Articles in this issue emphasize the value of partnerships in moving forward with major advancements in Health Information Technology (HIT) and Electronic Health Record (EHR) modernization. Designing for error-tolerance within these systems is a critical goal in health care. Article one presents a technique for broadening the use and utility of heuristic evaluation methods in the design of outpatient consultation orders, and in the spirit of partnership requests, readers share their findings. Article two is an interview with Dr. Raj Ratwani, where he discusses challenges to human factors in influencing HIT and seeks to understand the most common safety and usability challenges within HIT through leading a national initiative with the Agency for Healthcare Research and Quality (AHRQ). Article three examines the makeup of clinical teams and seeks to understand how these teams interact and function. Article four describes the development of a contextually-based scenario library for use in scenario-based evaluations of usability, an integral system attribute in the mitigation of risks and in preparation for EHR modernization. We conclude with our Spotlight series, providing a summary of VA informatics training programs.

As always, we welcome your questions, feedback, and ideas for new articles via e-mail to VHA10P2HFQ@va.gov.
Himalaya Patel, Ph.D., April Savoy, Ph.D., & Michael Weiner, M.D., M.P.H., VA Health Services Research & Development Service (CIN 13-416), Richard L. Roudebush VA Medical Center, Indianapolis, IN

My hypothetical consultation order ended abruptly: “Please refer to Hand and Upper Extremity Clinic.” This guidance would have been nice to know before starting. Instead, my half-finished referral to the Orthopedics clinic would have to be redone. Meanwhile, my imaginary Veteran patient with suspected carpal tunnel syndrome would have to wait a bit longer for an appointment...

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Training Programs to Prepare VA Staff for Next Generation HIT
Hasan Shanawani, MD, VA National Center for Patient Safety

Every day, EHRs are taking a bigger role and have an increasing impact in how we deliver health care to patients in general and to Veterans in particular. For those who want to learn how to more effectively use our EHR tools and to apply those tools in their care delivery roles, the VA Health Informatics Workforce Development Team has a number of training programs...

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Applying Usability Heuristics to Improve Outpatient Consultation Orders
Himalaya Patel, Ph.D., April Savoy, Ph.D., & Michael Weiner, M.D., M.P.H., VA Health Services Research & Development Service (CIN 13-416), Richard L. Roudebush VA Medical Center, Indianapolis, IN

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This guidance would have been nice to know before starting. Instead, my half-finished referral to the Orthopedics clinic would have to be redone. Meanwhile, my imaginary Veteran patient with suspected carpal tunnel syndrome would have to wait a bit longer for an appointment.
But why is this the case?

Both inside and outside the U.S. Department of Veterans Affairs (VA), barriers to communication are common in outpatient medical referrals. In VA, we suspected that some barriers were linked to the usability of components of VA's electronic health record system, Computerized Patient Record System (CPRS). To investigate, we analyzed 26 facility-level consultation order templates from CPRS at three VA medical centers. Our review was a heuristic evaluation, a process by which experts assess a system’s implementation of usability principles.

Heuristic evaluation can support a broader plan for improving health information technology. This article includes suggestions for planning a heuristic evaluation of your consultation templates and sharing your findings.

Consultations from a VA referrer’s perspective

Outpatient referrals are generated when a referrer, such as in primary care, formally requests recommendations about, evaluation of, or treatment for a patient by a consultant with expertise in a different medical specialty. At VA, referrals are documented in CPRS using consultation orders. Each such order represents an early referrer–consultant communication of a patient’s needs.

To support electronic referral communication, VA specialty care services work with VA clinical application coordinators (CACs) to create consultation templates. Each template prompts for information pertinent to the associated referral. Navigating through templates can be difficult, especially for new users. Templates vary in both structure and content across services and facilities. Few templates automatically include relevant clinical data.

