

Marketing Intelligent BPM to Healthcare Intelligently

Charles Webster, MD, MSIE, MSIS

ABSTRACT

Health information technology (HIT) professionals who learn about business process management (BPM) technology are usually impressed. Nonetheless, BPM has been slow to diffuse into healthcare. HIT has technologies corresponding to some BPM suite core components. But process orchestration engines remain rare. Fortunately, there are signs that the HIT market is entering a period of greater need and appreciation for BPM ideas, products, and services. I describe the current state of affairs within the health IT industry and suggest how BPM vendors can engage, educate, and communicate, about BPM's unique value to healthcare and health IT.

INTRODUCTION

Health information technology (HIT) professionals who learn about business process management (BPM) systems and suites (BPMS) and related process-aware technologies are usually impressed with their potential to manage and improve healthcare processes. Business process management and process-aware information systems, including offshoots such as adaptive case management and process mining, are relevant to central issues of healthcare reform: identification of best practices, coordination of care, consistency across processes, and efficient use of resources.

Nonetheless, BPM has been slow to diffuse into healthcare. HIT has technologies corresponding to some BPMS core components, but engines executing executable process models remain rare. Fortunately, the HIT market is entering a period of greater need for, and receptivity to, BPM-related concepts and software. Making a successful pitch to healthcare, for applying BPM tech around and at the point of care, requires an educational approach that addresses healthcare workflow's unique pain points.

The following is an exercise in "meta-marketing." If marketing is communicating value of BPM to healthcare, then meta-marketing is about communicating to you how to do so successfully. In this essay I recount what I say about BPM to interested healthcare audiences and consider how we can improve marketing from BPM into healthcare. I'll talk about the health IT "wall"; opportunities and obstacles for BPM in healthcare; how to hone the "intelligent" BPM message; and a program to educate, highlight, and recruit health IT and BPM stakeholders.

HEALTHCARE NEEDS BUSINESS PROCESS MANAGEMENT

When addressing a healthcare audience, I may start out this way:

“Mobile, social, cloud, big data, etc. move over: PAIS.

Process-aware information systems (PAIS) ideas and technology — workflow management, business process management (BPM), and adaptive case management systems — are diffusing into healthcare from other industries. A Process-Aware Information System is ‘a software system that manages and executes operational processes involving people, applications, and/or information sources on the basis of process models.’ The best known PAIS is a business process management system or suite.

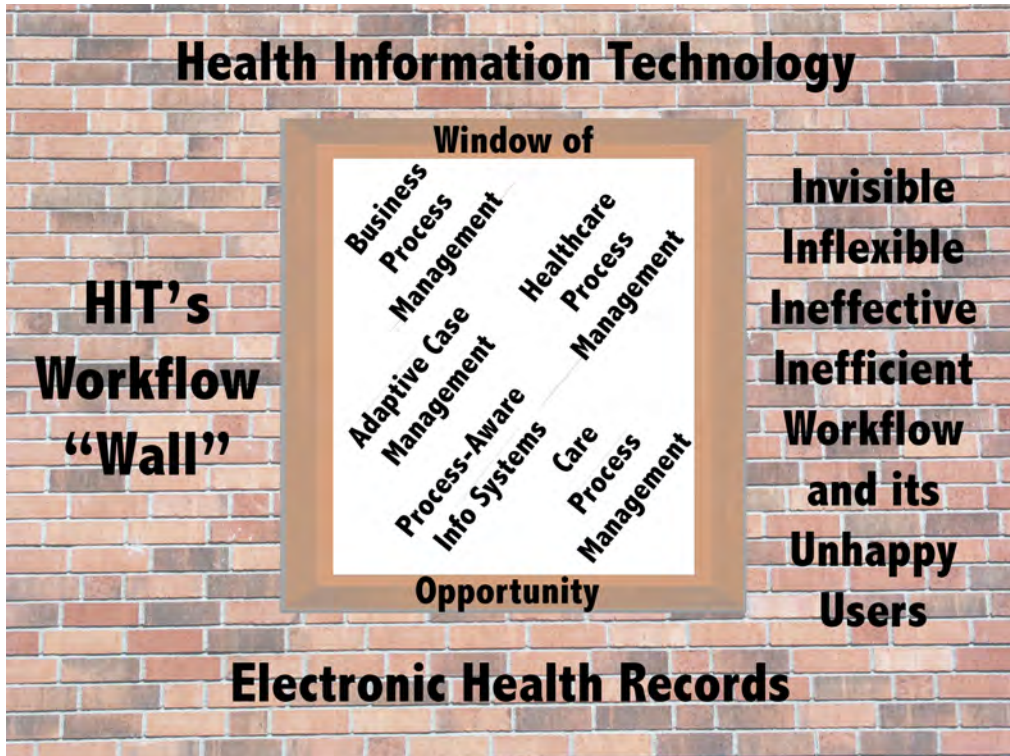
[...BPM 101 and healthcare specific use cases...]

