The Impact of HITEKS’ CAPD360™ A.I. Solution to Create Workflow Efficiencies and Increase Health System Revenues

Importance of Notifying Physicians within their Workflow
Major shifts in the last ten years in the healthcare landscape have substantially impacted hospital system reimbursement. Placing an ever-greater importance on documentation accuracy and integrity, public payers such as Medicare and Medicaid have substantially reduced physician reimbursement. Similarly, private payers (Aetna, Cigna, United, etc.) have negotiated fee-for-service contracts, with treatment process and claims data submissions being screened with an unprecedented degree of scrutiny.

A fundamental problem plaguing the healthcare system lies in the ongoing struggle that health-care providers face in their administrative dealings with insurers. Across the country, providers lose considerable time and money in their efforts to submit, dispute, and collect payment for their work. Each year, the provider revenue cycle strives to maximize the impact of $496 billion spent on billing and insurance-related costs (BIRCs), which includes a 50% administrative excess amounting to $250 billion annually (Crocker 2006).

Introduction

This White Paper examines the evolution of CDI processes and the importance of implementing a CAPD (Computer-Assisted Physician Documentation) solution in a health system to create workflow efficiencies and increase revenues.

With payers demanding precise accuracy and flagging accounts which come from changed documentation, the considerable complexity and friction that complicates the process of getting paid has left physicians inundated with a surge of reimbursement-related documentation queries. These excess administrative responsibilities are outside of their patient-to-patient workflow and result in a lack of timely and accurate compliance (Jain, 2019). Reduction in revenues through more account denials and reduced reimbursement for inpatient and outpatient encounters for both professional and hospital billing can be countered effectively through direct and timely documentation advice to clinicians within their workflows. Since doctors spend most of their time in the Electronic Health Record (EHR) conducting results review, documentation and data entry, it is the ideal environment to capture their attention to notify them of a documentation query while they are still within the record of that patient (Sinsky et al., 2016).
Evolution in Resourcing Clinical Documentation Improvement (CDI) Processes

Around the turn of the century, Health Information Management (HIM) departments saw an opportunity to correct physician documentation to ensure it was clinically congruent with insurance coding rules. HIM functions began hiring nurses and physicians to serve as Clinical Documentation Improvement Specialists (CDS) to identify conditions that were evaluated, monitored, and treated over the duration of a hospital stay but failed to be documented in a fashion that could be accurately coded (Towers, 2013) and ultimately reimbursed. Similar to how they perform today, these CDS combed through patient charts mostly in the inpatient setting and generated paper queries and CDI forms to physicians to complete the chart documentation. The addition of this labor-intensive form initially brought along a great return on investment (ROI), demonstrating the enormous financial benefit of improved documentation. However, with organizations growing, there was increased complexity in managing documentation, and a lack of qualified individuals left the prospect of hiring additional human resources for the purpose of CDI unfeasible.

As the EHR and Computerized Decision Support System (CDSS) have evolved with a greater capacity to manage medical records, the paper-based approach of conducting chart review and generating queries by CDS has migrated to an electronic medium. Commercial CDI applications are available to assist CDS to perform a computerized chart review and enhance the efficiency of data abstraction. Usually, these products exist outside of the EHR, creating additional workflow problems for the CDI team with double and triple data entry of the same data (SOI, ROM, etc.), and necessitate untimely communication to the documenting doctor. Experiments with physician notifications through emails, text messages and other communications back to documenting authors results in further delays in obtaining physician feedback to queries since they are inundated with inbox messages, emails and phone messages.
The rapid uptake in the EHR over the past 10 years along with advances in interface standards and clinical analytics techniques has afforded the opportunity for a more integrated approach to CDI. The goal of maximizing clinician efficiency and optimizing revenue cycle is to apply CDI advice directly into the workflow process of patient care. Similar to how CDSS were integrated years ago with the decision-making processes of clinicians in mind, CDI advice can be seamlessly integrated into the workflow within the EHR prior to the completion of the clinical note.