These issues and others can delay consultation ordering and appointment scheduling. One in three outpatient referrals is discontinued (rejected) by specialty care services, and about half of discontinued referrals produce no appointments within 30 days of the request. Explanations vary for discontinuing a referral without an appointment; common explanations include missing prerequisite tests (14%), requesting unneeded appointments (13%), sending to the wrong consulting service (13%), duplicating previous orders (8%), and providing incomplete referral information (7%).

Inspecting your facility’s consultation templates

Before conducting your heuristic evaluation, review a published guide like the one posted by Oracle Corporation (PDF). For more specific information about evaluating consultation templates, see our recently published article in the Journal of Medical Systems. Next, consider the three factors described below: choosing templates to evaluate, finding evaluators, and choosing heuristics to assess.

Which consultation templates?

A heuristic evaluation may cover one or more components of a health information technology. Our aim was to identify a broad range of possible usability problems within a purposive sample of VA outpatient consultation templates. Related aims are listed below:

- Electronic consultations (e-consults), which yield a consultant's recommendations based on review of medical records instead of a clinical encounter with the patient.
- Referral to out-of-network consultants.
- The organization of the consult menu (the electronic list of consulting services and/or templates)
Combining multiple similar templates.

After deciding which templates to review, consider how to present the templates to your evaluators. If all evaluators can access the medical record system at your facility, and if they can find the consultation templates, they can review the templates directly. To prevent accidental ordering for real patients, your facility may supply fictitious records or grant access to an independent testing copy of the electronic health record system.

If direct access to the electronic health record system is not feasible for all evaluators, screenshots, or screen captures, of the templates can be used. Using screenshots gains consistency at the expense of interactivity. It also requires creating, organizing, and sharing the images. Because templates may include items that are hidden by default, before taking screenshots, activate any hidden items.

In Microsoft Windows, to make a screenshot of an opened template, use the built-in Snipping Tool and select the template’s window when prompted. For greater flexibility, press [Alt] and [Print Screen] together to copy a screenshot to the Clipboard, then paste the screenshot into an image editor or word processor. To capture templates spanning multiple pages, some third-party software may help: Try screenshot applications like Snagit (commercial license, $43), and image editors like Paint.net (open source, no cost).

Which evaluators, and how many?

Evaluators with expertise in both human-factors engineering and medicine are the most desirable—and the most difficult to find. Therefore, an interdisciplinary team is recommended. If you identify qualified evaluators at other facilities, consider the costs and benefits of getting them credentialed at your facility. Most usability issues are expected to be discovered with three to five evaluators.

Which heuristics?

Unlike in an informal expert review, each usability issue found in a heuristic evaluation is linked systematically to an applicable usability heuristic. As a result, your list of heuristics will shape the breadth and depth of your findings. Published heuristic evaluations of electronic health record interfaces often use J. Nielsen’s list of ten heuristics. An eight-item list is maintained by B. Shneiderman, and a 14-item list was published by J. Zhang and colleagues. Consider adding your own heuristics, as we did to address unmet communication needs. Whatever you decide, share operational definitions of all heuristics with your evaluators, and plan to resolve disagreements.

Typically, each issue found during a heuristic evaluation is assigned a severity rating. A common range is 0 through 4: An item rated 0 is not a problem, 1 is cosmetic, 2 is minor (greater than cosmetic), 3 is major, and 4 is critical for safe medical care. As with the heuristics, offer evaluators a guide to rating severity; plan to resolve disagreements.

What happens afterward?

Heuristic evaluations focus on identifying problems rather than creating solutions, and designing templates is beyond the scope of this article. Nevertheless, the findings of a heuristic evaluation can point to a set of design goals. For example, our results suggested increasing opportunities for free-text responses while limiting the need to recall specific lab values and dates.

Your results may provide evidence for specific changes. For each consultation template that you propose to change, address the needs of at least three groups of stakeholders: referrers using the templates, consultants receiving the referrals, and the CACs (or, if
outside VA, an equivalent group of clinical programmers) maintaining the templates. Referrers will appreciate a self-contained form that decreases the overall time to write the order. To compare completion times among template designs, you can use simulation software like CogTool (open source, no cost). Consultants will appreciate receiving complete information and a clear clinical question in each referral. Review any service agreements between referring and consulting services; determine how well the new template represents the agreement’s terms. Finally, CACs will want to build and maintain the template easily. To minimize translation work, design the template using a basic text editor like Windows Notepad.