Takeaways include a powerful new idea (the executable process model), examples of successful applications of PAISs in healthcare, and a positive but skeptical attitude useful for further investigation. The next big idea in healthcare IT is the process-aware information system.”

Healthcare is like a very large country that has been closed off to the rest of the IT world for decades. It’s been so large, so well funded, so lacking in market-competitive forces, that it’s not had to invest in workflow technology. While healthcare automated workflows, it didn’t use true (that is, process-aware) workflow automation.

We (I’m now speaking as a longtime health IT professional) have no way to represent (and edit and improve) healthcare workflow so it can be designed and executed without requiring computer programmers to hardcode it. Today, “workflow” is spread throughout the implementation code of every electronic health record (EHR) and HIT application involved in this workflow. EHR and HIT-mediated interactions, inside hospitals and clinics and outside with patients and payers, are fragile, prone to ambiguity, don’t cross organizational boundaries well, and scale badly. In fact, the more we automate healthcare workflows with workflow-oblivious software, the more static healthcare workflows become and the harder it is to propagate change and new players into these workflows.

Current health IT workflow-oblivious EHRs and health IT systems are hitting a wall. Tens of billions of dollars of subsidies are being paid to hospitals and physicians to convince them to “adopt” (with an unintended, but ironically accurate connotation that these systems would “orphans” otherwise) health IT systems that slow them down, whose workflow can’t be changed or improved, and are losing their users money.



Health IT's Workflow Wall and BPM's Opportunity

The health IT "wall" has a window of opportunity in it for proponents of BPM (including adaptive case management and process mining). Health IT is increasingly arguing with itself about "What went wrong?". "What went wrong" was that health IT prematurely settled on, and then locked into, workflow-oblivious structured-document management information systems, instead of modern process-aware workflow management.

Health IT focuses on representing data and manipulating data, leading to emphasis on meta-data, data about data. This is fine, as far as it goes. It's just that it doesn't go far enough and it is not sufficient to address healthcare's thorny problems of (lack of) productivity, inflexible workflows, unhappy users. The only way to systemically improve workflow is to represent workflow, and then think hard about steps to improve workflow. Just as data about data is meta-data and thinking about thinking is meta-cognition, workflow of workflow is meta-workflow. And thinking about meta-workflow in healthcare, health IT and medical informatics is sorely deficient.

Attempts to educate healthcare and health IT about the workflow of workflow will fail unless education is wrapped around healthcare and clinical use cases. This is why it is so important to find and highlight use cases at the border between healthcare and BPM. One source is examples where BPM vendor supplied technology has been applied to an area of interest within healthcare. In some cases, business process management is rebranded as healthcare or care process management. However, there is also another source. While healthcare is literally decades behind other industries when it comes to applying workflow technology, it's also large and varied. There are

some homegrown health information workflow management systems and products. But they are infrequent, unknown, and under-appreciated.

