Transforming the EHR into a Knowledge Platform to Ensure Improved Health and Healthcare

By Ian Chuang, M.D., Chief Medical Officer
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The EHR Is More Than The Automation Of The Paper Chart. It Is A Knowledge Platform. This white paper focuses on the need and best practices for EHRs to be set up not only for cost-benefit success and workflow efficiency, but for their ability to inform and support the clinical process toward improved outcomes. Knowing that better clinical decisions require content that defines data, workflow and decision flow across care processes, this paper will explain how the EHR, configured correctly per care processes and integrated into the workflow, can be transformed from a data-recording repository to a proactive system for knowledge-driven care. It will also offer tips for making this happen.

Overview

Depression, anxiety, alcohol or other substance use illnesses are among the most common and disabling health conditions worldwide, according to a 2007 article published by “The Lancet.” These conditions often co-occur with chronic medical diseases that can exacerbate the behavioral or mental illness and/or substantially worsen associated health outcomes.

Consider the following example:

Todd* suffers from manic depression. Todd’s clinician informed him his condition could be treated pharmaceutically to reduce symptoms and improve quality of life. However, when the clinician went to prescribe a certain drug, he was alerted by his electronic health record system that the drug would be rendered less effective or even dangerous when combined with another drug Todd was already taking to treat a medical condition. The clinician changed the prescription, improving care and possibly saving Todd’s life. This is called “clinical decision support,” and it is one way an EHR can add significant value to a clinician and improve the care of the consumer.

For an EHR to intelligently inform the user to improve clinical decision making, a number of requirements are necessary to deliver the ideal human-system interaction. The digitalization of healthcare is more than just the displacement of the paper record to the computer screen. During EHR implementation, much attention is placed on inputting the same required data as in the paper world to support transactions, communication, compliance and reporting. How tasks and activities were accomplished in the world of paper-based processes can -- and must -- evolve in the electronic world. Keep in mind, a paper document is nothing more than a flat, static data collection device. The way clinicians used to work, the pen was optimized for paper. An electronic system can and will do things paper documents cannot, but end users must rethink their workflows and data requirements. Unfortunately, this basic principle is oft forgotten when faced with demands of a tight implementation timeline; the primary metric becomes speed not necessarily the quality of the system setup for clinical workflows and outcomes. That’s a mistake. Data is king and if the data requirements are not thoughtfully considered early on in the implementation and continuously after, decision support capabilities will be constrained. If data is not good, the technology is meaningless.

Data Flow, Decision Flow, Workflow In Clinical Decision Support

As consumers interact with different caregivers in many venues of the healthcare system, relevant personal data inputted at various points must follow the individual throughout the care system. Caregivers complete tasks as part of their clinical interactions with consumers, and buried within this clinical workflow are often multiple points in time when important decisions are made. Data must flow seamlessly to support decision-making throughout the workflow to achieve the desired outcomes.

* Name has been changed
In traditional, paper-based systems of care, data is passed around via fax, telephone calls, word of mouth, or sometimes not at all. The clinician must process all that disparate data to formulate decisions manually. The paper-based system flow is then data entry, followed by clinical decision, followed by workflow. Omissions and errors occur. Care is compromised.

Most clinicians equate CDSS with alerts within the EHR and many – likely because of they were historically the primary function in most CDSS – view them as a nuisance. In poorly designed EHR CDSS, alerts can be based on overused, incomplete or erroneous data or can appear at wrong points in the workflow. However, a CDSS can deliver decision support information with high validity and reliability if there is purposeful design and implementation of an architecture that supports knowledge flow across the system. If clinical decision support is about human-system interactions through which clinicians are guided to make more informed decisions, those decisions will only be as good as the knowledge platform upon which they sit and are dependent. Data, workflow and clinical decision-making processes are all important.

Well-designed electronic health records can mitigate this risk with automated clinical decision support functionalities – when the data is accessible and reliable.

The knowledge flow approach starts with the end goal in mind. The end goal is the best set of achievable outcomes for each individual. Then what is the workflow and the key decisions within that workflow that are necessary to lead to the desired outcomes? As a clinician provides care for his client, following a workflow, he utilizes a clinical decision support system (CDSS) to inform the decision-making process; clinical decision supports (CDS) help guide the physician to make more informed, evidence-based and/or person-specific decisions.

Ensuring the information and decision support functionality fits well into the workflow is also key. Knowledge must be provided at the right time, for the right individual, for the right reason, and tie together with other decision points and decision flow along the entire care continuum. Presenting raw, static data isn’t sufficient to assist the user in understanding the decision choices and their possible outcomes. What is presented, how it is presented and when it is presented are crucial to the user acceptance and improved clinical outcomes.

