



## Best Practices

# Best Practices: CDI Technology Improves Physician Documentation, Coding Accuracy, and Revenue Cycle Operations at UPMC

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## IDC HEALTH INSIGHTS OPINION

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This IDC Health Insights study focuses on best practices seen in a case study at the University of Pittsburgh Medical Center (UPMC) designed to improve clinical documentation, coding accuracy, and revenue cycle operations. The clinical documentation improvement (CDI) application, leveraged with computer-assisted coding (CAC), in place at UPMC since 2008, assists physicians by incorporating its technology into their normal workflow. CDI allows healthcare systems the opportunity to perform concurrent document review while patients are hospitalized and physicians are actively providing treatment. This drives more efficient coding and enhanced revenue and prepares physicians and staff for ICD-10 implementation. The goal of leveraging natural language processing (NLP) using CDI, in conjunction with CAC, is to automate the coding and physician query processes to ensure that cases can be properly documented, coded, and final billed by the time of patient discharge.

This study examines UPMC's approach and best practices associated with managing coding and clinical document review processes and provides an overview of the challenges created by the CAC/CDI applications. The implementation of the new CDI application dramatically changed the workflow of coders, clinical documentation improvement specialists, and physicians requiring change management within UPMC's Corporate Coding Division and clinical departments. However, despite the challenges, the project has been extremely successful and yielded strong benefits. The system was learned by users in a short period of time, was readily adapted by physicians, is improving documentation quality, provides accurate coding/billing, and significantly increased revenue while preparing the health system for a smooth transition to ICD-10 coding when the regulatory changes take effect. Key findings from the UPMC project included:

- Automated CDI further enhances the CAC initiative and improves the quality of documentation in the patient record while adding concurrent coding capabilities.
- Automated CDI follows specific business and clinical rules and detects documentation requiring more clarity and/or specificity and, as a result, enables additional identification of complications and comorbidities (CCs)/major complications and comorbidities (MCCs) and quick turnaround time for the completion of queries and final billing of cases.
- A sound automated documentation improvement program allowed for better coding accuracy as well as revenue enhancement.
- Workflow improvements resulting from automated CDI extended to CDI specialists, coders, and physicians, all of whom enjoy improved communication and collaboration.

- Physician workflows were enhanced as a result of automated queries received as inbox messages embedded in physicians' normal workflow and the ability to click through a link to get to further detail in the patient record if clarification is required.
- Workflow integration helped increase the number of overall queries responded to and agreed to by physicians.
- Improved quality of structured data in the record that will be used for analytics will drive improved clinical and operational performance.
- The CDI technology, once completely installed, is expected to provide annual revenue improvement of an estimated \$32.8 million across the 22 hospitals of the UPMC health system.

## IN THIS STUDY

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The goal of this study is to provide an objective representation of the benefits that accrue from the best practice-based implementation of CDI in a health system. This analysis is based on the results of the implementation of technology that was a joint development effort on the part of UPMC and Optum. This CDI application is now generally available on the market. Optum's solution is not the only option available to health systems; other vendors offer additional products in this space. The benefits from the use of CAC applications coupled with CDI technology can be extensive for large health systems as well as small and midsize hospitals that invest in this technology. This analysis presents the development, planning, and implementation undertaken by UPMC in the 2008-2014 time frame as it implemented CAC and CDI at two of its largest academic hospitals and one community hospital. It examines the business issues and challenges of UPMC's project, the business risk and situational complexity as well as the lessons learned, and current and future (expected) benefits from the project.

During the course of the research for this study, IDC Health Insights conducted an interview with Rebecca Kaul, president of UPMC's Technology Development Center (TDC); attended a presentation given by UPMC on the product; and held product briefings covering Optum's CAC and CDI technologies as well as those of competitors offering comparable functionality. Secondary research was also conducted on the issues associated with the project and technologies.

## SITUATION OVERVIEW

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UPMC is an integrated delivery network (IDN) headquartered in Pittsburgh, Pennsylvania, and operates 22 academic, community, and regional hospitals with 4,732 licensed beds across western Pennsylvania. UPMC also has an international presence, with operations extending the reach of its services. Across its global operations, UPMC generates \$11 billion in annual revenue, and with 60,000 full-time employees, UPMC is western Pennsylvania's largest employer. UPMC also operates a health plan, with approximately 2 million members in its network. UPMC hospitals handle 187,000+ inpatient admissions per year and 505 discharges on an average day. UPMC began development of its inpatient CAC application in a joint venture back in 2008 to make its coding more accurate, improve coder productivity, enhance revenue, reduce overtime hours for coders, and decrease the need for external audits.