Please tell us what you learn! Sharing your findings can benefit everyone involved. We can also conduct your heuristic evaluation and help you choose and complete other assessments of usability.

Authors’ note: Himalaya Patel manages the Human–Computer Interaction and Simulation Laboratory (the HCI Lab) at Richard L. Roudebush VA Medical Center. April Savoy directs the HCI Lab at Roudebush VAMC and holds appointments at Indiana University East and at Regenstrief Institute. Michael Weiner is the chief of Health Services Research and Development at Roudebush VAMC and holds appointments at Indiana University School of Medicine and at Regenstrief Institute.

A Spoonful of Human Factors Goes a Long Way: An Interview with Raj Ratwani, PhD

Jeanie Scott, MS, CPHIMS, Informatics Patient Safety, Office of Health Informatics

Raj Ratwani, PhD is the Acting Director and Scientific Director of the National Center for Human Factors in Healthcare at the MedStar Institute for Innovation. The institute is part of the MedStar Health care system, and was founded on the principle that innovation is at the center of major advances in health care. As Director, Dr. Ratwani applies human factors and cognitive science theories to challenging health care problems to develop innovative solutions.

JS: How have you seen human factors impact safety in Health Information Technology?

RR: I see human factors impact Health Information Technology (HIT) in several ways. First, I see it make major advances in the safety of front line systems. Redesigns of clinical workflow, Electronic Health Record (EHR) content display changes, human factors participation on committees to drive new workflows, and even seemingly minor changes, such as modifications to User Interfaces (UI), can all end up having really big impacts on the way clinicians interact with front line systems.

Secondly, I see human factors impact larger health care systems at the organizational level. Human factors involvement is vital in driving safety during EHR implementation, customization, and in long term use of the product. Human factors is needed to advise organizations on the aspects of surveillance and training to ensure safe practices by clinicians.

The final piece I see human factors impact safety is in the shaping of federal policies that drive usability and safety of EHRs. My organization actively works with the Office of
the National Coordinator that oversees the roll out of EHR technology in developing policies that shape the safety of EHRs. Policies can be shaped to not only optimize the safety of the products, but also to reduce the burden on providers or vendors as a result of active policies.

JS: What challenges does human factors face in impacting Health Information Technology?

RR: If you think about the general science of human factors which focuses on understanding human capabilities and understanding how humans interact with systems around them, including other people, HIT, processes, and organizations, the challenge in a health care setting is conveying the need for human factors intervention. This challenge is not unique to HIT alone, but felt across all technological fields. People get busy thinking about the design and development of HIT and its subsequent implementation and use, and they often forget to consider what the system needs to accomplish to satisfy the end user. The central role of human factors engineers is to help the transition between the engineers and developers and the front line clinicians or end users. They assist in conveying what the front line capabilities and needs are to ensure the HIT systems meet those needs.

Adoption of HIT fails when there is a rush to get a technology in the hands of clinicians. Costs often increase beyond anticipation and this causes an underappreciation for human factors. Human factors does not carry rigorous, concrete outcome measures, and thus often comes off as an added cost that’s unnecessary. When in reality, if ignored a system is put in place that’s not useful and organizations end up paying more to fix the problem than if they had just made the initial investment in human factors and usability up front. Thus, one of the biggest challenges in HIT is convincing people that it’s important to have human factors engineering involved from the beginning.

JS: How do you see human factors and informatics work together?