Modern CDSS are available as computerized alerts and reminders, order sets, patient data reports, computerized guidelines, clinical workflow tools, and documentation templates (Sutton et al., 2020, Farion et al., 2013; Hoffman et al., 2011). The leading EHR software providers have opened their data and workflow interfaces and collaborated with companies like HITEKS. The intent is to operationalize CDI as a CDSS that can improve compliance with clinical documentation requirements in a physician-centered fashion, learn from the clinician feedback to the automated queries, and catch the doctor before they sign their note so that corrected documentation is not denied by payers.
HITEKS’ CAPD360 Insight is one commercially available product that was developed as part of an integrated, “Preferred Workflow” approach, with initial efficacy described in the current paper. CAPD360 is an EHR-integrated and physician-centric software solution that optimizes documentation in real time at the point of care, facilitating the construction of documentation that aligns with completeness expectations by third party payers. Real-time suggestions in the EHR screen are delivered in conjunction with the note-writing and reviewing processes, along with unobtrusive Task List and To-Do reminders for a fluid Preferred Workflow.

The Preferred Workflow consists of notifications for both Direct and Silent modes, which bring a physician to the automated query screen shown here. The Screen has the following features, incorporating HITEKS’ query feedback to the EHR once the note is written (saved):

1. Query Title is shown at the top of the left-hand panel placed next to the note found deficient in documentation
2. Suggested text (up to 6 options) which is linked to underlying ICD-10 terms can be added with a click wherever the physician places their cursor in the note on the right, which also prompts the physician to add that diagnosis onto the patient’s problem list, if warranted
3. Workflow options to Agree, Reject, State as Clinically undetermined, Ask me later, or Defer the query
4. Evidence summarized and linked for the physician to evaluate the reason for the query, which allows streamlined review of the patient’s data
5. Infobutton which opens a HITEKS window with highlighted abstracts of text and other data to reduce the need for lengthy chart review
6. Items to Address button under the note is highlighted to quickly show the physician how many queries are awaiting response
Almost as important as the CAPD technology is the clinical reference knowledge used to create the automated query rules. HITEKS’ query library has content for over 110 query types of various diagnoses and clinical subject areas which are the focus of the queries. Health care providers start with the templates to create new query models or use them as-is. In addition, a hierarchical relationship between query types allows generalized queries like Encephalopathy to be automatically replaced by more specific queries such as Metabolic Encephalopathy when certain evidence in the patient’s chart is present, mimicking the manual CDI query building process. The ability to notify providers to adjust clinical documentation in a timely and obvious way, prior to note signing, also prevents denials from payers who flag claims submissions when they see altered or corrected documentation. The CDI notifications as part of a Preferred CDI Workflow are controlled by the EHR vendor, who can use their graphical user interface (GUI) to notify users with additions to their task list, side-bar menus, and on the bottom of each note.

As part of the real-time nature of the CAPD360 experience, clinicians (both CDS and documenting physicians) become educated on the latest documentation requirements for both inpatient and outpatient clinical encounters. The quality of documentation is improved at the point of care while the patient facts and physician decision-making are still in recent memory, reducing the administrative burden of wasted reorientation to the patient’s chart when a retrospective query is issued.

To improve accuracy and compliance with documentation queries, HITEKS’ CAPD360 provides real-time queries within Epic as the physician writes and reviews her notes. Notifications for physicians and CDS promote transparent communication with 100% coverage of all patient accounts.

A requirement of participating in the analysis was the usage of HITEKS’ CAPD360 Insight integrated with the Epic EHR’s Advanced CDI License, including the NoteReader CDI module, during May 2019 to July 2021. One of HITEKS’ clients, a health care system with multiple years of experience in re-organizing and optimizing their CDI processes, was proficient and interested in analyzing their outcomes related to the use of HITEKS’ software. The system includes four Community Hospitals (labeled CH1-4 in the charts) and one Academic Medical Center (AMC) with a total of 1,621 hospital beds located on the Eastern Seaboard of the United States. Prior to redesigning their CDI function with new processes and technology, they had a 40% gap in coverage of inpatient accounts. The selection of a technology vendor to automate their processes included the ability to cover 100% of patient encounters with enough of the most frequently issued queries and others which were less frequent but time-consuming to generate.
To measure the workflow and financial impact of HITEKS’ CAPD360, the following questions were asked:

1. What will be the impact of automating queries if the end result is a greater volume of queries for physicians to respond to?

2. What will be the impact of delivering physician notifications for queries and the actual queries themselves in a timelier manner than is currently the case for manually produced queries?