## CAC and CDI Definitions

CAC and CDI technologies both affect the coding and clinical documentation processes but address different business issues. CAC technology streamlines the coding process and coder workflows using NLP technology to auto-review documentation and recommend the correct codes based on evidence of documentation within the patient record. The CAC technology automates the coders' workflow process, allowing coders the opportunity to quality check codes and make final decisions on or reject codes as appropriate. CAC's capabilities include the ability to examine unstructured text contained in the medical record using NLP technology to identify and examine information that may require coding. CAC is commonly used in its basic form to extract key words needed to auto-code simple cases, reserving coder skills for more complex coding tasks. In more advanced implementations of CAC, such

as the one at UPMC, contextual algorithms are applied to help derive additional meaning from text in addition to the extraction of key words. This technology improves the effectiveness of coders and further streamlines workflows.

CDI technology goes further than CAC. CDI leverages the NLP and contextual understanding of text developed as part of CAC but also applies additional business rules logic, helping CDI specialists identify information that may be missing from the medical record, and that could result in additional coding opportunity or understanding of the clinical complexity for accurate reimbursement. The two types of scenarios that UPMC has targeted are clinical specificity, where additional detail is needed to code accurately, and clinical clarity, where more discrete data is needed. The CDI tool facilitates the generation of automatic queries that are presented to the CDI specialist that then can be routed to the appropriate clinician for confirmation and adjustment of the clinical documentation before changes are made to codes for final billing. UPMC has integrated the queries with its pre- and postdischarge clinical documentation systems so that the queries are presented conveniently within the physician workflow. CAC is a prerequisite for CDI but can also run as a standalone application.

CAC and CDI technology are often implemented concurrently to achieve optimal results. The ROI from both CAC and CDI results from efficiencies in workflow, better staff utilization, and revenue enhancements from missed coding opportunities as well as more accurate coding because of the identification and coding of complications and comorbidities and major complications and comorbidities.

## CAC and CDI at UPMC

UPMC began its journey toward CAC and CDI with a comprehensive evaluation and pilot project conducted with multiple vendors. Retrospective analysis was used to compare the effectiveness of different technologies and to select the particular engine and approach, and the technology was then further enhanced and refined via a codevelopment approach in collaboration with Optum. At the time of this case study, the CAC and CDI technology was deployed in six UPMC hospitals, including UPMC's flagship hospital UPMC Presbyterian Shadyside (which represents a third of UPMC's admissions), UPMC St. Margaret hospital, and UPMC Mercy hospital. UPMC plans to roll out CAC and CDI to the entire health system by May 2014.