RR: I’m formally trained in human factors, and that’s typically my lens into viewing the world. I think to make advancements in HIT usability and safety, informatics and human factors practitioners need to work together. There is some overlap in what they do, but they have different world views, training, and backgrounds. My understanding of informatics is that it’s a discipline focused on utilizing health information to make advancements in safety and quality. The discipline is focused on accessing and analyzing health information to create innovation. Whereas human factors will focus on ensuring people are able to work with health information systems efficiently, effectively, and safely, and that information is presented in an effective way. Human factors can provide support in terms of improving data visualizations and EHR usability. The field of informatics will accelerate once quality data can be pulled from EHRs and other HIT systems. Human factors can play a role in ensuring quality data is entered into and pulled from these systems through improving usability. This in turn, will enable informaticists to leverage better data to reach their goals.

JS: What efforts do you see to bring a greater awareness of human factors to the Health Information Technology lifecycle?

RR: I find it becoming increasingly easier to convey the need for human factors in HIT development because leadership is hearing of the safety and usability struggles and frustrations experienced with EHRs at the front lines. People are actively searching for solutions and ways to fix the problem, and people are finally seeing human factors as playing a role.

There are struggles in implementing and optimizing HIT. A human factors approach takes time. For example, consider the implementation of customized software. Human
factors engineers will gather data through focus groups to understand the various workflows involved, and this process takes time from scheduling the interviews through analyzing and interpreting the data. People need to consider this when developing timelines and their intentions for their products. Human factors engineers can scale their level of involvement based on the risk levels, timelines, and priorities. For example, products with high risk functionality should definitely employ human factors resources, knowledge and insight, so teams must consider this when developing timelines. Development teams and human factors engineers should communicate to understand what the product lifecycle involves and what the product is trying to achieve in order to choose the methodologies that best fit the risk. A little bit of human factors is better than no human factors. Involving human factors engineers, who in turn work to understand the end user, in shaping decisions, designs, implementation or customization, is typically better than the alternative, which is having someone with little knowledge of the work processes making decisions on how the HIT will operate. Teams that don’t employ human factors during development are often left surprised when the end users don’t find their products usable or helpful. Sometimes you need to really show what the human factors process is for others to fully understand its benefits.

**JS:** Are you aware of any current or ongoing human factors initiatives that can benefit Health Information Technology?

**RR:** I’m currently leading a large, five-year project for the Agency for Healthcare Research and Quality focused on understanding the most prevalent HIT usability and safety challenges so that test case scenarios and other design and development documents can be developed to help overcome them. There is little data on where the specific risks in HIT systems exist. Our current focus is to gather data to better understand what front line clinicians are facing and the harms that their patients are being subjected to. We plan to use that data to provide more insight on how to design, develop, implement and optimize HIT systems. We are mining 1.8 million patient safety event reports entered by front line clinicians to determine which ones are HIT-related or usability-related. We currently have an algorithm developed to identify those that are HIT-related, and are working to modify it further to understand which are usability-related. From there we can distill down to the specific topic areas that pose usability challenges, for example, EHR automation challenges and awareness of active/inactive orders. EHR automation issues pose hazards to such areas as medication orders. The system defaults to a time the user wants, but in reality the user intends to have it administered at a different time, but because of a poor user interface, it’s not apparent to the prescribing provider. Similarly, when interfaces do not represent information to the clinician effectively clinicians may not be aware of the “state of the system” For example, when placing orders clinicians may not be aware of the state of the order and may think the order is active when it’s actually inactive which may cause delays in care. Once prevalent areas like these are identified, we can start thinking about test case scenarios and design solutions. Another nice contribution from this work is that the developed algorithms can be applied and used by others to identify other risks and hazards and continuously refine and optimize their systems.

**JS:** How do you benefit from the use of partnerships?

**RR:** To make any major advancement in HIT requires a multi-stakeholder approach. We often get stuck in the game of blaming one particular stakeholder for issues, but it takes groups working together to make improvements. To that end, my organization partners with the federal government, other human factors centers, healthcare agencies, patient safety organizations such as the Institute for Safe Medication Practices, HIT vendors, and many other professional institutions. For example, when we deal with large data sets, we partner with the Computer Science department at Georgetown University and the Human Factors Industrial Engineering department at the University of Buffalo. We draw from all talent pools, like VA, where major advances in safety occur. It’s critically
Problem Analysis of Team Care in the VA Health Care System
Abigail Noonan, Jennifer Herout, Jolie Dobre, Brian Moon, & Donna Baggetta, Human Factors Engineering, Office of Health Informatics