There's a potential common cause among health IT vendors who have self-developed workflow engine, process model-oriented platforms one hand and BPM vendors who have provided or adapted their workflow platform to healthcare purposes on the other. Why? The importance of achieving a critical mass of pro-BPM voices and the importance of clinical and healthcare-specific content and workflow. Healthcare data and workflow is idiosyncratic and confusing. It can take years of try-and-try again before a traditional health IT solution can be deemed successful and achieve market traction (regardless of whether it "gets" workflow or not).

Healthcare IT buyers don't want "empty" BPM software, just as they did not want "empty" EHRs in the early years of that industry. EHRs (then called EMRs) lacked lists of drugs and diagnoses, forcing early adopters to have to enter this content for themselves. Most current BPM software does not come with already created and road-tested clinical and healthcare workflow. This is why we are seeing BPM used first in healthcare in those areas that most resemble content in other industries, such as human resources, insurance and other routine "paper work". As these back-of-the-house systems are implemented, their implementers, familiar with other, more clinically and healthcare specific domains, are recognizing the potential for applying process-aware information systems closer and closer to the point of care.

Meanwhile, some (though not many, mind you) indigenous health IT vendors, have also implemented workflow engines and represented workflows (workflows represented as structured data in a database where it can be inspected, executed, and improved). While these workflow management systems may not have all of the bells and whistles of a pure-play BPM suite, they do have one advantage: healthcare and, in some cases, clinically-specific content.

By common cause between health IT and BPM I don't necessarily mean partnerships between specific EHR or HIT vendors and BPM vendors, though this is beginning to happen. I do mean that a rising tide of interest and understanding of process-aware technology, such as BPM, benefits both "native" health IT workflow vendors and BPM vendors.

THE TOP TEN REASONS BPM HAS BEEN SLOW TO DIFFUSE INTO HEALTHCARE

The issue we have right now is how to get that figurative light bulb to start going off over health IT heads. If we are to successfully connect and combine two different universes of discourse (as the linguists say) we really do need to drill down into the nitty-gritty of what has been retarding diffusion of BPM into healthcare. I've already alluded to some of these following. But it's worth to more formally and explicitly layout the conditions of the terrain we attempt to traverse.

1. *Workflow Complexity*: Complicated data and simple workflow is complicated. Simple data and complicated workflow is complicated. Healthcare's complicated data and complicated workflow is hyper-complicated.
2. *No Cost Competition*: In other industries, companies are forced to adopt technology to optimize workflow to minimize cost while maximizing flexibility.

3. *Regulatory Environment*: EHR and HIT vendors are stretched thin addressing Meaningful Use requirements.
4. *Screens vs. Workflow*: It's easier to appreciate EHR screens (layout of data and controls over space) than workflow functionality (sequences of events over time).
5. *Threat to Revenue Streams*: Switching to new platforms is risky and threatens current revenue streams.
6. *Billing Over Clinical Emphasis*: As long as the right codes are generated to maximize revenue, nothing else matters.
7. *Skeuomorphism*: Misguided attempts to model EHR user interfaces on paper medical record forms.
8. *Workflow Stereotypes*: Workflow management systems and business process management once emphasized automating human users out of processes. Not true now!
9. *Not Invented Here-ism*: Medical informatics (for which I designed the first undergraduate curriculum) is, in its own way, as insular relative to informatics research outside of healthcare, as health IT is to the larger IT world.
10. *Paradigm Shifts*: You stick with a paradigm unless you're forced to change. Health IT picked a document-based, instead of workflow-based, paradigm.

One of these top ten reasons is worth discussing further.

6. *Billing Over Clinical Emphasis*: As long as the right codes are generated to maximize revenue, nothing else matters.

So many healthcare and health IT stakeholders invested so much, and convinced so many others to invest so much, in current health IT models, that there is considerable resistance of admitting that current structured document management systems, with human users having to simulate workflow engines, have failed. So the argument is made that it's not health IT's fault. It's incentives. While I agree that incentives play an important role, they are not the only cause of health IT's current predicament.

