Part I
Building a Strong Conceptual Foundation and CDS Program

A poor farmer produces weeds.
A good farmer produces crops.
A wise farmer produces soil.
—Zen saying
The primary purpose for your clinical decision support activities is to provide CDS interventions into care delivery in a manner that improves care processes and outcomes. There is important organizational context in which these CDS interventions are selected, configured, deployed and produce results—whether in a solo physician practice or a large integrated delivery network. As we will define in more detail in Chapter 1, these contextual components together comprise the “CDS Program.” When the program includes effective mechanisms for achieving clarity and alignment around CDS goals and strategies—and other core capabilities related to executing interventions—it is more likely that individual CDS initiatives will achieve desired results.

Using the metaphor in the quote at the beginning of this section, many attempts at CDS have produced weeds. Those organizations that can repeatedly leverage CDS to significantly and measurably improve targeted outcomes have cultivated effective and fruitful CDS programs.

Chapters 1 through 4 that follow provide guidance on developing (or refining) CDS programs so that they contain the necessary ingredients to reliably produce valuable CDS interventions. Figure PI-1 illustrates these building blocks and how they are addressed in the Part I chapters. Note that knowledge management is an ongoing process that draws from and feeds back into CDS program management.

As described in the “How to Use This Book” section of the front matter, the introduction to each part contains two case studies—one in a community hospital and one in a small office practice. These hypothetical examples (based on synthesized real-world experiences) illustrate what it might look like to follow portions of the guidance presented in the chapters that follow.

You can examine the example(s) most pertinent to your setting before you dive into the chapter details, refer back to them as you review the chapter, and perhaps share the material with others on your team to help them understand the relevant processes and desired outcomes. In both case studies, each text section is introduced by a “Task” that relates to the material presented in the chapters. These headings help make explicit the key points that are being illustrated.

**CASE STUDY FOR HOSPITALS: REDUCING POTENTIALLY PREVENTABLE INPATIENT VTE INCIDENCE**

Establish a strong, shared foundation of knowledge for yourself and your team around basic

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**Figure PI-1. Building Blocks for a Successful CDS Program**

- **Basic Concepts and Approach (Chapter 1):** A shared broad understanding of the CDS toolkit and the role of CDS as an operational imperative
- **Organizing a Successful CDS Program (Chapter 2):** Documented plan used for CDS-related assessments, decision-making process, oversight and execution
- **Knowledge Management for CDS Programs (Chapter 4):** Proactive and systematic process for acquiring, validating, and updating CDS content
- **Other Key CDS Program Building Blocks (Chapter 3):** Capabilities to understand and improve systems, workflow, and CDS performance metrics
concepts such as the broad CDS definition and toolkit, and CDS’s role as a strategic tool for driving measurable performance improvement. Use this foundation to underpin your efforts to develop successful CDS programs and interventions.

At Grandview Hospital, Mrs. Sadie Adler, a 75-year-old postoperative hip fracture patient, developed a potentially preventable venous thromboembolism (VTE) and then died suddenly as a result. A review of her case at Grandview’s Morbidity and Mortality Conference identified that she had not received interventions (broadly referred to as “VTE prophylaxis”) that might have prevented this condition and tragic outcome.

Hospitalist Dr. Glenda Goldsmith had performed Mrs. Adler’s pre-op evaluation, and after the Morbidity and Mortality Conference, she chose to champion this process improvement (PI) project for the hospital. Dr. Goldsmith understood the challenge was daunting but was fortunate to quickly enlist Grandview CEO Albert LaSalle’s support after presenting this case to the Medical Executive Committee. CEO LaSalle noted that the hospital chose VTE as a quality measure in its contract with Alpha Health Plan and that addressing this issue effectively could also result in a bonus payment to the hospital. In addition, the Joint Commission had just requested that the hospital begin reporting its incidence rate of potentially preventable VTE.

These forces made it logical for Grandview and the Medical Executive Committee to select the improvement of VTE prophylaxis as a key performance goal for the next year. They created a financial incentive program to help ensure adequate attention—among myriad other priorities—to this initiative by pertinent stakeholders.

