Technology Trends and Impacts on CDI Programs

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Computer Assisted Coding & NLP

• “The use of computer software that automatically generates a set of medical codes for review/validation and/or use based upon clinical documentation provided by healthcare practitioners.”
  – Delving into Computer Assisted Coding, AHIMA Practice Brief

• Natural Language Processing (NLP)
  – Software that can ‘read’ physician documentation, identify key clinical facts and map those facts to codes
  – Physicians use standard dictation/transcription, speech recognition, or templates with free-text fields
  – CAC uses NLP technology called information extraction
CAC Hospital Contracted and Deployed Growth (est)
## NLP approaches

<table>
<thead>
<tr>
<th>NLP approach</th>
<th>Precision (right answers)</th>
<th>Recall (code coverage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbolic rules and statistical components (LifeCode®)</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Symbolic rules</td>
<td>High</td>
<td>Low/medium</td>
</tr>
<tr>
<td>Statistical</td>
<td>Low/medium</td>
<td>Medium/high</td>
</tr>
<tr>
<td>Pattern matching</td>
<td>Low/medium</td>
<td>Low/medium</td>
</tr>
<tr>
<td>Medical terminology matching</td>
<td>Very low</td>
<td>High</td>
</tr>
</tbody>
</table>

### Standard measures of NLP accuracy

**Precision**: Measures the number of accurate results compared to total results. Higher rates of precision mean lower false positives.

**Recall**: measures the number of accurate results compared to potential accurate results. Higher rates of recall mean lower false negatives (or missed codes).
Status of CAC Deployment in 2015

- Approximately 1,100 hospitals under contract for CAC
- Some are using NLP to assign codes and others are just live with workflow and encoder only.
- Very few vendors have published any data on NLP performance, which determines the success of a CAC solution.
- Large gap of contracted to deployed represent implementations in progress, as well as vendors who have dropped from the market.
Key Challenges Faced with CAC

• Some customers seeing very significant ROI (CMI and Productivity), while others seeing little to no improvement, even with the same vendor’s solution.

• Depending upon vendor, ICD-10 codes generated from NLP technology have been presented at various points within the past two years.

• Integration process much more complex than most health systems expected across all vendors. Not all vendors had integration experience at the level required to insure success, especially with HL-7.

• Some NLP solutions are struggling or ineffective coding PCS codes for inpatient procedures.
Key Challenges Faced with CAC

• Some organizations preserving legacy systems (Encoder and Workflow), processes, and workflows that impact productivity and efficiency.
• Redundancy between CAC solution and other systems such as encoder, edits, abstracting, workflow queues. Requires coders to go into more systems than required.
• Coders still challenged with mindset change switching from coder to auditor/coder. At almost every customer site, at least one coder starts out deleting all NLP assigned codes and recodes the chart with Encoder. Retraining and best practices need to be driven from management.
• Vendors dropping from market, narrowing down to select few.
CAC/NLP Projections

- CAC will provide benefit moving into ICD-10 for coding accuracy and compliance, depending upon NLP approach by each vendor.
- Productivity impacts will be hard to quantify based upon expected losses with ICD-10, hospital ICD-10 readiness, how long they have used CAC in an ICD-9 environment.
- Vendor list for CAC will get even smaller.
- Some vendors will shift focus to workflow and encoder and away from value of NLP
CAC/NLP Projections

• Market disruption heading into 2016 based upon ICD-10 results in production.
  – Ride it out or de-install?
• Health systems may be tasked with taking on more ambulatory coding due to physicians not being able (or not wanting) to code in ICD-10
• Many customers will not know what to expect with NLP performance for ICD-10. Are their ICD-10 results the new standard, what is the standard? How will they know if their NLP engine is performing up to par or not with ICD-10?
Transforming CDI with NLP
Natural language processing (NLP) is transforming HIM & coding with computer-assisted coding (CAC) solutions
  – Benefits - Productivity, accuracy, efficiency, transparency, manageability
  – CDI programs shares these same goals
However CAC is not the same as CDI
CDI is not limited to finding only “code-able” facts, but clinically significant facts that are evidence of an information gap
Integration of CDI/CAC and Case Finding Technology