As one piece of ongoing work in analyzing clinical domains in support of Electronic Health Record Modernization (ERHM), Human Factors Engineering (HFE) conducted an in-depth study on team care. The objectives were to (1) understand how teams are defined and constructed and (2) understand how teams function today. Final analysis included:

- How clinicians communicate, manage tasks, and coordinate with each other;
- Issues with performing follow-up on ordered consults, orders, appointments, and labs;
- How clinicians compensate when they can’t accomplish required work within the Veterans Health Administration (VHA); and
- Findings that affect team cohesion, workflows, and patient coordination.

HFE practitioners conducted a review of policies affecting team care at the VA and a brief literature consultation (see the end of the article for works consulted) on team care in clinical settings. In addition, four focus groups, with fifteen clinician participants, and four subject matter expert (SME) interviews were conducted. The resulting data informed the site visit interview topics as well as providing data to be analyzed as part of the body of data on team care.

Lastly, five HFE team members performed a three-day site visit to a Level 1A VA medical center and affiliated Community Based Outpatient Clinics (CBOCs) in the Southeast United States. The site visits focused on provision of outpatient primary care by clinicians and staff. HFE conducted 21 interviews with these staff, attended three morning huddles, and observed three clinics for several multi-hour sessions.

For data analysis, the team divided the notes and transcripts into 1423 relevant raw data points. The data was coded by one of four HFE practitioners and audited by a second HFE practitioner, resulting in 8 primary codes with multiple sub-codes. The data was further analyzed by the study lead and assigned to a more actionable and illustrative finding, more easily used by developers and stakeholders, resulting in 163 individual (though frequently related) findings. Frequently noted findings are summarized below with the number of related data points in parentheses.

**HIT Communication (118)**

Teams use health information technology (HIT) to communicate across departments. Team members mentioned frequent use of co-signing to ensure their team members see CPRS information, but also noted that it contributed to the known problem of alert overload. Other examples of HIT communication cited include:

- Team members used notes and orders, though they clutter the record;
- Pharmacists indicated contra-indications via flagged orders;
Problem discussions and recommendations occurred through email-like exchanges called e-consults;
Clerks used HIT check-ins to note when a patient has checked-in;
Specialists provided direct patient care, spreading scarce resources.

**Paper-Based Workflow (33)**

Providers use personalized, paper-based methods of accomplishing their day-to-day task management, patient-care, health record management, and team coordination. The time delay, hand-written notes, and lack of inter-operability with HIT introduce possibilities for incorrect information being placed in the record. As one clinical pharmacy specialist said, “Every morning I print my list of patients for my clinic. If the patient cancels after the list is printed, I do not know that the patient cancelled...” In another example, a nurse shared the notes she took on a printed schedule as she facilitated their daily morning huddle (see Figure 1). Other paper-based methods of work arounds included:

- Printed routing slips at check-ins;
- Jotted notes for vitals and positive screens;
- Printed schedules used by providers throughout the day for writing their notes about patients;
- Post-it notes used for communication;
- Faxed records from non-VA providers scanned into CPRS as difficult-to-search images; and,
- Paper progress notes used during connectivity outages.

![Figure 1. Notes handwritten during a huddle. (Click here for full sized image.)](image)

**Messaging Task Management (31)**

The main provider of a primary care team often uses Lync or a My HealtheVet (MHV) secure messaging (SM) inbox as a method of task management. Additionally, teams use group chat to maintain awareness of team member status. One team member described it, “We are always sending messages between each other [sic]. Or if someone was out and you covered their clinic and you want to catch them up. Or if you're collaborating, and getting a second opinion.” However, these uses of messaging can allow information to fall through the cracks:

- Lync doesn’t confirm messages are read.
- MHV SM inboxes are shared by team members, who may assume someone else has addressed a patient concern.
- MHV SM cannot be between primary teams.