At the time of this tragic event, Grandview had strong nursing leadership and a physician champion for its electronic health record (EHR) efforts, but the remaining physicians were hesitant to change. The hospital was also fortunate to have IT and quality departments that were engaged and responsive. While Grandview had implemented computerized practitioner order entry (CPOE), at the time of this event it had no house-wide VTE prophylaxis order sets—and the ones it had were scattered among admission and postoperative orders. Standardized risk assessment and prophylaxis selection were virtually nonexistent and clinical care varied widely. Among hospital employees, there was little awareness of VTE as a significant issue, and it was mostly up to individual physicians to order prophylaxis. Also, there were no checks for prophylaxis by nursing or pharmacy, and no regular auditing of VTE rates.

PI leader Goldsmith had been intrigued over the past few years by the promise of clinical decision support (CDS) to improve care processes and outcomes and spent time learning about this subject from journal articles, sessions at medical conferences, and books devoted to the topic. She had been a physician liaison for the CPOE implementation, and in light of Mrs. Adler’s potentially preventable death, saw that there was tremendous opportunity to enhance Grandview’s use of CDS to address VTE prophylaxis and other high-priority conditions. Her CDS studies had convinced her that for Grandview to be successful, it would need to build a robust CDS program that would provide fertile soil for CDS interventions focused on VTE prophylaxis and other key conditions could be developed and maintained over the long term. This would require the sustained effort and collaboration of many stakeholders and new organizational structures and processes. Potentially daunting, but …

Determine and document the who, why, what, how and when of your CDS approach and activities.

Fortunately, Grandview had a strong complement of leaders who shared a vision of quality care and patient safety. These included physician champions in medicine and surgery, a chief nursing officer and nursing executive champion, and a chief financial officer (CFO) who could appreciate the nuanced link between Grandview’s financial health and its core healing mission. Other key quality advocates included the director of pharmacy, and the chief information officer (CIO) and his IT staff. Grandview had recently hired an internist on staff,
Dr. Fred Jones, as part-time director of clinical informatics. He had some formal informatics training and was initially engaged to support the hospital’s EHR and CPOE efforts, but he would soon step up to a more central role in Grandview’s improvement efforts.

The recent tragic events—and the attention they drew in various Grandview forums—galvanized recognition in these leaders that they must work together to more effectively leverage their information system to provide better care—not just for VTE prophylaxis, but for the increasing number of clinical goals and quality measures that were becoming important to the organization. They needed a new, but strong and effective, CDS program. The leaders committed early on to engaging the entire hospital on this journey. A key ingredient was to gain commitment from each clinical unit to measure and improve targeted outcomes and to engage in the full lifecycle of CDS interventions to drive this change.

Realizing that clinical, operational and financial outcomes were all-important and inter-related, they made sure that leaders with accountability for all these dimensions were engaged in developing the CDS program and that this effort would likewise be coordinated with other related organizational activities such as committees related to quality and operational improvement.

The CDS Committee was formally established with the support of senior administration. Clinical Informatics Director Jones was the natural choice to chair this committee, and he and Grandview agreed to increase his time devoted to this role (and corresponding compensation) to accommodate the additional important responsibilities. The CDS Committee included members who sat on existing relevant committees within the hospital. Members from the P&T Committee, the EHR Committee, the Patient Quality and Safety Committee and nursing unit directors, as well as senior leadership were represented. Leadership recognized the importance of “cross-pollinating” the committee so that the CDS Committee could both be influenced by and understand the committee’s effect on other aspects of the hospital’s practices and culture. While the committee established its CDS charter and processes/procedures, VTE prophylaxis would be the first focus for the group. It was recognized, however, that this committee could not drive quality improvement (QI) projects itself, so they recommended the formation of a VTE QI Team with whom they would work closely on the specifics related to this condition.

Hospitalist Goldsmith, who had been inspired to become the physician leader in this effort, agreed to lead the VTE QI Team with a nursing unit director as co-chair. Leadership ensured that the team had adequate representation including two floor nurses, a pharmacist, an IT representative, a surgeon, the physician champion, nursing director and a quality consultant. Dr. Goldsmith would report and work directly with CDS Committee Chair Jones and the rest of the CDS Team to develop the tools recommended by the QI Team.