- Demonstrating the value of the program
  - Analytics, KPIs
- Workflow prioritization
- Query response
- Operational tools
- Coding integration
Case Finding Automation with NLP

• NLP can extract the clinical evidence that indicate gaps in documentation
• Like in CAC, recall and precision are important measures of accuracy
  – High recall ensures that a high proportion of relevant facts are captured
  – Capture important facts that can escape manual processes
  – High precision means CDI specialist don’t waste time reviewing cases that don’t have gaps
• Comparing CDI evidence to CAC results provides automated validation
Case finding algorithms

**Markers** When a threshold is met within a scenario a Marker is assigned to that account for CDI team review.

**Scenarios** consist of a proprietary set of algorithms that process the Indicators in various possible combinations. (This is the Proprietary Content or “Secret Sauce”)

**Indicators** are individual clinical elements in the record, medications, lab values, words in a document, radiology findings.
Key Benefits of NLP Driven CDI

• Filters out cases that do not have any query opportunities
  – Benefit: Best use of valuable nurse clinical documentation specialists focusing on only cases with opportunity

• Focuses CDIS on only cases with valid queries
  – Benefit: Typically identifying more queries with Optum technology than with CDIS alone

• Productivity improvement
  – Benefit: Auto case finding and marking enables them to review more cases per day.

• Cover additional payers
  – Benefit: Expand coverage of program

• More justification for queries with all clinical indications identified
  – Benefit: Higher physician acceptance of queries
Example: Case Finding Content from an NLP driven CDI Solution

<table>
<thead>
<tr>
<th>Medical Conditions</th>
<th>Medical Conditions</th>
<th>Medical Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Blood Loss Anemia</td>
<td>Decubitus Ulcer★</td>
<td>Pathology★</td>
</tr>
<tr>
<td>Acute CHF★</td>
<td>DVT</td>
<td>Peritonitis★</td>
</tr>
<tr>
<td>Acute Renal Failure</td>
<td>Encephalopathy</td>
<td>Pleural Effusion</td>
</tr>
<tr>
<td>Acute Respiratory Failure★</td>
<td>EKG</td>
<td>Pneumonia★</td>
</tr>
<tr>
<td>AMI</td>
<td>Hyperkalemia</td>
<td>Prematurity</td>
</tr>
<tr>
<td>Atelectasis★</td>
<td>Hypokalemia</td>
<td>Respiratory Acidosis</td>
</tr>
<tr>
<td>BMI High</td>
<td>Hypomagnesemia</td>
<td>Sepsis</td>
</tr>
<tr>
<td>BMI Low</td>
<td>Hyponatremia★</td>
<td>Shock</td>
</tr>
<tr>
<td>Bronchopulmonary Dysplasia (BPD)★</td>
<td>Ileus★</td>
<td>Thrombocytopenia★</td>
</tr>
<tr>
<td>Cerebral Edema★</td>
<td>Intractable seizures★</td>
<td>UTI with Indwelling Urinary Catheter</td>
</tr>
<tr>
<td>Chronic CHF★</td>
<td>Jaundice</td>
<td></td>
</tr>
<tr>
<td>Chronic Kidney Disease</td>
<td>Lysis of Adhesions★</td>
<td></td>
</tr>
<tr>
<td>Chronic Respiratory Failure★</td>
<td>Malnutrition★</td>
<td></td>
</tr>
<tr>
<td>Debridement★</td>
<td>Metabolic Acidosis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pancytopenia</td>
<td></td>
</tr>
<tr>
<td></td>
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</table>
★ = optimized for both adult and pediatric populations
### CDI Performance Monitoring Program

#### Discharge Date Range

<table>
<thead>
<tr>
<th></th>
<th>Sep-15</th>
<th>Oct-15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Inpatient Discharged Cases</td>
<td>3667</td>
<td>3895</td>
</tr>
</tbody>
</table>

#### Total Cases With CDI Review

<table>
<thead>
<tr>
<th></th>
<th>Sep-15</th>
<th>Oct-15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cases With CDI Review</td>
<td>1481</td>
<td>1549</td>
</tr>
<tr>
<td>Total Concurrent Reviews (Initial + Subsequent)</td>
<td>4082</td>
<td>4292</td>
</tr>
<tr>
<td>Total Retrospective Reviews</td>
<td>546</td>
<td>826</td>
</tr>
<tr>
<td>Total Inpatient Discharges with Enabled Markers</td>
<td>2390</td>
<td>2555</td>
</tr>
<tr>
<td>Total Cases with CDI Review and Case Finding Markers</td>
<td>1425</td>
<td>1472</td>
</tr>
</tbody>
</table>