Knowing the workflow and key clinical decision points lead to a set of data requirements necessary for automated CDS.
The set of data or information necessary for decision making doesn’t just appear magically. Where and who will be inputted the necessary data? Will the data be interfaced from another system? Is the data coded or structured in ways that the CDS can use? These all matter if we want the CDS to operate in predictable and useful manner.

A common problem in the construction and deployment of decision support systems is that they are done in a piecemeal fashion, sometimes in isolation, without regard to an overall care process orientation. That is why we start with consideration of the clinical workflow. Doing so guarantees the decision supports will tie together in a way that makes sense clinically for how work and decisions are made along the entire care process. It is never just one single decision that impacts the outcome; it is the set of optimized care and clinical decision along the entire care process that produces the desired outcomes. Only when data flow, decision flow and workflow are comprehensively and strategically considered in an EHR implementation can a well-functioning CDSS be achieved.

Knowledge Flow: Closing The Loop

What is knowledge flow?

Knowledge flow uses the entire system to design workflows that leverage data to optimize how key clinical decisions are made via the EHR. It integrates decision support into the workflow to guide clinical decision-making and analysis, creating a closed-loop continuous improvement process. The closed-loop process is predicated on the fact that information is available to the right person at the right time and that process and outcomes data is used to constantly evaluate how the system is working to support continuous process optimization. In a sense, such a system “learns” or improves over time. The EHR should support a knowledge-driven process.

What should be considered when setting up your EHR to ensure proper knowledge flow?

EHRs Improve Clinical Workflow. Knowledge Flow Leverages Data To Optimize How Key Clinical Decisions Are Made.

- E-prescribing saves time
- EHR is an asset with recruiting physicians
- Receives labs faster with an EHR
- EHR enhances data confidentiality

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Availability: Evaluating and designing the desired care process workflow must include identifying key points for decision-making and how they relate to desired outcomes. Then, the system must be designed so the requisite data is made available at those key points to support decision-making.

Accessibility: Key clinical data or meta data required for clinical decision-making must be accessible and interpretable across time and space. Once data is inputted into the EHR, it can be lost in a big black hole in the database. Where and how the data is inputted determines where and how the system stores the data, how easy it is to find and retrieve and interpret the data. One has to think about the “down-stream” use of data for clinical decision-making when making design and implementation decisions about input forms and fields. The question, “Who else will need this data?” should be central to all data design considerations. It can be another caregiver, someone in another venue or even in another organization. Where in their workflow will this data be needed to aid decision-making? With this insight, one can determine if the inputted information, whether in the form of drop down list choices, searched terms or free text, will provide the desired information. **The input of data is the starting point of the successful knowledge flow system.**

Understandability and Usability: Other data considerations include whether the data will be codified via some standardized and universally understood code. If the data will be text-based, are there alternative, synonymous terms, or different but semantically related terms, that may be inputted? If yes, then a data dictionary plus a structured way to semantically interpret these related concepts is required. SNOMED CT is such an international terminology with both standardized concepts and a semantic skeleton upon which to define additional behavioral health data dictionary concepts. Are data inputted via a coding system? If yes, then the data needs to map or be translated.

Data is what gets inputted and buried within the EHR database. **Knowledge is what we need for CDS.** This requires computation rules, calculations, statistics as well as formats for presenting the knowledge. Healthcare is complex and fragmented and there is no guarantee that any one clinician or patient knows what he/she should know at any point in time. The issue isn’t about lack of knowledge, because the information does exist in the database – somewhere. Rather, clinicians can be stymied by lack of awareness, oversight or an incomplete clinical picture, because the data they need is hidden within the EHR. That knowledge must be lifted out and presented to the user when it is relevant, even if he/she didn’t think to ask for it. In order for the EHR to interact with the users to inform and guide evidence-based care processes, pre-designed content and functionalities must be embedded into the EHR in order to present the right information and interact with the users in the right way. This will lead to optimized decision-making.

Deliverability: Knowledge deliverability is key to successful knowledge flow. How one wants the information to be formatted is also something to consider. One can receive information passively or proactively or in a combination of both ways. In other words, should knowledge be passively displayed on the screen or should the information interrupt workflow, for example via an alert that could require action in order to proceed?

A simple framework of designing the types of passive decision support presentation might include the following:

- **Identify:** Just let me know about it i.e. I just need a reminder
  - “Todd’s fasting blood sugar is 190 mg/dL.”
• Inform: Tell me about it
  ■ “Todd’s last glucose was elevated above target. He needs his blood sugar checked during his visit.”