They began by evaluating the current state of VTE prophylaxis utilization: the hospital had open admitting and considered itself ahead of the game with a fully functional EHR and CPOE in place for three years. The QI Team quickly realized that the VTE-related death was not an isolated event. While difficult to monitor, Grandview floor nurses often reported patients not being placed on VTE prophylaxis. The surgeon on the QI Team reported not having any order sets or guidelines to help prompt him to remember to start VTE prophylaxis, and he was unaware as to how well his colleagues were doing in their prophylaxis efforts. He knew some doctors had added this to post-op orders, but there was no standardization. No one seemed to recognize the significant gap between the hospital’s current approach to VTE prophylaxis and best practices.

At their first joint meeting, the QI Team and CDS Committee identified the committees with which they needed to interact in order to improve care processes and workflows. They noted that VTE prophylaxis is a part of national quality organization recommendations and aligned with hospital efforts to reduce non-reimbursed complications—so they
would need to collaborate with all hospital groups focusing on those issues. Although an initial focus for the joint efforts was VTE prophylaxis, the CDS Committee participants recognized that it would be important to use this particular improvement effort as a scalable model for approaching other PI projects. For example, they needed to determine who would take ownership of defining patient selection criteria, intervention standards of care and related protocols for best practice VTE prophylaxis—and would need to likewise achieve local consensus on best patient care practices as a central component of other CDS projects as well.

**Understand and cultivate key CDS building blocks including your deployed information technology, documentation of clinical workflows and capacity to measure intervention effects.**

Chair Jones and other CDS Committee members were aware that some EHR systems and CDS vendors had pre-configured CDS interventions that addressed VTE prophylaxis through risk assessment forms, order sets for appropriate therapy, and other tools. However, they didn’t have any readily available documentation or shared sense of the information system capabilities and content, patient data availability and other key elements that would underpin their VTE CDS interventions. A first order of business was therefore to appoint a subgroup to gather this needed information.

From consultation with the QI Team, the CDS Committee realized the hospital had only anecdotal knowledge of its VTE prophylaxis performance—that is, how often it was actually received by patients for whom it was indicated. They realized that to measurably improve quality and safety, they needed reliable baseline and post-intervention data on key outcomes, as well as processes that contributed to those outcomes. For the VTE project, the CDS Committee and VTE QI Team decided that the outcome measure would be preventable VTE (how often patients developed a clinically evident VTE while in the hospital); the care process measures would be rate of ‘any’ prophylaxis and rate of ‘appropriate’ prophylaxis validated by a risk-assessment tool. The team then devised a ‘dashboard’ for these measures with run graphs so they could see if the interventions had any impact over time. In addition, they agreed that as they selected specific CDS interventions to improve these measures, they would need additional metrics to shed light on whether and how these interventions were being used.

The QI Team’s rough estimate was that approximately 75 percent of patients were on appropriate prophylaxis. However, when they tried to gather data from the EHR, it required time-consuming chart reviews because, at the time, reporting mechanisms with the level of detail needed couldn’t be readily obtained from the system. Team members strongly agreed that going forward, they would ensure that reporting and measurement would be automated to the greatest extent practical in any intervention they designed. Still, they launched a chart review that revealed only 45 percent of patients were on any type of VTE prophylaxis—including just mechanical prophylaxis—and the rate of appropriate prophylaxis was a dismal 25 percent. The QI Team developed an “aim statement” for their VTE prophylaxis project that they would strive toward an appropriate VTE prophylaxis rate of greater than 90 percent.

Confronted with the unacceptable current rates, the team began discussions to identify processes in place for assessing patient VTE risk and ordering prophylaxis. Despite the fact the team had wide representation from hospital services, members realized they lacked adequate “on-the-floor” knowledge. So they engaged the hospital’s quality department to observe front-line workers and develop an accurate process map for how VTE prophylaxis is handled for admissions and transfers.