The following is adapted from my blog post titled *Fixing Our Health IT Mess: Are Business Models or Technology Models to Blame?*

[begin blog post extract]

You may not agree with me that Health IT is a mess. Check out my sentiment analysis of Twitter's reaction to the New York Times coverage of the recent RAND report. You'll at least agree that many people do agree with me.

That said, reasons offered for the mess are all over the map. You can read my summary. I'll focus on one defense of Health IT: It's the business model, not the technology. Sometimes it's put differently, as in: It's the incentive model, not the technology. But business models are all about incentives: to create a business, to sustain a business, to do business with a business.

So, to those who say it's the business model, not the technology, I say the opposite: It is, in fact, the technology model, not the business model.

I'm a fan of business and models. I understand the importance of financial incentives to mold behavior. I have degrees in accountancy and industrial engineering, the spiritual homes of cost, revenue, and profit engineering and performance-based incentive systems.

But, no matter how much you persuade, pay, or punish frozen workflows, they won't change. You have to unfreeze the workflows, change them, and then refreeze them. Most current EHR and health IT systems have relatively frozen workflows. They don't have the necessary innards: workflow engines, process definitions, graphical editors, or similar means to achieve similar ends. Process-aware systems include workflow management systems, business process management and adaptive case management. Executable and malleable workflow is what these systems do. It's the opposite state of affairs in the EHR and health IT world.

The problems of Meaningful Use [a Federal subsidy program for EHRs] are entirely predictable through the lens of the infamous Iron Triangle anti-pattern of software development. Attempting to bring too many features to market too soon usually results in unstable, less usable, and hard to maintain software.

Wait, you say. Why can't we add resources? You can. Up to a point. At the beginning of a software project, adding the right programmer or two can be helpful. The problem is, as the number of personnel grows, you run into Fred Brooks' most enduring law: "Adding manpower to a late software project makes it later."

There is no way out of the Iron Triangle. You can only make it bigger. It should be renamed the Carbon Nanotube Triangle (strongest, lightest material known). You can change the triangle's shape by shifting emphases among features, schedule, and resources. And you can change its size through technological innovation. So far we've been trying to do the former, mostly via stakeholders asking, begging, demanding that we slow down. Some innovators nibble at the problem, creating workarounds and crafting end-runs: EHR-lite, EHR-extendors, mEHR etc.

The only way to increase the size of the Iron Triangle (to deliver more and better features sooner) is to change what economists call the "factors of production". In this case the factors are the software technologies we use to attempt to meet the requirements of Meaningful Use.

Most EHRs and many HIT systems are based on structured documents represented in relational databases. What do users of Meaningful Use certified EHRs complain about? Workflow! It's the wrong workflow. It's laborious workflow. The workflow doesn't fit their specialty or special needs. The workflow can't be changed. The workflow slows them down.

Well? If the problem is workflow and we aren't using workflow technology, maybe we should use workflow technology? This seems so obvious that one must ask: Why hasn't it already happened? I cover that in Top Ten Reasons EHR-BPM Tech Is Not (Yet) Widely Deployed in Healthcare.

To expand the Iron Triangle we need to move from structured document management systems to structured workflow management systems. Workflow management systems have been used in other industries since the mid-nineties. With improvements and complementary technology (business activity monitoring, process mining, simulation, graphical editors, adaptive and adaptable workflows) workflow management became business process management and adaptive case management.

I agree that even malleable systems won't change and improve unless they are caused to do so by outside forces. Business and incentive models play a role here. But frozen systems won't change even in the face of those outside

forces. Our current workflows can't change because they aren't modeled, reasoned about, executed, tracked and improved. EHR workflows are frozen. We need to unfreeze these workflows to, if not escape from Iron Triangle, at least expand it to accommodate our goals and needs.

To those who say it's the business model, not the technology, I say the opposite: It's the technology model, not the business model.