## The Development Process

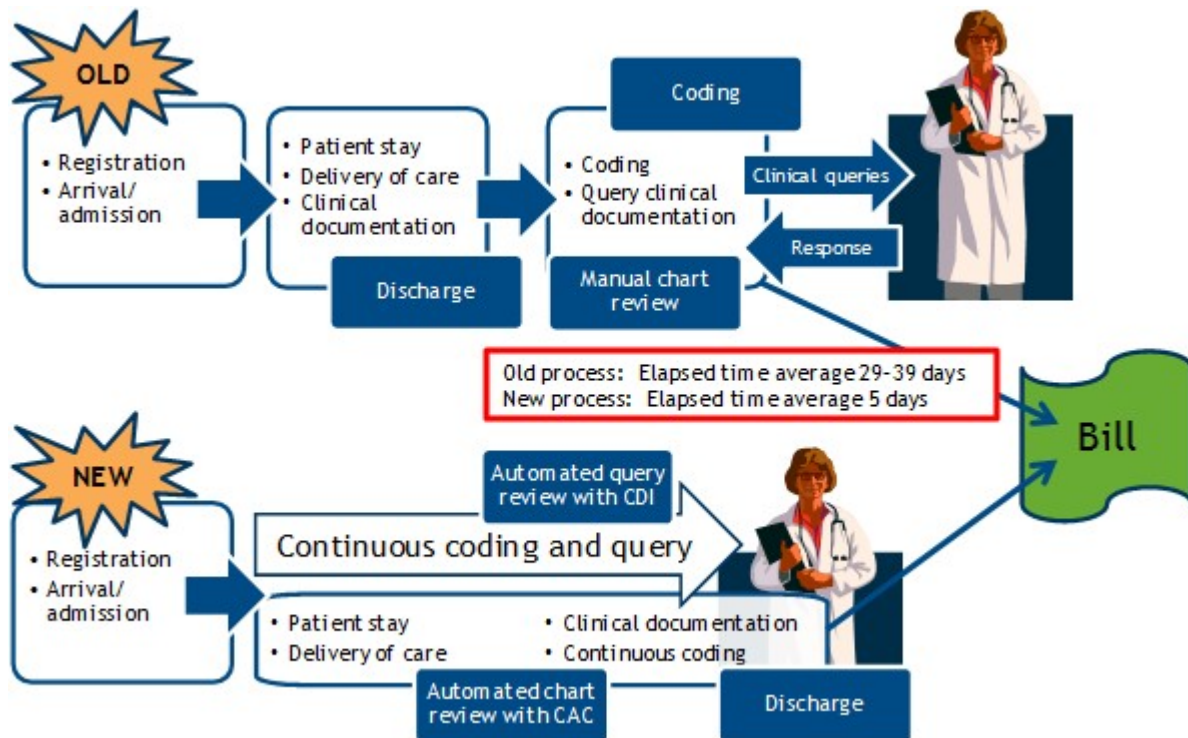
The first key milestone in the project was proving that the engine would work. Once the engine was in an alpha state, UPMC ran the engine against a retrospective analysis of existing billed claims. The study on the alpha engine recoded the cases with the system and redid the CDI queries to compare the results of the engine with those of the previous manual process. During this alpha test, UPMC was working with cases that had already been billed. The health system repeated the coding of these cases, completed CDI queries, and rebilled and collected additional revenue from the cases involved in the study. The significant revenue uplift observed from this retrospective study provided such positive results that UPMC's CFO requested that the product be used in a batch mode retrospectively while the automated product continued to be developed.

The second milestone that UPMC observed in the project was moving ahead with the implementation of the workflow changes, and gaining user acceptance of these changes, that were required for the

project. Workflow changes affected CDI specialists, coders, and physicians with varying degrees of disruption, but the most severe business process changes occurred in the Corporate Coding department. According to Kaul, "The CDI project was a huge transformation from the old to the new workflows and required putting together a number of pieces in addition to clinical data feeds and processing of data." Since UPMC has gone live, the health system's internal audit group completed an assessment of the developed queries and determined that the queries were adequate and sound based on evidence in the patient record and, once responded to by physicians, provided improved documentation in the patient record. After going live with the automated CDI system in October, UPMC completed another study and estimated that the projected annual value of the automated CDI across all of its hospitals will be approximately \$32.8 million. Turnaround times on automated queries have improved, as has the time to final bill cases. While results varied across its hospitals, UPMC saw the average elapsed time for responses to queries fall from 29-39 days prior to implementation to just 5 days on average with the new CDI application. Approval rates for queries have also improved from approximately 70% to 95%, as accuracy is improved and rules are applied uniformly with the software (source: UPMC HIMSS presentation, February 2014). These business processes are described in Figure 1.