**Warm Handoffs (28)**

Patients may see multiple clinicians or staff in different departments (sometimes unplanned) during the same visit. Performing in-person (warm) handoffs ensures that complicated information is conveyed correctly and patients arrive at the correct department. Handoffs are, in general, a weak point for coordination. Patients can be sent to inappropriate clinics – like a female being sent to a Women’s Health Clinic despite needing a different type of care. Warm handoffs can alleviate errors.

**Mental Health Roles (43)**

Mental health services are provided by a range of roles including: psychologists, psychiatrists, social workers, mental health social workers, patient-centered medical home assessment staff, nurse practitioners, primary care providers, military sexual trauma coordinators, and pharmacists, as well as multiple types of non-VA providers. Patient assignment is done by availability, historical preferences of the patient, and presumed capabilities; because the roles do vary, this convenience assignment can have ramifications on care provided.

**Adjustment for Criticality (24)**

Patients with urgent needs necessarily disrupt established routines. Necessary triaging is integral to patient-centered care, but hard to predict, coordinate, and support. Examples include:

- Unscheduled handoffs to embedded mental health providers;
- Handoffs to the ER based on test results;
- Appointment priority due to a positive pregnancy test; and,
- Emergency walk-ins seen regardless of delays caused.

**Team Cohesion (48)**

Coordination relies on personal relationships between team members. Multiple positive examples of coordination that improved team cohesion were seen in the analysis and should be fostered and encouraged. Examples include:

- Relying on group cognition and memory of patient history during huddles;
- Using historical knowledge of the providers to more accurately predict timing and walk-in response; and,
- Using personal contacts in other clinics/departments/facilities to get accelerated care for patients with urgent needs.

**Patient Characteristics (32)**

Team care is stressed when patients are less functional. Patients struggling with mental health can have behavioral issues, making team members reluctant to engage with them. Patients with cognitive impairments may have issues following instructions and care plans, or relaying their symptoms to the team. Both cognitive and behavioral impediments can contribute to patients missing or being late to appointments, causing long wait time and hurried patient encounters.

These findings are being used in the ongoing HFE journey map work to support VHA HIT initiatives. Potential next steps include an additional site visit, further validation by clinicians, providers, and staff, consultation with non-VA clinicians as they are an important part of many Veterans’ healthcare teams. Next steps will also include interviews with information technology (IT) and non-VA providers and a patient
interview study for their perspective on their roles, pain points and facilitators.

The full team care report can be found on the HFE SharePoint™ Tracker.

Data points resulted from natural breaks in observations or answers to questions. They could be a phrase or 1-2 sentences.

Works Consulted:


Usability Engineering for EHR implementation

Ross Speir, Human Factors Engineering, Office of Health Informatics

For the past several years, VA investment in improving the usability of its health IT (HIT) systems has led to the maturation of a usability engineering competency. Usability engineers engage with project teams across the IT development lifecycle to help articulate user needs, create realistic scenarios of intended use, and evaluate the usability of software designs. Over time, usability engineering methods and tools have been honed to better uncover design problems that would impede the effective, efficient, and safe use of software. Furthermore, a growing portion of the VA clinician community routinely volunteers lunch-time to support usability efforts that advance our shared goal to improve VA HIT system usability.

This article will discuss how the VA usability engineering competency could be leveraged to reduce costs of an EHR implementation at sites and expedite users becoming effective and efficient within the new system.
At some point in time, someone at a medical center will flick a switch that turns on a new, modernized EHR system. With appropriate planning, preparation, and training, this new system will support clinicians with the important work of providing patient care.

Yet making changes to a dynamic, complex system — such as a health care delivery system — will introduce unintended consequences. And this particular change involves integrating a sophisticated software product into a safety-critical environment and implementing new workflows that enable various user roles to collaboratively carry out interdependent tasks intended to achieve goals that are often uncertain and dynamic. This change process undoubtedly will have a cascading effect that impacts the ability of end users to carry out work efficiently and effectively.