[end blog post extract]

Cloud, mobile, social, and data technologies, which health IT looks toward importing into healthcare, often rely on process-aware technologies. For example, when innovators look to cloud and mobile for EHR alternatives, workarounds, and wrappers, they also get the process-aware technology that makes cloud and mobile workable. Secure, flexible, scalable, context- and process-aware cloud-based backends will be key to secure, flexible, scalable, context- and process-aware front-end mobile apps used by patients and healthcare providers. BPM vendors are further along than HIT vendors in use of cloud, mobile, and social technology. So: cloud, mobile, and social will be important "vectors" for transport of BPM's process-aware ideas and technologies into healthcare.

INTELLIGENT BPM VS. INTELLIGENT HEALTHCARE BPM

What about that "intelligent" in front of BPMS in the title of this chapter? (Well, then, what about the "intelligently" at the end, too?) I've been holding off addressing this adjective, as there is some debate within the BPM industry about what is "intelligent BPM." When I present BPM ideas to a healthcare audience I usually use a list similar to this:

1. Executable process models
2. Codeless development
3. Content management
4. Groupware-based collaboration
5. Connectivity
6. Event-driven processes
7. Process intelligence and monitoring
8. Simulation and optimization
9. Business rule management
10. Process component archives

Some of the components of this depiction of intelligent BPM systems correspond to rudimentary systems and subsystems already familiar to EHR and health IT professionals. Many EHRs have built-in document management systems (3) or use third-party software. Many EHRs manage clinical rules (9) as part of their clinical decision support functionality (some mandated). Interoperability (5) among EHRs and HIT systems is generally recognized and increasingly achieved. Business intelligence (7) and componentized architectures (10) are increasingly popular talk about. However, BPM's core technology innovation, a process execution and statement management engine (that is, a workflow engine executing process definitions) and "end-to-end" business intelligence made possible by process mining, have not yet had impact, let alone achieved significant mindshare.

In summary, some BPM-related technologies have counterparts in healthcare IT. Others are just beginning to appear. Regardless of maturity of individual technology, perhaps the BPM suite's greatest value is as a model for how all of these technologies can fit together.

But I'd really like to take discussion of "intelligent" healthcare BPM in a slightly different direction. So as to not compete in current debates about "intelligent" BPM, I'll use the more colloquial "smart." And I'll telegraph my punch with a rhetorical question and answer.

Question: Do We Need Smarter Users or Smarter User Interfaces?

Answer: Smarter User Interfaces.

Consider the distinction between intuitable EHRs and HIT systems (systems "figure-outable" by their users) versus truly intuitive EHRs and HIT systems (systems that figure out their users and do something useful with that insight). Intuitable usability corresponds to what I call shallow usability. It's the "surface" or skin of an EMR.

In contrast, intuitive usability (used "correctly") corresponds to what I call deep usability. It is about how all the components and processes deep down behind the user interface actively work together, to perceive user context and intentions, reason and problem solve, and then proactively anticipate user needs and wants. Deep usability is like having the hyper-competent operating room nurse handing you the right data review or order entry screen, with the right data and options, at the right moment in your workflow.

To perceive, reason, and act (let alone learn) EHRs and HIT systems need at least a rudimentary "brain." When many folks think of medical artificial intelligence, they think of medical expert systems or natural language processing systems (rule-based, connectionist, or statistical). However, the most practical candidate "brain" today, with which to improve usability by improving workflow, is the modern process-aware (and context-aware) business process management (BPM) engine (AKA workflow or process engine).

Intuitive EHRs and HIT systems need to represent user goals and tasks and execute a loop of event perception, reasoning, and helpful action. BPM process definitions represent goals and tasks. During definition execution, goal and task states are tracked (available to start, started, completed, postponed, cancelled, referred, executed, etc.) and used to coordinate system-to-system, user-to-system, system-to-user, and user-to-user activity.

BPM engines "perceive" by reacting to not just user-initiated events, but potentially other environmental events as well, an example of complex event processing. For example, a patient entering or leaving a patient class or category, going on or off a clinical protocol or regime, moving into or out of compliance, measuring or needing to measure a clinical value, or a clinical value becoming controlled or not controlled, are all complex events that can and often should trigger automated workflow.