**FIGURE 1**

**CAC and CDI Business Process**



Source: IDC Health Insights, 2014

## Business Needs

U.S. health systems are facing a slew of regulatory changes that will affect the revenue cycle, including the implementation of electronic health records (EHRs) and the inception of meaningful use requirements. In addition, new payment models, resulting from value-based care initiatives with both private and public payers, and reductions in reimbursement rates for existing fee-for-service, particularly Medicare, patients have forced the need to examine processes and look for opportunities to add efficiency across hospitals' business models. The implementation of the ICD-10 codeset originally scheduled for October 2014 (now anticipated for 2015) is also expected to have a significant impact on the revenue cycle. Although a recent indefinite delay of the ICD-10 implementation makes this regulatory change less of an urgent priority, it is still important for hospitals to update revenue cycle capabilities. Within the revenue cycle process, these changes have placed pressure on coders and CDI specialists to make the best use possible of all the newly available electronic applications but also to improve accuracy as reduced reimbursement rates make it more important than ever to avoid missed opportunity and reduce denied claims. With so much more new information to consider, and new rules to incorporate, the business need for incorporating automation into the coding and billing process was clear at UPMC and is evident at most U.S. health systems. As Kaul indicated, "In a 300-page medical case, a human cannot catch everything, but the system can." The combination of CAC and CDI not only helped catch all the details but automated the process of obtaining additional specificity that is required to bill as accurately as possible and to arrive at the appropriate ICD-9 code. Physicians are not coders, nor are they used to documenting at the level of specificity that will be required for ICD-10. They need to be educated on how to document their cases with more specific details so that the end coding process can map to the more specific ICD-10 diagnosis. From a business value proposition standpoint, value is increased with more specific coding and capturing more billable clinical information. UPMC also expects to see downstream benefits to having more information captured on the front end accrue not only to coding but also to provide more specific data for better analytics, operational understanding, and improved outcomes. According to Kaul, "UPMC expects that gathering more specific information about patients will allow them to better treat patients."

The conventional approach to CDI improvements in hospitals has historically been to work with human CDI specialists and consultants to improve the review process and generate and follow up on queries manually. These interventions are usually done periodically and not continuously. The conventional approach is time consuming and costly and subject to human factors. As staff move forward after the improvement period is complete, without the reinforcement of the consultant who has implemented the process change, the health system often reverts back to the original processes and returns diminish. The software-based approach chosen by UPMC is unique because it implements a new process that is supported and reinforced by the technology with each case. The workflow facilitated by the software allows the health system to digest more change more quickly and continuously refine and optimize processes by leveraging the software to support change in the future. The software provides a continuous improvement process and consistency that cannot be duplicated with occasional human interventions.

## Management Challenges

The primary management challenges created during the CAC and CDI implementation were managing operations and workflow changes. Prior to the implementation, UPMC was working in a manual, retrospective world. Coders worked on a retrospective, postdischarge basis and didn't do their coding work until after patients were discharged. In the old workflow, the doctor documented, the patient was discharged, the case was coded, and the bill was dropped. This process is documented as the "old" process in the process diagram (refer back to Figure 1). In moving to CAC and CDI, UPMC also moved to a continuous, cyclical, concurrent coding workflow, which was quite different for the clinical and coding teams.

The new CAC/CDI process at UPMC is not linear and reflects a continuous workflow that occurs concurrently as patient documentation accrues. The bills are coded in near real time, and clinicians are asked questions needed to improve documentation while the patients are still in the hospital. UPMC has integrated the queries with its pre- and postdischarge clinical documentation systems so that the queries are presented conveniently within physicians' workflow. This was a challenging integration at UPMC, and will be at most health systems, but the benefits of achieving this integration are clearly reflected in physicians' sentiment about the CDI implementation. UPMC physicians indicate they appreciate the new workflow for CDI queries, and this is demonstrated in the improved turnaround times and approval rates for queries. The physicians like the new workflow because it is easier to answer questions about the patient while the patient is being treated in-house rather than after discharge, as details about the patient and treatment are fresh in their mind.

## Technology Challenges

UPMC selected Optum as a partner for the CAC and CDI project because of its leadership and longtime involvement with coding technology. UPMC began its joint venture on CAC with A-Life Medical, which was acquired by Optum in 2010. Prior to making the decision to partner with Optum, UPMC investigated various CAC engines, running sets of documentation through the engines in a pilot project. The same cases were run, and compared side by side, and Optum did a better job of codifying information and extracting facts. UPMC also emphasizes the partnership with the responsive, aggressive team at Optum as an important factor when the two teams were codeveloping the business rules logic that is critical to the CDI engine.

Additional technology challenges associated with implementing CAC and CDI are related to getting the data into the system to analyze and also implementing the integration required to automate the query process. CAC and CDI engines need electronic data, which may come from a variety of systems including enterprise EHR, laboratory, radiology, and other departmental clinical and administrative systems. Getting electronic data from these systems and putting it into the CAC/CDI system are challenging and require time and appropriate planning. UPMC was already using an EHR and had access to data from its systems, but the data needed to be accessed and published in a format in which the CAC/CDI engine could ingest it. The work at UPMC was accomplished using resources from Optum and UPMC.