As the team assessed workflows, it considered all the staff involved in managing patients at risk for VTE. The team established that the workflow—risk-assessment, initiation of prophylaxis, and monitoring of patients for signs and symptoms of VTE—was best handled as a shared responsibility of the care team. They knew that it was critical to distinguish VTE present on admission from that acquired during hospitalization because of the different implica-

tions for performance improvement efforts and reimbursement. This evaluation and mapping exercise revealed many ‘weak links in the chain’ of ensuring that all patients for whom it was indicated received VTE prophylaxis in the appropriate manner.

Examining current VTE prophylaxis-related work processes also provided an opportunity to understand more deeply how the IT infrastructure at Grandview supported these processes and how it might be leveraged more fully. For example, the QI Team noted inconsistent ways that clinicians documented the presence of a VTE during or prior to the admission. This observation spawned a dialog with the CDS Committee and other pertinent Grandview committees about revisiting policies for problem list documentation to create a more reliable foundation for CDS interventions to address VTE, and other improvement imperatives as well.

Directly witnessing these information flow weak links and decision support opportunities in both workflow and underlying systems triggered many ideas among the QI Team observers and their CDS Committee colleagues. They considered ways to strengthen key processes by ensuring that the individuals taking these steps had the information-based tools they need to support the appropriate decisions and actions. These insights from the VTE exercise spawned follow-up conversations between the QI and CDS Teams about how they could further build upon and apply these analysis and problem-solving approaches in other joint projects. The effort to catalog EHR and other system capabilities pertinent to VTE prophylaxis also triggered a productive dialog with Grandview’s EHR vendor about optimally leveraging those tools for VTE and related projects.

Establish knowledge management policies along with tools and processes to enforce these policies.

After gaining a better understanding of current practices and rates of VTE prophylaxis at Grandview Hospital and after establishing their initial ‘dashboard,’ the QI Team began to research the evidence base and related best practices for assessing VTE risk and providing appropriate prophylaxis. They uncovered a variety of approaches that other hospitals used with good results, ranging from physician-led assessment tools within admission order sets, to pharmacist-driven monitoring and nursing-driven risk assessments.

The CDS Committee recognized that identifying, tracking and applying best care practices at Grandview as clinical evidence evolved would be a complex process for VTE—let alone the other topics they would address over time. After lengthy discussions with hospital staff and the Medical Executive Committee, the CDS Committee helped establish a sister group—the Knowledge Management (KM) Committee—to plan for and handle the acquisition, validation and updating of CDS content used at Grandview. The new committee created subcommittees to conduct evidence reviews, define best practices and perform gap analyses—which would identify the variance between the proposed new process and current processes.

As its first project, the KM Committee identified authoritative sources of VTE guidance to be the American College of Chest Physicians (ACCP), the American College of Physicians (ACP), and the American Academy of Family Physicians (AAFP), among others. They discussed when and how these national guidelines might be modified for needs, infrastructure and the specific patient populations at Grandview. Work began to develop a guideline policy and the processes required to ensure adherence to these clinical recommendations.

Focusing on the process of ordering appropriate VTE prophylaxis, the team broke the process into three parts based on the evidence they found: (1) assessment of VTE risk and evaluation of potential contraindications to prophylaxis; (2) ordering of appropriate mechanical or pharmacologic agents or documentation of exceptions for not ordering; and (3) ongoing monitoring and assessment during hospitalization.

The team initially endorsed a complicated scoring system for VTE-risk assessment; however, the time to complete it was found to be overly burdensome. More research led to agreement on a very
simple ‘three bucket’ approach to risk assessment: patients would be identified (according to evidence-based criteria) as low, medium/high and very high risk for VTE on initial hospital presentation. These risk levels were presented in a simple table format to allow for rapid patient evaluation and categorization—especially when incorporated into CDS interventions later on in the process.

Working with the KM Committee, the QI Team developed a brief written guideline policy for hospital approval that outlined their agreed-upon risk-assessment levels, relative and absolute contraindications for prophylaxis, recommended prophylaxis interventions for each risk level, and expectations for order-related documentation and timing for physicians and nursing staff. They agreed that having this written consensus document would serve as a resource now and in the future while working on tools to ensure compliance. The KM Committee recognized that evidence is always changing and so dated their current guideline and decided on a six-month review to ensure it was up-to-date.

