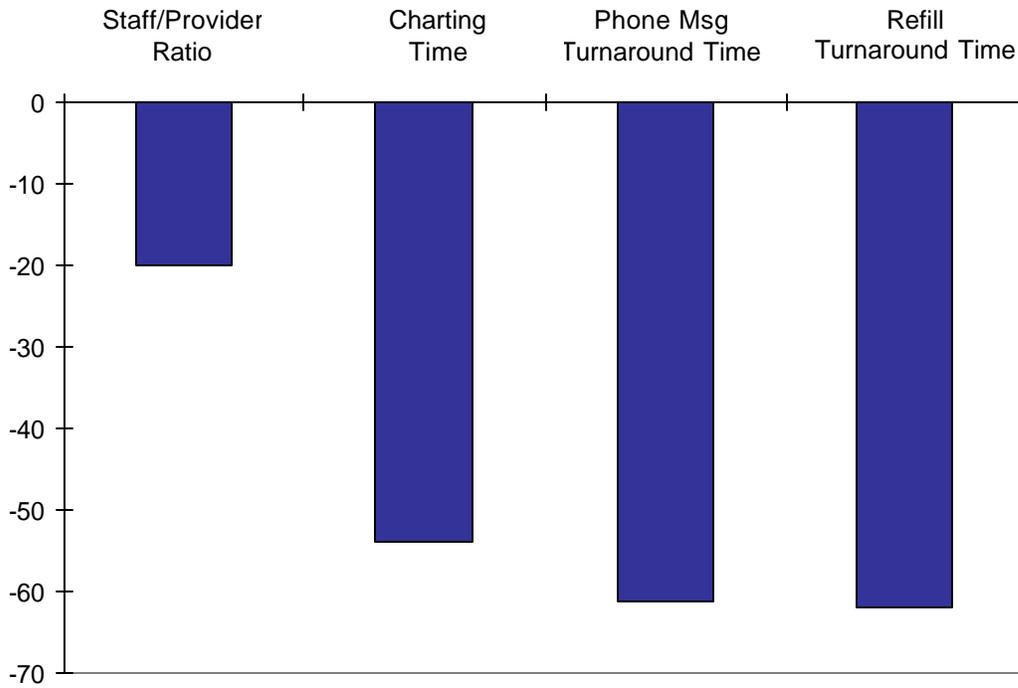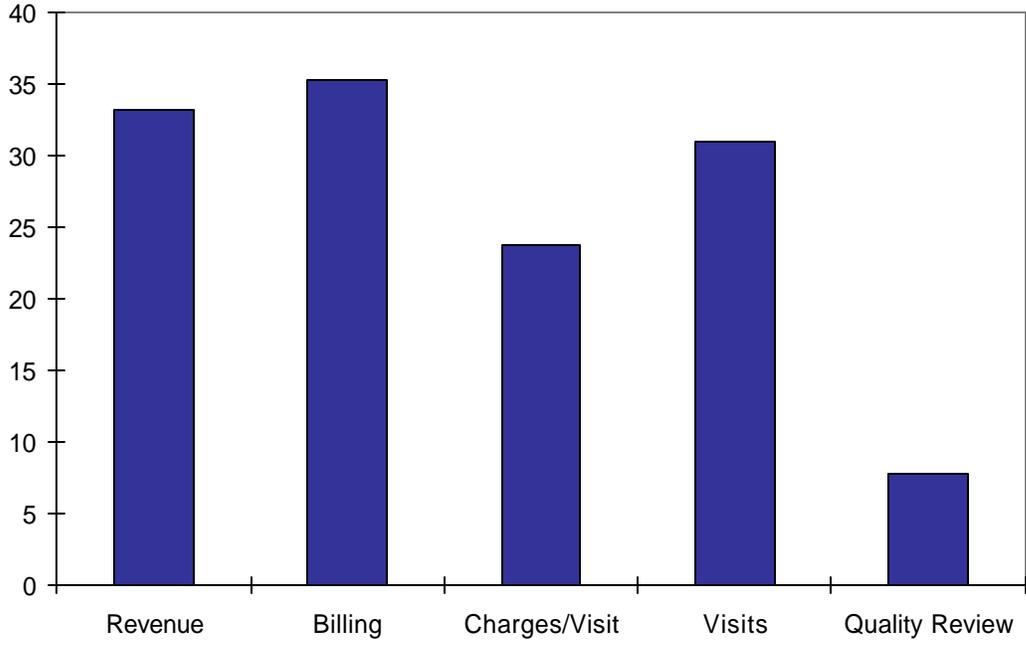
Multi-encounter workflow management includes the following: follow-ups, a step in one workflow definition triggers application of a future workflow definition (such as returning for a specialized test); referrals, in which a workflow definition triggers a future review of an intervening external consultation; and recurring activities such as screening tests and chronic disease management.

Workflow management systems for ambulatory medicine must (eventually—to be maximally effective) span time, space, and subject matter. Be sure to check off the three multis when comparing EMR workflow management systems.

A Workflow Management Usability and Productivity Survey

Ultimately, the effect of workflow management technology on productivity is an empirical question: does it work? We conducted a survey of ten primary care practices with respect to the impact of an EMR workflow management system on usability and productivity. The results are concisely summarized in the following bar graphs.

Percent
Increase

40
35
30
25
20
15
10
5
0

Revenue   Billing   Charges/Visit   Visits   Quality Review

Staff/Provider   Charting   Phone Msg   Refill
Ratio   Time   Turnaround Time   Turnaround Time

0
-10
-20
-30
-40
-50
-60
-70

Percent
Decrease

Figure 2
Impact of an EMR workflow management system.