## THE BEST PRACTICES

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UPMC's CAC and CDI implementation had strong results and clearly used best practices that include the following:

- **Get buy-in by showing results early.** The relative ease of availability of retrospective data to run simulations on makes building a business case for CAC/CDI far simpler than for most automation exercises. There is hard ROI from the improved billing with CDI that can be estimated ahead of implementation and presented to financial and clinical leadership to help justify these types of systems and get buy-in.
- **Start with a pilot hospital.** While results accrue faster as more coding/CDI teams and hospitals are involved, starting with a pilot location or department will help ease into the workflow changes and allow leadership to learn lessons as they go along. Each hospital will have its own technology nuances, such as additional data feeds to be added and tested, and a staged implementation will allow IT teams to continue to meet this implementation challenge as the project moves beyond the pilot hospital.
- **Don't underestimate the IT challenge of data acquisition.** Getting the data was a big hurdle, even at UPMC, which has used automated clinical systems for quite some time. Coding and CDI teams should clearly identify the data they need to code/bill a case and incorporate and then work with IT to map that data and create the feeds for presentation of the data to the engine for analysis. This challenge will vary in complexity depending on the organization and experience of IT and project staff.
- **Completely understand the workflow change requirements.** The workflow change is the most disruptive part of the CAC and CDI implementation, particularly within the coding department for coders and CDI specialists. When implementing this technology, it is critical to leave extra time for training and fine-tuning new workflows and working with staff to manage the issues associated with the change. It is critical for IT to work closely with the coding director, CDI specialists, and coding managers to accomplish the change.
- **Expect to see a learning curve.** Given the scope of the workflow changes needed, a learning curve was expected. While UPMC's end results were positive with improved productivity among coding and CDI teams after the first month, a decrease in productivity should be expected immediately after system implementation. After an average learning curve of one month, an improvement in productivity can be expected to be achieved as staff become comfortable with the applications. Staging the implementation can help ease the impact of the learning curve and will allow some workers to get past the learning curve before you bring on the next site. I think this would have been true had there been enough CDI staff to work more markers, but not true based on what we are seeing – production has not greatly increased because of coders' working markers. We are currently evaluating what the non-CAC productivity would look like a few months in, moving from a non-CAC hospital to a CAC and CDI hospital.
- **Look to the C-suite for leadership.** At UPMC, the strong financial results shown by the early pilot project made a winning case for the technology with the CFO, a key decision maker for the product. CMIOs and clinical leadership are also important champions; the clinical workflow impact of the project was largely positive, but any change is change, and getting management buy-in for support and assistance in managing the process is important.



## The Business Benefits

The business benefits of the CAC/CDI project at UPMC allowed the health system to improve its revenue cycle management capabilities, drive enhanced revenue, and prepare for ICD-10 implementation with the use of computer-assisted coding and clinical documentation improvement technologies. These benefits were driven by the strong benefits of the automation technology itself as well as the best practice-based approach to handling the challenges created by the programs. The implementation of the new technology dramatically changed the workflow of coders and required extensive change management within UPMC's coding and clinical departments. However, despite its challenges, the project has yielded strong business benefits – increasing revenue collection in the near term while preparing the health system to move smoothly into ICD-10 coding when the regulatory changes take effect.

Key findings from the UPMC project included:

- The CAC and CDI program is expected to provide annual revenue improvement of \$32.8 million across the health system, amounting to an average of \$242 per case.
- CAC improves the accuracy of coding and can enhance revenue, while CDI allows for concurrent coding and more chart reviews, and missed opportunities are minimized.
- While workflow change is disruptive for CDI specialists and coders, clinician workflows are improved as providers now receive queries in near real time and have the ability to respond to them easily with embedded workflow in clinical applications.
- In addition to the immediate effects on revenue, workflows, and ICD-10 preparedness, UPMC also expects to generate additional business value to accrue in the future as the enhanced coding and documentation effort improves the quality of structured data in the hospitals' systems. This data will be used in analytics to help drive improved clinical and operational performance, and it has the long-term potential to help improve outcomes for patients. UPMC plans to finish the implementation of CAC and CDI in all of its hospitals by May 2014.