At this point, the VTE Prophylaxis QI Team—in collaboration with the KM Committee—had gained an understanding of current practice, developed written and approved clinical care guidelines, and established the beginnings of a quality dashboard. The CDS Committee reflected on this good work and considered its implications for the Committee’s own responsibilities, for example, emphasizing the importance of close collaboration with other Grandview bodies to help it understand and align its work with organizational improvement priorities, evidence-based care protocols and the realities of care delivery workflow at Grandview.

**CASE STUDY FOR SMALL PRACTICES: IMPROVING DIABETES CONTROL IN THE OUTPATIENT SETTING**

Establish a strong, shared foundation of knowledge for yourself and your team around basic concepts such as the broad CDS definition and tool-kit, and CDS’s role as a strategic tool for driving measurable performance improvement. Use this foundation to underpin your efforts to develop successful CDS programs and interventions.

Having recently implemented a new certified EHR* and gained some experience in quality measurement, a five-physician, community-based, primary-care internal medicine practice began to consider the next steps to improve the practice’s clinical and business performance. Key participants in this process at Elm Heights Internal Medicine included Dr. Myrna Franks as the performance improvement (PI) leader; Tom Beck, the practice’s only RN; and Paula Matthews, the practice manager (PM).

During one of their weekly business meetings, the five physicians began discussing possible quality performance improvement initiatives. PI leader Franks suggested that implementing additional EHR functionality beyond the core documentation, ordering and data review functions they were finally becoming comfortable with might help to improve quality measures. Practice manager Matthews noted that implementing this functionality would also support the practice’s efforts to address Meaningful Use incentive requirements and, depending on the focus of their initiatives, for potential participation in pay for performance (P4P) initiatives. The other members of the practice agreed with these ideas and suggested that Beck, Matthews and Franks coordinate the initiative for the practice.

By discussing the importance of building a continuous quality improvement program with everyone in the office, PI leader Franks and practice manager Matthews explored with the practice how they could leverage their EHR to help achieve better clinical and operational outcomes. They understood that many tools they wanted to incorporate into their EHR would fall under the category of clinical decision support (CDS). They considered questions about what resources the enhanced CDS activities would require (see Chapter 2 for personnel and organizational requirements) and what rewards it could bring (see Chapter 1 for discussion of the Promise

of CDS). They also noted that the different practice members expressed various concerns and priorities for the program. The team recognized they needed to articulate a shared vision of the “why, what and how” of the effort. They also had to be able to identify the “what’s in it for me?” from the program for the physicians, and for everyone else in the practice (including the patients).

The last thing that PI leader Franks, nurse Beck, and practice manager Matthews (who had dubbed themselves “The CDS Team”) wanted was to get off on the wrong foot by making the CDS program and intervention activities appear as yet another cost or burden that would impact productivity. In her role as practice manager, Matthews researched the return on investment (ROI) from an intensified practice focus on CDS (see Figure 1-3 in Chapter 1) and shared his assessment with the group. If done well, the program would be well worth the time and money invested, and considering the costs and other challenges up front would help ensure everyone’s expectations were in line with reality.

The CDS Team also discussed the importance of considering patient and practice management workflow implications associated with an intensified focus on CDS. For example, routinely using CDS interventions as part of their quality improvement initiatives would require an important fundamental shift in how the practice viewed its information generation and use; that is, it would need to handle information and medical knowledge in an even more systematic and goal-directed fashion than was required in the initial EHR install.

They decided to create an Elm Heights Vision to document their CDS-enhanced quality improvement program’s basic principles and essential operating procedures. That would help the practice develop an explicit plan for how they would more efficiently and effectively record, manage and leverage patient data in their information systems—and the best available clinical evidence and care practices—to improve their patient care process and outcomes. The payoff was optimizing their performance on key clinical quality and safety measures and ensuring optimal health for their patients. In addition, they anticipated increased patient and staff satisfaction and other related benefits to the practice and its members. The vision document would be incorporated into the Elm Heights Internal Medicine Business Plan when it was revised in the coming year.

The CDS Team expected that a stronger “culture of care value” would emerge from the intensified practice focus on leveraging patient data, clinical knowledge and care processes more effectively for the benefit of all. They agreed that care value could be summarized by the following equation, where efficiency and costs are pertinent to both the practice and the patient.