The VA usability engineering competency, established to uncover barriers to user efficiency and effectiveness during software development, can also be leveraged to mitigate barriers and risks during HIT implementation.

Throughout a software development project, usability engineers will work with both stakeholders and users to create contextually-based scenarios that represent real-world situations that the new system must accommodate. These scenarios describe common situations, as well as situations reflecting complex work (‘edge cases’), that will occur less frequently. Sometimes, scenarios will be created to intentionally introduce user error (as an assessment of error-tolerance). Scenarios are then given to intended users to walk through the software (following one of several usability assessment protocols) in order to uncover potential problems.

This type of scenario-based assessment might also be applied to HIT implementation — if the organization changes how it typically thinks about ‘usability.’ When evaluating usability during software development, the ‘usability’ is typically an attribute of the user interface design — a quality measure that indicates a goodness of fit for users, tasks, and environment. The solutions to problems that are uncovered typically lead to changes in the design of the software’s user interface.

Utilizing a scenario-based assessment for a HIT implementation effort, the organization would need to think about ‘usability’ as an attribute of the integrated system -- the technology, the clinical workflow, information flow across systems, user communication, etc. Potential problems uncovered as part of a ‘system usability’ assessment — carried out as part of deployment — would be addressed by more immediate solutions (changing software configurations, modifying workflows, updating user training, etc.). But the overall objective of the usability engineer remains the same — to determine if specified users can achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use.

To prepare for the transition to a modernized EHR, Human Factors Engineering (HFE) has begun partnering with front-line health care providers to develop high-value, end-to-end scenarios of patient care across multiple clinical services. The focus is on the needs and goals of the users; not on the specific technology. These scenarios will be publicly available to program offices, subject matter experts and implementation teams at local sites. These scenarios can be used to:

- Mitigate risks of unintended consequences associated with deployment through context-relevant testing of system usability, interoperability, data quality, and patient safety;
- Walkthrough local EHR configurations and workflow implementations from a perspective of cross-service care continuity;
- Expedite adoption of EHR and workflows by supplementing user training with VA-centric patient care scenarios considered high-value by front-line providers.
Every day, EHRs are taking a bigger role and have an increasing impact in how we deliver health care to patients in general and to Veterans in particular. For those who want to learn how to more effectively use our EHR tools and to apply those tools in their care delivery roles, the VA Health Informatics Workforce Development Team has a number of training programs. The courses are a good first step for those considering taking more clinical IT responsibilities at their facility. The courses are web-based to allow maximum flexibility and convenient access. Except where noted, all courses are open to VA employees and Federal Partners (i.e. Department of Defense) and have unlimited capacity. Options to build your skills in support of this transition include:

- **Introduction to Health Care Data Analytics.** This online 9-week course was developed in conjunction with Bellevue College with funding from the Office of the National Coordinator for HIT. Registration is required for this course, and enrollment is limited to 600 per session. 31 Continuing Education hours. About 4-5h/ week;

- **Introduction to Health Informatics 101.** This online course allows unlimited enrollment. It’s six self-paced modules comprised of topical lectures, discussion forums, and other online activities. Complete only those modules of interest or the entire series. About 12h/ month to complete all 6 modules;

- **Health Informatics Lecture Series 301.** More than 40 Individual lectures presented by experts in the health informatics field on VA’s Talent Management System. About 1 hour per lecture;

- **Nursing Informatics Journal Club** provides nurse informaticists an opportunity to participate in reading and reviewing professional literature, videos and published studies. Group meets the 4th Thursday of each month at 1 PM ET via Microsoft Lync. American Nurses Credentialing Center credit available;

- **Health Informatics Certificate Program (American Medical Informatics Association (AMIA) 10x10).** This rigorous 6-month course (12 hours/ week for 6 months) is modeled after AMIA 10x10 Certificate Programs offered by universities and other agencies. Limited enrollment, limited to VA staff at present due to high demand and limited capacity.

There are more courses available! For further information, check out the [Course Catalog](#).