## FUTURE OUTLOOK

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UPMC has seen significant financial and operational benefits from the CAC and CDI applications to date and expects to continue to see benefits at existing sites and as the technology is rolled out to its remaining hospitals. As coders and clinicians become accustomed to the new workflows, efficiency is expected to improve further.

IDC expects the implementation and use of CAC and CDI to be a critical success factor for hospitals transitioning to the new codes as the implementation date for ICD-10 approaches. Having CAC and CDI in place at the time of ICD-10 go-live will allow hospitals to automate some of the code selection and queries that will be required as coders and physicians attempt to assemble the more detailed clinical documentation associated with the new, more specific, and much larger set of codes contained in ICD-10. Having this automation in place will ease the transition to ICD-10 for UPMC and perhaps result in a smaller coding lag and fewer denied claims as the complex new codes go into place. In addition, IDC expects the CAC and CDI technology may help restrain the need for staff augmentation in HIM departments during and following the transition to ICD-10.

### Actions to Consider

IDC Health Insights strongly recommends that hospitals, health systems, and practices without minimal CAC capabilities invest immediately to have systems implemented as close to the ICD-10 implementation date as possible. CAC and CDI technology should be considered a critical success factor for hospitals and practices approaching ICD-10.

In addition, providers considering the implementation of CAC and CDI technology should:

- Perform an initial assessment of the current applications, architecture, and approaches to determine the organization's CAC and CDI requirements as well as the data and workflow integration needs of the organization. Speak with clinicians and potential clinical and financial champions to help them understand the potential impact and benefits and build support for the implementation. The HIM department will be a focus, as its workflow is affected the most, but the IT challenges of implementing and integrating CDI are also significant.
- Determine the scope of the project, whether the project will include CAC or CDI alone – or both solutions together, and which hospitals or practices will be used as pilot settings. This decision should be based on the projected benefits from the project and technology needs and complexity of the implementation given the current state of IT at the hospitals and practice involved as well as human factors such as existing automation or readiness for change to workflows. The scope decision will help determine the staging of the project.
- Present the value proposition to clinical and financial leaders, being clear about the gains to productivity and end-user satisfaction that can be expected from the implementation as well as the hurdles to implementation.
- Work with the end users to determine the desired functionality needed, the processes in use, and the challenges involved. If multiple sites and care settings are involved, plan for scoping of the implementation across these sites.
- Work with the vendors of the CAC and CDI applications to learn about which products are best supported if legacy clinical applications are in use, and take the requirements of all the data that will need to be incorporated into the CAC and CDI process into consideration when selecting a vendor. The emphasis and approach to the business rules logic of the CDI engine should also be considered in the decision of fit of a particular CAC or CDI supplier offering to the organization.

### LEARN MORE

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#### Related Research

- *Best Practices: High-Level Infrastructure Achievements Drive EHR Success at Mercy Health System* (IDC Health Insights #HI244935, December 2013)
- *Pivot Table: IDC Health Insights' U.S. Healthcare Solutions Market Share and Forecast Guides, 2013, Version 2* (IDC Health Insights #HI243613, October 2013)

- *Technology Selection: Optimizing the Creation and Maintenance of Order Sets for Ongoing CPOE Success* (IDC Health Insights #HI242872, August 2013)
- *Best Practices: Case Study – Vendor Neutral Archiving Drives Improved Productivity, Storage Costs, and Care Quality at London Health Sciences Centre, Ontario* (IDC Health Insights #HI239669, February 2013)
- *Best Practices: Single Sign-On Drives Productivity, Security, and Adoption When Used with EHR at The Johns Hopkins Hospital* (IDC Health Insights #HI238582, December 2012)

## Synopsis

This IDC Health Insights report focuses on best practices seen in a case study of the University of Pittsburgh Medical Center's (UPMC's) efforts to improve the center's revenue cycle management capabilities, drive enhanced revenue, and prepare for ICD-10 implementation with the use of computer-assisted coding (CAC) and clinical documentation improvement (CDI) technologies. The use of CAC and CDI technologies leverages natural language processing and additional automation to assist in the coding and billing of patient charts while automating and improving the timeliness of queries during the billing process.

According to IDC Health Insights Research Director Judy Hanover, "The business benefits of CAC and CDI technologies will allow health system hospitals and practices to improve their revenue cycle management capabilities and drive enhanced revenue and should be considered a critical success factor in preparation for ICD-10 implementation."

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