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\text{Care Value} = \frac{\text{Quality of Care} \times \text{Efficiency of Care}}{\text{Costs Incurred}}
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Their integrated, CDS-enhanced approach to optimizing this equation was expected to increase patient, physician and staff satisfaction, as well as patient and practice health and well-being.

**Determine and document the who, why, what, how and when of your CDS approach and activities.**

PI leader Franks, nurse Beck and practice manager Matthews understood that care delivery is best when everyone appreciates and appropriately engages all other care team members (including the patients). Similarly, they recognized that such a team-based approach is imperative for this next step in their quality improvement efforts to more fully leverage CDS. Without an actively engaged team working together with a purpose, these efforts can turn into an annoyance (for example, through unwelcome and unhelpful CDS interventions) and become an impediment to quality care (by distracting people from more productive practice- and patient-management activities). They have learned that unless there is teamwork present at every level—from improvement target selection through intervention execution and follow-up—the result will be inefficiency, increased cost, potential for errors and
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an undermining of the practice's vitality. Part of this learning came from another practice's CDS horror story resulting from their failure to work together to carefully define role responsibilities and workflows for responding to automated reminders about critical overdue testing.

In thinking broadly about whom they might involve in their CDS efforts, the CDS Team agreed that in addition to closely involving everyone in the practice, they had to also look outside for collaboration and support. The CDS Team agreed that participating in their EHR vendor's user group and leveraging support from their local HIT Regional Extension Center (REC)* could help them network with other practices on a similar path and share tools and ideas, so they wouldn't have to “reinvent the wheel.”

Even before reaching out to others, the CDS Team recognized that the efforts required by practice members to achieve new CDS-enabled advances—planning, implementation, monitoring and maintenance—had to be carefully balanced against the other demands for running the practice. Ideally, the responsibilities of each person working on (or receiving) CDS would not appreciably slow down other normal operations. They knew that their CDS/PI plan should help each member to work smarter, not harder, to achieve the practice's CDS-enabled quality and efficiency vision. Thinking ahead, they recognized that careful attention to understanding clinical workflows and practice management activities—and improving them in the context of the practice culture and goals—would be key to success.

Elm Heights Internal Medicine had always taken pride in their ability to manage patients with complex chronic conditions. As they were acclimating to the EHR, each of the five physicians began to notice opportunities for the system to provide better workflow and decision support to further improve the care and outcomes for their many patients with diabetes, asthma, depression, heart disease and other chronic conditions. The new Elm Heights Vision and plan provided them with the foundation to turn this promise into reality.

The CDS Team immediately recognized that care for these chronic conditions was the focus of many payer P4P programs and a critical component in national ambulatory quality initiatives such as those used by the Physician Quality Reporting System (PQRS) and National Committee for Quality Assurance (NCQA) and also part of Meaningful Use clinical quality measures. PI leader Franks also noted that the performance measures in these programs could be used to drive the design of CDS interventions to improve care assessed by these measures. For example, in the case of diabetes, that measures for hemoglobin A1c (HbA1c) testing and values, completion of diabetic foot and eye exams and LDL cholesterol testing and values could be used to inform CDS interventions that support appropriate attention to and management of these care needs.

Having considered themselves and discussed with others the key ingredients of their new CDS efforts, the CDS Team drafted a plan for cultivating and leveraging CDS capabilities—which will be used in deploying specific CDS interventions—to measurably enhance the practice's care value. They discussed this plan with everyone in the office during formal practice meetings, and informally as well. Based on the thoughtful input and helpful feedback they received from all who conducted or were affected by care activities, they produced a few iterations until they had a version everyone was excited about making happen.

The plan reinforced that the program had to enhance provider and patient decisions, actions and results—and track each to the extent practical. It identified changes to current roles and new activities that were required for the program to be successful. The Elm Heights physicians and staff were well-prepared to accept these enhancements, since the plan identified how the new way of working would benefit them. For example, proactive support that highlighted information needed for decision making.


and ‘makes the right thing the easy thing to do’ for common and important care processes would save everyone time and improve efficiency. Diagnosis-based order sets that facilitated fast and accurate ordering of tests, patient education materials and follow-up appointments were one of many examples.