Usability and productivity results from a survey of ten primary care practices demonstrate <u>dramatic increases</u> in revenue, billing, visits and visit charges, and quality review scores and equally <u>dramatic decreases</u> in staff/provider ratio, charting time, and phone message and refill request turnaround times. The survey suggests that the combination of workflow management and patient charting can greatly increase user satisfaction, return on investment, and practice productivity.

Informal Definitions and Ambulatory Examples

Workflow management systems have their own terminology, much of which can seem abstract or arcane. So, here are some very simplified definitions (and ambulatory examples), adapted from Workflow Management: Models, Methods, and Systems, by van der Aalst and van Hee (2002, MIT Press).

	Short Definition	Ambulatory Example
Work item	Task to perform	Vitals signs awaiting performance during a patient encounter
Workflow Definition	Description of a process detailed enough to drive EMR behavior	Get the Patient, Take Vitals and a Chief Complaint, Review Allergies, Review Medications, Review of Systems, Examination Screen, Evaluation and Management, Billing Approval
Worklist	List of tasks to perform	A nurse's To Do list
Case	A particular application of a workflow management system	A particular patient's encounter managed by a workflow management system
Process	Order of tasks to be performed and resource requirements	A Well Child pediatric visit
Resource	Something that accomplishes tasks (usually a user)	A physician, nurse, technician
Role	Set of related skills accomplished by a resource	The role of nurse or physician
Routing	Types of routing include sequential, parallel, conditional, or iterative task execution	Routing a recording to a transcriptionist and the report back to the physician

Task	Unit of work carried out by a resource	Obtain vital signs
Trigger	An event that changes a work item into an activity	Starting to accomplish the task of responding to a phone message by selecting a To Do list item
Workflow	A process and its cases, resources, and triggers	The tasks and people involved in accomplishing a patient encounter
Workflow Definition Tool	User application for creating workflow definitions	An ordered picklist representing Get the Patient, Take Vitals and a Chief Complaint, Review Allergies, Review Medications, Review of Systems, Examination Screen, Evaluation and Management, Billing Approval
Activity	Performance of a task	Obtain vital signs within a patient encounter

Anyone who markets a "workflow management system" that really is a workflow management system should show a least some familiarity with this terminology and be able to demonstrate relevant features of their application. If they can't even talk the lingo, their "workflow management system" is probably just a "workflow system."

Shopping for an EMR Workflow Management System

As "workflow management" becomes a more popular marketing term, watch out!

A workflow management system is not something like email or patient tracking or laboratory connectivity that can be tacked on to an EMR ("available next quarter!"). The very nature of a database that supports structured data capture and workflow management requires that documentation tasks (the core of most EMRs) be built on a workflow management system foundation. "Adding" a workflow management system to an EMR is akin to adding a foundation to a skyscraper or a hull to a ship. The only way to "add" a workflow management system to EMR is basically to recreate it from scratch, on a workflow management system foundation. Look for an EMR workflow management system with excellent patient encounter documentation capability—and a preexisting workflow management system foundation that has been around long enough to have proved its mettle.

Regarding messaging (including email), patient tracking, and backend connectivity—all of these are excellent features that can be used to great advantage in a workflow management system. Messaging facilitates person-to-person coordination; interfaces

make application-to-application coordination possible; and patient tracking is obviously all about coordinating the most important resource of all, patients! All of these can be used to coordinate resources, and coordination is certainly a central theme of workflow management. However, while these may facilitate workflow, they aren't workflow management.

Workflow management is about the user (or at least someone acting for the user, who is intimately familiar with the user's needs and wants) creating exactly the right workflows for a medical practice by creating exactly the right workflow definitions. While messaging, tracking, and connectivity may be wonderful tasks to add to a workflow definition, they are still just tasks and resources in the user's environment. It's the workflow management system that puts the tasks together to create optimal workflows.

Watch out for vendors who do not understand the difference between workflow and workflow management, and therefore believe they have workflow management because they have what they consider to be good workflow. (Again, tacking on email or patient tracking or a laboratory interface may be part of good workflow, but none of these are workflow management.) Use the "Edit a Workflow Definition" test to determine whether or not the EMR in question really is an EMR workflow management system, that is, (1) watch an encounter, (2) edit a workflow definition, (3) compare the resulting encounter.

When comparing EMR workflow management system features, watch out for vendors who claim a long list of features relative to a product portfolio or suite, instead of a single integrated EMR workflow management system. On one hand, there are workflow management systems that have not been successfully adapted to ambulatory documentation requirements. On the other hand, there are the EMRs for documenting the patient encounter that have no workflow management. Adding an interface between a generic workflow management system and an existing EMR is similar to the flawed approach previously described with respect to messaging, patient tracking, and connectivity. Documentation capabilities and workflow management features need to be designed together and tweaked together over the course of several years to instill confidence that the integration between documentation tasks and workflow management architecture is seamless and stable.

Conclusion

We've been on a behind the scenes tour of EMR workflow management system technology. It's behind the scenes because that is where a workflow management system works, to present the right screen content to the right person at the right time. Ask yourself, who or what is the workflow engine? If the EMR user manual has long sections devoted to "workflow" of the kind the user must accomplish ("Click here, then click here, then here, here, here and here…"), the user is workflow engine.

If the EMR can be instructed in what to do—automatically—based on who, what, why, when, where, and how, it is an EMR workflow management system. Further, if that

instruction can be customized to your local circumstances and preferences, then the EMR is a workflow management system that can both generate your electronic patient documentation and increase your practice productivity.

Bibliography

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