#### Total Cases with CDI Review and Case Finding Markers

<table>
<thead>
<tr>
<th></th>
<th>Sep-15</th>
<th>Oct-15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Distinct Accounts with Queries</td>
<td>456</td>
<td>434</td>
</tr>
<tr>
<td>Total Queries Sent</td>
<td>593</td>
<td>565</td>
</tr>
<tr>
<td>Responded</td>
<td>572</td>
<td>527</td>
</tr>
<tr>
<td>Total Query Agrees</td>
<td>461</td>
<td>421</td>
</tr>
<tr>
<td>Total Query Declines</td>
<td>111</td>
<td>106</td>
</tr>
<tr>
<td>No Response</td>
<td>20</td>
<td>31</td>
</tr>
<tr>
<td>Remaining Open Queries</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Physician Response%</td>
<td>96.46%</td>
<td>93.27%</td>
</tr>
<tr>
<td>Physician Agree%</td>
<td>80.59%</td>
<td>79.89%</td>
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</tbody>
</table>

#### CDI Impact

<table>
<thead>
<tr>
<th></th>
<th>Sep-15</th>
<th>Oct-15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cases With CDI Impact</td>
<td>177</td>
<td>140</td>
</tr>
<tr>
<td>Total Cases with Workflow Opportunities</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Severity Queries</td>
<td>196</td>
<td>194</td>
</tr>
<tr>
<td>Total Cases With Physician Agree</td>
<td>374</td>
<td>337</td>
</tr>
<tr>
<td>% Of Cases W/ Measurable CDI Impact</td>
<td>47.33%</td>
<td>41.54%</td>
</tr>
<tr>
<td>Average Relative Weight Gain</td>
<td>+0.75</td>
<td>+0.76</td>
</tr>
<tr>
<td>Total Financial Gain</td>
<td>+$1,147,974</td>
<td>+$904,509</td>
</tr>
</tbody>
</table>

#### CDI Case Mix Index

<table>
<thead>
<tr>
<th></th>
<th>Sep-15</th>
<th>Oct-15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline Case Mix Index for CDI cases only</td>
<td>1.066</td>
<td>1.110</td>
</tr>
<tr>
<td>Queried Case Mix Index for CDI cases only</td>
<td>1.815</td>
<td>1.866</td>
</tr>
<tr>
<td>Case Mix Index for all Cases</td>
<td>1.218</td>
<td>1.253</td>
</tr>
</tbody>
</table>

#### CDI Review/Marker Data

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<td>1425</td>
<td>1472</td>
</tr>
<tr>
<td>% of Inpatient Cases that had Markers</td>
<td>65.18%</td>
<td>65.60%</td>
</tr>
<tr>
<td>% of Cases W/ Case Finding Marker that had CDI Review</td>
<td>59.62%</td>
<td>57.61%</td>
</tr>
<tr>
<td>Avg Marker per Acct</td>
<td>3.654</td>
<td>3.623</td>
</tr>
<tr>
<td>Total Markers</td>
<td>8732</td>
<td>9257</td>
</tr>
</tbody>
</table>
NLP Driven CDI – Early Results

• Up to 40%+ improvement in CDIS productivity
• Increase in number of valid queries via correlation of much more clinical data such as labs, diagnostics, medications as well as physician and nurse documentation.
• Increase in CMI
• Increased capture of CC/MCC
• Shared information across CDI and Coding enhances communication
• Real-time case processing gets CDIS assigned to case within minutes of query opportunity identified
• Tracking of DRG from working to final bill enables reporting on true financial value of CDI program
NLP Driven CDI Challenges