Understand and cultivate key CDS building blocks including your deployed information technology, documentation of clinical workflows and capacity to measure intervention effects.

The practice’s certified EHR provided part of the foundation for their new generation of CDS interventions, but the CDS Team knew they would need to expand how they viewed and used other key systems, such as the practice management system. They would have to consider how to optimize these systems’ role in supporting workflow and decision making, and providing more analytical information about care processes and the outcomes they produce.

As a first step, the CDS Team assessed in detail the capabilities of the office EHR system. When selecting their EHR, Elm Heights Internal Medicine decided to use a certified EHR so that they would be poised to take advantage of government programs such as the one that provides incentive payments for Meaningful Use of EHRs. Although the EHR had been in place for a little over a year, the CDS Team knew that the practice had not yet exploited the software’s full capabilities. For example, they had not fully implemented the secure patient messaging module, health maintenance alerts were only partially implemented, and the e-prescribing module did not flag high-cost medications.

To begin analyzing how the EHR and practice management systems were currently used to support care processes in the practice, PI leader Franks guided the group through a preliminary evaluation of current patient management workflows pertinent to the chronic conditions on which they would be focusing their CDS efforts. This set the stage for—and began triggering ideas about—next-generation CDS interventions that could enhance processes and outcomes.

Since they did not yet have a lab interface, they quickly recognized that they would need to analyze the workflows associated with the lab results that are received by fax. This would require accelerating the effort to deploy an interface from the lab system, or an interim change in workflow to include manually entering the results into the system as structured data elements. Better lab value management through an electronic lab interface would help with their medical home efforts and would be critical to providing discreet data needed to trigger the many disease management CDS interventions that depended on this information—not to mention increased staff efficiencies and decreased opportunity for errors and omissions compared to manually handling lab data.

This workflow analysis highlighted that practice physicians typically document that lab results have been reviewed and communicated to the patient in an office note narrative, despite the presence of a specific checkbox for these activities on one of the EHR templates. Use of the template would both standardize the documentation and potentially improve data entry for these important activities. They realized that to link additional decision support and reporting to these results review and communications functions, the corresponding workflows would need to be standardized. In addition, they realized that there was an opportunity to better utilize current care team members to simplify and improve these processes, for example, using in-office messaging through the EHR could facilitate communication between the physicians and nurse Beck about lab result handling.

The CDS Team realized from the workflow analysis that issue of “structured data” (such as the check being present or absent in the lab handling EHR template field) as opposed to unstructured “free text” (such as the narrative patient progress notes) was an important and recurring issue. Structured data are important for documentation, reporting and decision support—and could therefore lead to higher reimbursement. On the other hand, free text is more comfortable to the practice physicians, and several considered it more appropriate to capture impor-
tant clinical nuances. It would take careful thought and work with the entire practice—and the EHR vendor—for the CDS Team to strike an appropriate balance between capturing and using structured and unstructured data in their CDS efforts.

To help with next steps in understanding and leveraging the practice’s EHR, PI leader Franks contacted the vendor and arranged for a Web meeting to include practice manager Matthews and nurse Beck. The meeting’s goal was to discuss their CDS goals with the vendor and to fully understand how to optimize the systems capabilities—including ordering tools, alerting functionality, relevant data display, documentation tools, and others—in supporting their performance improvement efforts.

The meeting with the vendor revealed many useful insights about this system, for example, that it does have helpful capabilities for alerting about interventions required for chronic disease management, such as HbA1c testing in diabetic patients. The CDS Team learned how they could create an alert for patients with overdue HbA1c tests. They also learned about better approaches for fine-tuning alert specificity planned for a forthcoming EHR release. The vendor also provided tips from other clients about how to optimize the use of templates for capturing structured data.