3. What will be the role of the CDS in the CDI process if many queries can be automated?

4. How will the organization measure the impact of a CAPD query tool since one has not existed thus far and there has been little experience in the industry with such a capability?
Unique Characteristics of HITEKS’ CAPD360 Automated Query and Notification System

1. REAL-TIME QUERIES
   - Within 1.2 Seconds and delivered in 2 modes
   - Direct Mode
   - Silent Mode

2. EHR-INTEGRATED NOTIFICATIONS
   - Available in the Epic App Orchard
   - >110 Automated Queries Available
     - Specialties include:
       - General Inpatient
       - Ambulatory
       - Pediatrics & NICU
       - Sepsis/SIRS
       - Behavioral Health
       - Electrolytes

3. EXTENSIVE, GROWING QUERY LIBRARY

To improve accuracy and compliance with documentation queries, HITEKS’ CAPD360 Insight provides real-time queries within Epic as the physician writes their note. Notifications for CDI Specialists and documenting physicians promote transparent communication between them in the clinical workflow system: Epic. 100% of inpatient admissions and outpatient practice visits are run through the algorithms to provide a systematic review of all documentation. CAPD360 Insight for NoteReader CDI is a computer-assisted physician documentation (CAPD) improvement tool that results in 3 times the amount of queries and 3-5 times the amount of responses from physicians to HITEKS automated queries.

It operates as an Epic-integrated cloud-based NLP, A.I. and clinical workflow service that suggests improvements to clinical documentation with the goals of increasing CDI coverage to the entire chart, improving physician documentation compliance and reducing the number of manually-generated CDI queries. It uses a proprietary engine to locate medical terminology in clinical note text along with relevant structured labs, vital signs and medications, and applies algorithms from HITEKS’ advanced, configurable query knowledge base. HITEKS identifies and presents documentation improvement suggestions at the point of service to physicians and CDI Specialists through the Epic NoteReader CDI workflow and prioritizes queries to either the CDI specialist or the physician for review. Clinicians access the suggestions and associated evidence as they write their inpatient or outpatient notes, and then respond to HITEKS’ suggestions with a click, or enter new text in their note to complete accurate and compliant documentation.
Active query types used in the automated queries during the course of this analysis included the following Direct Mode queries (turned on starting November 20, 2019) and Silent Mode queries (turned on starting May 9, 2019)

### Results:

The most frequently triggered queries during the 2-year course of usage were as follows:

- Malnutrition (Direct)
- Obesity (Direct)
- Heart Failure, Acute and Chronic
- Acute Respiratory Failure
- Sepsis

While not all the queries proved to be DRG impactors, there were other reasons to include the queries which didn’t impact DRGs: promoting an appropriate terminology to the documentation to comply further with reimbursement and quality guidelines, improving accuracy and calculation of Severity of Illness and Risk of Mortality (SOI/ROM).
The data above demonstrates that over the course of 2019, following implementation of CAPD360 Insight For NoteReader CDI in Silent Mode on May 9, 2019, the number of activated queries increased from 490 in May 2019 to 1483 in October 2019. It also demonstrates that over the course of 2019, the count of responses to activated queries increased commensurate to the Activated Cases, as seen by the increased count in “Completed Cases” by subsequent documentation.

The data above demonstrates a sustained response from physicians to automated queries delivered through the Preferred Workflow Modes. The average number of monthly CDI cases satisfied using the Preferred Screen (shown on page 5 of the current White Paper) was 105.85, which is 19.26% of all automated queries delivered in the same time period from December 2019 to July 2021 in both Silent and Direct Modes.
Count of query responses by subsequent documentation by physicians (not using the Preferred Workflow but receiving automated queries by HITEKS) between Silent Mode only period (May 2019 to November 2019) and both Direct and Silent Mode (December 2019 to July 2021)

The data in Figure 3 demonstrates the change in the count of query responses by physicians to activated queries from May 2019 to January 2020, the timeline during which CAPD360 Silent Mode was active from May 2019 to October 2019 and CAPD360 Direct Mode was active from November 2019 to January 2020. The increase in the count of query responses by physicians after Direct Mode was turned on compared with the count of query responses during the initial 6-month Silent Mode duration demonstrates that improved timeliness in the delivery of the query results in greater documentation improvement, regardless of the response modality (Preferred versus Subsequent Documentation Workflow).
Financial Metrics:

Financial improvement was measured by assessing the impact of the HITEKS CAPD360 query automation system on the change in DRG (Diagnosis Related Group) on an aggregated patient account basis post-HITEKS. Pre-HITEKS there were 2 types of inpatient account classifications related to CDI: charts without queries and charts with manual CDS queries. In inpatient encounters post-HITEKS there are 2 additional classes of CDI: charts with HITEKS-only queries and charts with both HITEKS and manual CDS queries.