• CDI Specialists go through similar transition as coders, although not as extreme. Learn to trust and rely on technology to find cases with query opportunities.
• Increase in number of valid queries means more physician interaction, for better or worse.
• Requires better query response methodology to make it simple for physicians to respond.
• Real-time automated case finding continually builds worklists for CDIS, so managing workflow becomes a new challenge.
• Much better integration of coding and CDI program facilitates more streamlined opportunities to collaborate on cases, which may have been difficult before with multiple systems for coding and CDI.
• Not all NLP solutions will be deployed in the same manner to drive CDI, similarly to CAC.
• Review of Key Performance Indicators and follow through will be essential.
NLP Driven CDI – Outlook 2016+

• May surpass CAC installs in 5 - 7 years
• Installed in blended vendor environments
• ROI information will continue to be published
• Potential to re-shape CDI market away from heavy focus on consulting and more on technology assisted CDI
• Projection is an upward trend
Additional Trends in NLP Solutions:

Computer assisted physician documentation
What is NLP CAPD?

• Utilize NLP processing at time of physician documentation to provide physicians real-time feedback on documentation quality
• Upon completion of document, or while document is being created the physician views alerts
• Establish parameters for the type of alerts that are presented to physicians
Key Benefits of NLP CAPD

• Provide physician more timely feedback and reduce post-documentation queries
• Focused feedback alerts for the physician on only what they need to know.
• Reduced workload on CDI staff – document right the first time.
Early Results of CAPD

• Several vendors have been developing CAPD, and one vendor has attempted to deploy
• NLP is a key factor of success or failure
• Limiting factor with some solutions is that feedback is single document oriented and does not take entire case into account. This results in over-alerting the physician
  – Example, alert on type of diabetes even though it may be mentioned 10 times elsewhere in chart
• Dependence on front-end vendor
• Not really seeing this take off in industry. The concept and marketing is great, the deployment has been challenging
• Reliance on front end vendors limits utilization.
• Would need EMR vendors bought into integrating solutions
NLP CAPD – Outlook 2015+

- Limited growth unless EMR vendors get on board.
- Not been a priority of EMR vendors up to this point
- Most vendors have not solved the “single document” CAPD evaluation. One vendor has solved the problem, but is still reliant on front-end integration.
- Project a limited growth trend in next 2 – 3 years unless EMR vendors drive integrating this solution into the front end, however physicians and hospitals are not demanding it.
Additional Trends in NLP Solutions:

NLP Driven Documentation Integrity
What is NLP Driven Documentation Integrity?

• What if the documented final diagnosis or principal procedure lacked the supporting evidence?

• Typically with CDI – goal is identify evidence of a diagnosis or procedure not fully documented

• Reversing the CDI perspective – find the codes without the related markers
  – Use NLP to find the clinical evidence
  – Match resulting markers to final diagnoses and procedures
  – Codes without marker could be indicative of documentation deficiencies
Documentation Deficiencies for Diagnosis

Markers

Marker 3
Marker 2
Marker 1

Diagnoses

Diagnosis 1

Markers

Diagnoses

Marker 1

Diagnosis 1

Diagnosis 2

Diagnosis 3
Documentation Integrity: Compliance Implications

- Key consideration is that the documentation reflects the actual patient condition and care
- Documentation integrity is cornerstone of coding accuracy
- CAC provides the traceability to explain coding decisions
- Potential to extend traceability to compliance with documentation standards, medical necessity and clinical best practice
Documentation Integrity: Future Applications

• Foundation
  – Algorithms for automatic detection of duplicate documents or ‘cloned’ material with records
  – Measurement of the percentage of original material in a record
  – NLP-based CAC
  – NLP-based CDI with clinical information model
• Automated compliance and quality scoring of clinical documentation
• Flagging records that have redundancy, inconsistency or gaps
Documentation Integrity: Connecting to the EHR

- Addressing potential compliance and documentation quality would be best performed as close to the time of documentation as possible.
- Retrospective analysis and queries can often come too late.
- Concurrent processes are emerging on coding and CDI that shorten the cycle time.
- To have an impact, this information (query, marker, flag) must fit in the EHR workflow.
Future Applications of NLP
The Future of NLP

• Techniques for detecting cloned material
  – Algorithms that measure the difference between records or portion of records
  – Detection of similar – not just identical - records
  – Coding outcomes can be compared to identify “possible duplicates”
• Techniques used for NLP-based CDI
  – Hold promise to detect both gaps in documentation and missing clinical evidence
• Future - automated compliance and quality scoring of clinical documentation
Thank you.