Smart EHRs and HIT systems are adaptive, responsive, proactive, and capable of autonomous action.

- "Adaptive systems: these learn their user's preferences and adjust accordingly....
- Responsive systems: these anticipate the user's needs in a changing environment.

- Proactive systems: these are goal-oriented, capable of taking the initiative, rather than just reacting to the environment.
- Autonomous systems: these can act independently, without human intervention.”¹

Learn, anticipate, goal-oriented, initiative, independent...none of these describe the behavior of today’s typical EHR or HIT system towards its users. As a consequence physicians must compensate with a torrent of clicks (so-called “clickorrhea”) to push and pull these EHR and HIT systems through what should be simple interactions.

What “drives” this smart behavior? An executable process model. In older terminology, a workflow, or process, engine, executes a collection of workflow, or process, definitions, relying on user input and context (the who, what, why, when, where, and how) to select and control definition execution. If the engine encounters inputs for which there is no model, then fall back on general purpose adaptive case management techniques for tracking goals and tasks, making them visible and actionable by physician users. Traditional BPM technology automates the predictably routine. More recent adaptive case management supports dealing with unpredictable exceptions—the high value-added knowledge work that diagnoses and treats the complicated cases.

Usability can’t be “added” to today’s EHRs and HIT systems. It has to inform and influence the very first design decisions. And there are no more fundamental early design decisions than what paradigm to adopt and platform to use. No matter how “intuitable,” EMRs and HIT systems without executable process models become, they cannot become fully active and helpful members of the patient care team. Wrong paradigm. Wrong platform.

A truly smart EHR or HIT systems, on the other hand, has a brain, variously called a BPM, workflow, or process engine. This is the necessary platform for delivering context-aware intelligent user interfaces and user experience to the point of care. Right paradigm. Right platform.

HOW CAN WE ACCELERATE DIFFUSION OF BPM IN HEALTHCARE?

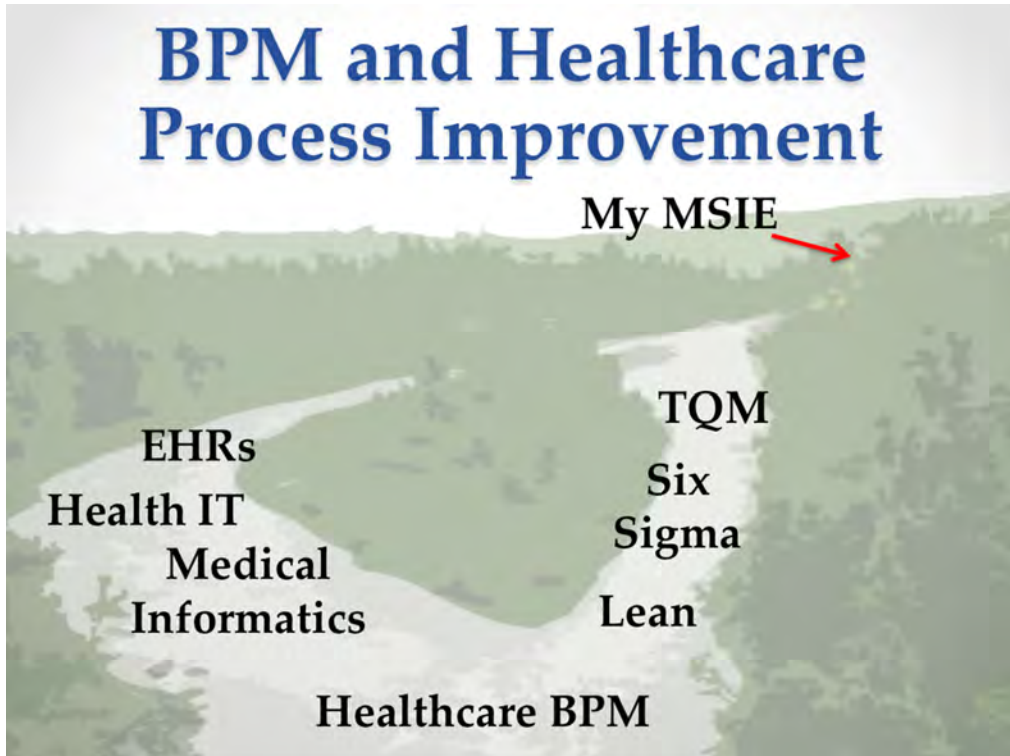
I recently gave a webinar (viewable on YouTube²) called The Power of Process: Workflow, BPM, and Healthcare. Here's the outline:

- The need for workflow/BPM in healthcare
- How other verticals are using these technologies to their benefit
- Use cases in the clinical space
- Use cases concerning supporting/operational processes
- First steps to implementing workflow/BPM

I won't rehash my webinar here, as it's basically BPM 101 (but you may be interested in its clinical and healthcare scenarios). What I will include here, though, are a couple slides and the questions provoked from webinar attendees.

¹ <http://ubiquity.acm.org/article.cfm?id=764011>

² <http://ehr.bz/chuckyoutube>



Reuniting Two Important Healthcare Informatics Traditions

Here's what I say:

“Now, I imagine we may have some healthcare process improvement folks out there, so what is the relationship between BPM and the healthcare process improvement? Back when I got my masters in industrial engineering (around the bend of that river), management engineers worked in hospitals and elsewhere, and they were involved in both sides of an equation. They measured and improved workflow, and created and implemented information systems. I worked in a hospital information systems department where the payroll system had been developed and implemented and managed by a management engineer, an industrial engineer.

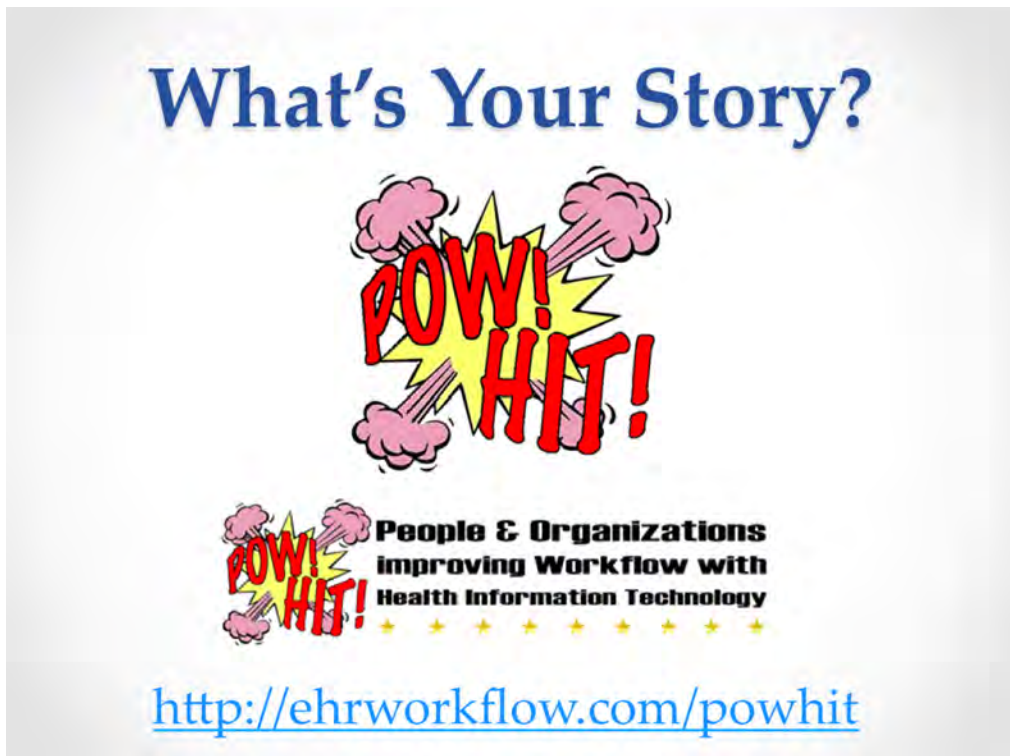
Then what happened is a bunch of folks went off and started developing electronic health records, and other health IT systems, and you've got this research behind it, which is medical informatics. I don't think they spent enough energy and time thinking about workflow problems and workflow theories and creating workflow tools.