The clearest measurement of financial return on investment (ROI) for HITEKS is seen in the accounts which have HITEKS-only queries, because there can be no other source for documentation improvement of those charts. In these accounts, which account for 10% of the total inpatient encounters over the study period, there was a 3% increase in revenues attributed to shifts in DRG. When extrapolating to the 20% of Combined Manual CDS and HITEKS-queried accounts which received queries, an additional 3% increase in revenues (attributed half to HITEKS, half to manual) can also be added to the ROI. At an annual inpatient revenue (according to Definitive Health) for 2020 of $2.62 Billion, this amounts to $15.72 Million ($7.86 Million + $7.86 Million) in increased revenue. For a health system with 1621 beds, this financial impact is estimated to be $9,698 increased revenue per bed annually. While the amount of increased revenue per patient account (i.e. per inpatient visit) is also important to know, that analysis is on-going and will be published in the next paper.
Discussion:

As shown by the response rates to HITEKS queries, each query results in documentation addition which results in new or more specific claims codes to the patient’s encounter. The implementation of CAPD360 resulted in a greater number of valid and completed queries compared to the manual CDS query process. In its first 6 months of usage in Silent Mode, a range of 800-1500 queries per month were generated by CAPD360 and the case activation frequency was high.

The newly introduced Preferred Workflow screens in Epic, known as “NoteReader CDI,” facilitated queries from CAPD360 to be presented efficiently to physicians in their workflow, and showed a significant and sustained response in the Preferred Workflow screens of approximately 20% of all queries. Overall physician compliance to respond to the CAPD360 queries showed a 321% increase in Direct Mode compared to Silent Mode, where the manual process of CDS reviewing CAPD360 queries delayed sending the queries to the physicians even though the queries were sent in real-time to the CDS.

The advantage of a physician seeing a query in Direct Mode is that they are engaged while they are still writing and reviewing their note. They are presented the fact that a query is available for their review, and they know that they must return to their documentation to complete it, either in that moment or at a later time.

Most CDI-related feedback to physicians, which is patient and encounter-specific, is best done at the point of care when the patient facts are still fresh in their mind and the time to re-orient themselves to the patient’s chart is minimized. CAPD360 queries are delivered within 1.2 seconds of a note being saved, pended or signed in the EHR system.

HITEKS is also pioneering CAPD queries while physicians are actively writing their note (prior to the note being saved or signed in the EHR), which creates an additional CDI advantage because payers do not have an indication of documentation changes and reduce the tendency of denials due to changed documentation. While most CDI practices are currently CDS-centric, the current analysis shows that physician-centric solutions like Direct Mode CAPD360 have the greater impact on CDI and Revenues compared with Silent Mode and manual processes. However, Silent Mode, which is real-time to the CDS, affords additional advantages to CDI compared with manual CDI processes because it ensures complete coverage of CDI for over 110 different diagnoses (also referred to as query types), and delivers queries in the Preferred Workflow screens which bring the physician directly to the note requiring their response, and reminders such as Task List/“To-Do”, and CDS follow-up tracking are efficiency methods within workflow which avoids the inefficient email and in-basket messages.
With the current analysis, the following answers were realized by the HITEKS and health system team participants:

1. What will be the impact of automating queries if the end result is a greater volume of queries for physicians to respond to?
   Physicians will respond in a more timely manner and in the context of their EHR workflow, making the overall experience of receiving and responding to CDI queries easier.

2. What will be the impact of delivering physician notifications for queries and the actual queries themselves in a timelier manner than is currently the case for manually produced queries?
   Because of the timely nature of the queries, physicians are more likely to respond timely which impacts the DRG while the patients are still admitted. The DRG shift results in a significant improvement of revenues, on the order of 3% increase for cases receiving Direct Mode queries.

3. What will be the role of the CDS in the CDI process if many queries can be automated?
   CDS responsibilities will shift to become more of a review function rather than a primary initiator of queries. CDS are essential to the creation and review of the query logic which is implemented as part of the automated queries, and continue to be required to create complex manual queries.

4. How will the organization measure the impact of a CAPD query tool since one has not existed thus far and there has been little experience in the industry with such a capability?
   Continuous measurement and tracking of financial and workflow metrics is important to assessing the impact of automated technologies. Examination of response rates by physicians, overall revenues and DRG shifts are paramount to continued improvement of the system.
While other technology-enabled prioritization and abstraction tools provide a mechanism for data abstractors (e.g. CDS) to do their work in a consistent and scalable manner, CAPD360 is meant to be a complement to the challenges facing documentation. In the short term, CAPD360 assists physicians to optimize their documentation in a timely manner at the point of care, reducing the documentation-related challenges that will be later encountered. In the long term, it enables physicians to more closely align with the expected documentation practices of the period, ensuring that physicians remain educated on the latest requirements. Greater deficiency identification with a proactive, immediate feedback component delivered within workflow imparts a revenue cycle advantage to organizations that can embrace automated query enhancement to their existing manual prioritization and query-building workflows.