• Educate: Teach me about it
  ■ “Based on Todd’s blood-glucose level, the following study may be of interest to you:
    There is new evidence that elevated blood sugar levels can be caused by drinking artificially
    sweetened drinks. For more, see NEJM V35 PP102-108.”

A framework of types of proactive decision support presentation might include the following:

• Guide: Show me the steps or criteria to make the decision
  ■ “Are symptoms severe enough to significantly impact normal daily activities?
    ❏ If no, then instruct patients for trial of conservative symptom management.
      ❏ If improving, return for re-evaluation in four weeks.
      ❏ If not improving, return for re-evaluation in two weeks.
    ❏ If yes, initiate pharmacotherapy for at least four weeks.
      ❏ Return for re-evaluation in four weeks.

• Take action: Once a decision is inputted, system adds the data or completes the selected task
  ■ Workflow: “Todd has been prescribed pharmacotherapy. A note has been sent to scheduling and
    an appointment will be set in four weeks.”
  ■ Clinical: Initial screen raises concerns about the possibility of diabetes mellitus. A set of pre-defined
    orders based on evidence based standard practices for easy ordering.

One common clinician complaint is that there is too much information. So, although the information is
relevant, the clinician user doesn’t need all that detail. The system should allow the user to set the level of
decision support information. If the issue is well understood by the user, then the identification level of passive
information is sufficient; the user just needs to know when the situation arises. Such a system can be designed
beforehand (i.e. clinicians can set a threshold of information alerts), or the system can be designed to learn
over time what level of information the clinician needs and to adjust automatically.
Netsmart Solution: CareGuidance™

CareGuidance is a set of clinical content and decision support tools aligned to the care process, designed to achieve desired outcomes. There are multiple points in the care delivery process where the work process and clinical decisions can be optimized. The CareGuidance content can include standards-based assessments, key structured data that is inputted through data entry fields or dropdown lists that support decision support and outcome analytics. CareGuidance works across the entire Netsmart CareFabric healthcare technology and software solutions, allowing organizations to influence workflows and clinical decision-making along the care continuum. CareGuidance has the ability to provide information to clinicians through alerts, notifications and reminders at the point of care, as well as providing the data and analytical capabilities to measure the use and results of the decision support features.

Deploying CareGuidance in Netsmart’s EHRs by clients is the next step of the evolution from digitalization of the paper record to the knowledge-driven automation of care process. Over time, through experience and different models of care, a library of content ends up being designed for healthcare organizations to leverage and incorporate into the programs and services.

Clinician Workflow Opportunities For CareGuidance

- Targeted cohort
- Scheduling
- Hallmark events
- Risk identification
- Assessment
- Reference
- Work routing
- Treatment Guideline
- Therapy
- Test
- Medication
- Reference
- Assessment
- Progress
- Compliance
- Progress
- Performance
- Pre-Intake
- Intake
- Service Plan
- Progress Notes
- Outcomes
ABOUT IAN CHUANG

Ian Chang, M.D., M.S., F.C.F.P., is Senior Vice President, Healthcare Informatics and Chief Medical Officer for Netsmart, the leading provider of innovative clinical and business solutions for health and human services organizations nationwide. More than 450,000 care providers, including more than 40 state systems use Netsmart’s CareFabric™ framework to provide integrated, coordinated delivery of health services to millions of people nationwide.

Dr. Chuang provides strategic leadership and a strong medical perspective as Netsmart develops innovative clinical solutions and leads its clients and the industry toward high quality care in an environment of disruption, convergence and integrated care.

Before joining Netsmart, Dr. Chuang served as Senior Vice President, Health Risk Management for Lockton Benefit Group in Kansas City, Missouri. He previously led the development of care management and clinical decision support systems at CIGNA Corporation. Prior to that, he was a Director and Vice President at Cerner Corporation, where he led initiatives ranging from a systems-based care transformation service with focus on evidence-based practice, to a next-generation CDS system with context-sensitive clinical information presentation and viewing.

He has also held clinical leadership positions at TherapyEdge, Inc., Click4Care, McKessonHBOC, Wellport Health Plan and HealthSource-Provident Administrators, Inc.

Dr. Chuang received his Doctor of Medicine degree from the University of Toronto and a Master of Science degree in Administrative Medicine from the University of Wisconsin. He currently serves as an Adjunct Assistant Professor in the Department of Health Informatics, School of Medicine, at the University of Missouri in Kansas City. He also continues to engage with public/private sector efforts around data standards and quality, currently as a member of the National Quality Forum Health Information Technology Advisory Committee (HITAC).

For more information about Netsmart, visit www.ntst.com.