The meeting results were discussed with the full practice, which agreed to revisit documentation-related workflows and roles, and consider changes in the documentation process to capture important CDS-related information in a structured format: for example, they would establish where and how to document in a structured way eye exams, foot exams and retinopathy diagnoses. They would also establish policies and procedures to automatically add diabetes as a chronic problem when it was used in documenting a patient assessment. The physicians also agreed that an upgrade to the system to acquire new CDS capabilities may be appropriate, especially if gains in office efficiency and financial reimbursement for quality reporting were to offset the upgrade cost. In any case, the practice re-confirmed that any contemplated system and workflow changes had to be determined by the group to have an appropriate benefit/cost ratio before being implemented.

The system and workflow review highlighted other changes that would likely be required for the practice to realize full benefits from their next-generation CDS efforts. For example, physicians would need to encode office visit diagnoses using a standard dictionary (such as ICD-9 / ICD-10) to support quality reporting and the creation of disease registries.

Since these new CDS efforts were focused on driving measurable improvements in performance, it was clear to the CDS Team that developing stronger capabilities around measurement and reporting would be foundational. Key metrics would include performance against improvement targets—such as how many diabetic patients have their HbA1c measured at the recommended frequency and have achieved desirable levels—both before and after new CDS interventions for these targets were implemented. Looking ahead, they realized that broader outcome measures—such as how often diabetic patients were hospitalized, had heart attacks, suffered kidney problems and the like—would become increasingly important.

Likewise, they would need to be able to accurately assess clinician use of, satisfaction with, and actions based on all CDS interventions they would implement. This included the hoped for positive effects, as well as any unintended consequences (both negative and positive) from the interventions. Without such measurements, the practice wouldn’t know where they needed to improve or where and how they have improved, or created, new problems. These measurement-related needs triggered another round of meetings with the EHR vendor and the full practice, as well as reaching out to the vendor’s User Group and REC. Based on this input, the CDS Team drafted notes on an overall CDS-related measurement plan to underpin their approach to the specific target-focused CDS interventions they would soon be deploying.
Establish knowledge management policies along with tools and processes to enforce these policies.

PI leader Franks had shouldered the responsibility to acquire, update and validate the new CDS interventions that would underpin the practice’s enhanced “Care Value.” She emphasized the importance of this task with the other practice clinicians and staff and secured their commitment to help as needed. In addition, she searched for help outside of the practice.

She reached out to the practice’s EHR vendor, other vendor clients within their users group (who might share success strategies and specific CDS intervention samples), and their local REC. She found each of these resources helpful in various ways that kept her from having to ‘reinvent the wheel.’ Nonetheless, she recognized that the practice had to maintain responsibility for vetting any CDS content they received from outside sources.

She had also found—following tips from colleagues in other practices and the REC—helpful CDS content sources from commercial suppliers, as well as authoritative and trustworthy public websites. This all helped, but PI leader Franks appreciated that keeping this content up-to-date was a constant challenge. She intended to explore mechanisms whereby the EHR might notify practice staff at specified times about the need to re-evaluate the applicability and currency of their deployed CDS interventions (such as yearly in the case of specific health maintenance alerts). If there were no feasible options for automated processes, however, she planned to use a more automated tracking method such as spreadsheets and/or automated reminders in a computer-based calendar.

She discussed with the CDS Team who exactly should be responsible for the intervention tracking system. They understood some parts of the monitoring function—such as calling attention to which interventions need review when—wouldn’t have to be filled by a physician. However, they did plan to assign a practice physician to conduct periodic literature reviews—and share results formally with whole practice—to ensure that the CDS interventions on a particular topic remained timely and accurate. They agreed that by sharing responsibility for this review across all the practice, physicians would reinforce their ownership and investment in these important performance improvement ingredients. In addition, each physician and nurse Beck agreed to immediately bring to the CDS Team’s attention any information they gleaned from their reading and continuing education activities that might suggest the need to modify any of their deployed CDS interventions.

These explorations helped the CDS Team—in consultation with the full practice—to develop and document their CDS-related knowledge management processes. These include CDS content and intervention acquisition; vetting the material to ensure consistency with practice patterns (and sorting things out when there’s a difference); maintaining the content and interventions so they remain consistent with evolving clinical knowledge, evidence-based guidelines and practice policy; and making, executing and documenting decisions about content and interventions and related practice policies. After it was approved by the practice, this knowledge management plan became a component of their CDS/PI plan.