Using a newfound, physician-centric approach, CAPD360 is meant to streamline the clinical workflow while improving the quality of documentation that is available when compared to the manual approach. Furthermore, consistent and compliant standards and knowledge bases can be regularly applied using computerized methods, reducing the risk of non-compliant processes. CAPD360 in Silent Mode provides automated queries first to CDS and then to documenting authors – the automatically generated queries enable the CDS to better identify areas for documentation improvement in a shorter time and prioritized identification of the patient account compared to a totally manual CDS process.

In the Silent Mode process, CDS are responsible for reviewing and ‘activating’ the query to documenting authors. This semi-automated process is more efficient and financially beneficial compared to the manual process, and reveals that the automation translates to greater discovery of opportunities to improve the quality of clinical documentation. The increase in the count of activated and completed responses illustrates that the physicians are also increasingly receptive to the queries over time. In an era where physicians find themselves increasingly vexed by technology, the increased count of responses by physicians reveals that the Artificial Intelligence (A.I.) benefits of improving CDS processes are real.
Additionally, it was found that when shifting from Silent Mode to Direct Mode, where the CDS were removed from notification workflow, the count of physician responses to identified deficiencies in documentation increased. The fundamental difference between Silent Mode and Direct Mode is the timeliness of the delivery of the query to documenting physicians. The Silent Mode CAPD360 is an upgrade from the manual mode and facilitates an automated delivery of queries to CDS; in other words, documentation improvement gaps are recognized by the software, delivered directly to the CDS, who can review the recommendation and forward it to the documenting author, freeing CDS from the responsibility of initially identifying deficiencies and enabling a focus on more complex documentation challenges.

More importantly, the increase in the count of responses when Direct Mode is activated serves to reveal that there is a direct relationship between the speed at which a query is delivered and the likelihood that an improvement in documentation will take place: the faster the delivery of the query to the physician, the greater the likelihood that the documentation will be improved as the physician responds to the query in a timely manner, 20% of the time within the immediate workflow screen of NoteReader CDI and 80% of the time within subsequent documentation workflow within the patient’s encounter visit.

This has major implications for the direction that clinical decision support systems (CDSS) and CAPD should move towards: it corroborates the notion that A.I. solutions focused on improving clinical documentation should be organized in a physician-centric fashion, should be centered around improving the timeliness of the delivery of queries to physicians, and placed within the EHR workflow screens to be noticed best by the documenting physicians. The result is tens of millions of increased revenues from the 3% increased revenues of the accounts where HITEKS is involved.

These findings collectively suggest that the implementation of CAPD360 integrated with the EHR workflows, as well as other physician-centric solutions that automate the generation of queries and cut the time it takes for a query to reach its documenting author, will lead to improved clinical documentation. The investment in the technology for automated, real-time queries can help HIM and revenue cycle functions build a reliable and timely revenue cycle, which front-loads the ability to capture accurate primary diagnoses, secondary co-morbidities and justification for care.
The 321% increase in the count of responses when Direct Mode is activated serves to reveal that there is a relationship between the speed at which a query is delivered and the likelihood that an improvement in documentation will take place: the faster the delivery of the query to the physician, the greater the likelihood that the documentation will be improved as the physician responds to the query.

This responsiveness by physicians, who are notorious for lack of response to computerized alerting, in general, corroborates the notion that A.I. solutions focused on improving clinical documentation should be organized in a physician-centric fashion and centered around improving the timeliness of the delivery of queries to physicians within the EHR workflow screens to be noticed best by the documenting physicians.

The financial impact of this solution is significant and results in tens of millions of increased revenues from the 3% revenue increase in income from patient accounts where HITEKS is involved in query generation. These findings collectively suggest that the implementation of CAPD360 integrated with the EHR workflows, as well as other physician-centric solutions that automate the generation of queries and cut the time it takes for a query to reach its documenting author, will lead to improved clinical documentation compared with manual processes.

Finally, the investment in the technology and training for automated, real-time queries reduces denials through the avoidance of addendums and other changed documentation, and more completely captures the patient story.
References