Meanwhile, over on the other side, we've got the Total Quality Management folks, Six Sigma and Lean. They're finding the causes of errors. They're finding the sources of variation and eliminating it. They're figuring how to do the same amount of work but with less waste. Well, more-and-more work is actually done in a kind of a mind-meld with the software. We really need to knit together these

two traditions and I think that the healthcare business process management hybrid is a way to do that.”

And here’s what I say about the following slide:

“One more thing, I love hearing workflow success stories regardless of whether they involved workflow engines or not. I’ve created a directory on my Twitter account (@wareFLO) website at EHRworkflow.com. POW!HIT! stands for People and Organizations improving Workflow with Health Information Technology.”



People and Organizations Improving Workflow
with Health Information Technology

I hope you can see what I am doing. I’m appealing to two important constituencies, health IT and healthcare process improvement. And I’m asking for stories about healthcare workflow. Stories can move people. That “exploding” POW!HIT! is actually a badge, of different sizes, you can download if I’ve featured you as a POW!HIT! Profile.

I answered webinar questions, to the best of my ability, extemporaneously. I won't include those answers here. What's important are the questions themselves, and your answer to them, if you are a BPM vendor looking to market and sell into healthcare.

1. Who needs to be the champion of workflow? Is it the physician, the nurse, administration, IT, what’s your thought?
2. Are there specific examples of high value, low complexity workflows that you can think of as low-hanging fruits?

3. How would you manage the ‘But we’re special,’ pushback,” most BPM theory gets from clinical care teams?
4. Could you comment on the similarities and differences at BPM within organizations versus across organizations?
5. How do we use this in inpatient flow management when the applications like ER systems, bed management systems and utilization management systems are all un-integrated?
6. Is Lean as a good first pass for healthcare entities looking to explore BPM?

If you are a business process management vendor, or a dynamic/adaptive case management vendor, or both, and you are interested in marketing to the healthcare and health IT market, a good answer to any of these questions might be a great place to start. That is, once you get past BPM 101. You may be able to think of even better questions. If so, fantastic!

To sum up BPM’s excellent opportunity in healthcare:

- Business process management (BPM) and adaptive case management (ACM) vendors are eager to partner with healthcare organizations and vendors. Many already do substantial healthcare business, though usually not at the point-of-care (yet).
- EHR users are restive, increasingly critical of the workflow-challenged systems they feel forced or bribed to use. Their professional organizations ask whether too much has been attempted too soon and with inadequate technology.
- Some EHR and HIT vendors have more customizable workflows than others. They may not think of themselves as EHR or HIT workflow management systems or EHR/HIT BPM systems, but in effect they are becoming so.

Therefore, the next steps to intelligently market intelligent business process management into healthcare are:

- Leverage existing BPM and adaptive case management vendor products and services. Especially emphasize healthcare BPM case studies.
- Educate EHR users and HIT buyers so they can recognize systems with the more customizable workflows. Use social media and complementary methods to get process-aware ideas and technology noticed, discussed, absorbed, and acted upon.
- Find and highlight EHR and HIT vendors with the right stuff: workflow engines, process definitions, graphical editors, plus other valuable BPM-like and -compatible products and services.

As I wrote in the beginning to this piece, business process management and process-aware information systems, including offshoots such as adaptive case management and process mining, are relevant to central issues of healthcare reform: identification of best practices, coordination of care, consistency across processes, and efficient use of resources. BPM has a convincing story to tell healthcare, about designing, implementing, executing, monitoring, and optimizing healthcare processes. We just need to educate healthcare, and address its unique workflow pain points, more forcefully and with ever more compelling examples of healthcare BPM.