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Industry Outlook and Resources Report

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Transitioning Coding Professionals into New Roles in a Computer-Assisted Coding (CAC) Environment

Transitions are common in the healthcare marketplace today. Encoding of clinical data is a key element of the health information management (HIM) profession. It binds the provision of care to the systems serving both clinical and administrative needs. Coding professionals are experts at adapting to change, since the code sets and coding guidelines require frequent updates to keep pace with the science of medicine. Clinical terminologies and classification systems are an essential and compelling part of an optimal healthcare delivery system. The people who manage and use code sets can expect significant changes ahead, creating new roles and demanding new competencies.

This paper addresses the recent shift to automated workflow and innovation in information systems designed to improve the traditional coding process. This paper focuses on preparing coding professionals for automation of code assignment. Foundational understanding of existing and emerging technology is an important part of preparing for emerging roles.

Technology Facilitates Coding Workflow Automation

Technical approaches exist to convert clinical documentation to the equivalent codes required for secondary use. Structured input using menu-driven “pick lists” of terms related to diagnoses, problems, and procedures and or services linked to codes is one way to automate the process. In some situations data maps between information captured in one code set can be linked to an equivalent code in another code set for reuse.

The most common technology supporting automatic generation of codes for human validation is to use natural language processing systems to convert voice or text input into coded form. For specific information about natural language processing (NLP) read the companion article “A Coder’s Guide to Natural Language Processing and Coded Data.”

Entering codes into a computer is a different task than evaluating codes assigned by a software program for validity. Computer-assisted coding involves three areas of focus important to consider in transitioning coding professionals into new roles and establishing competency requirements for use by employers in developing job descriptions.

- Education, training and compensation assessment
- Technology factors impacting job descriptions
- Process factors transforming the coding workflow
Coding professionals will be expected to understand and troubleshoot the work process flow as information is captured, stored, and transformed into coded data with machine assistance.

Therefore, new skills needed allow coding professionals to leverage the technology and improve the coding process for better results and a more cost-efficient process. In a healthcare delivery system that relies on coded data for reimbursement, quality of care measurement and informative statistics new workflows are emerging to take advantage of technological advances. This requires changes in academic curricula, development of training programs, and assessment of the compensation schedules for jobs requiring additional preparation for optimal performance.

The need for additional training and job enhancement impacts job descriptions and creates opportunities for coding professionals with the right qualifications. Therefore technology factors impacting job descriptions are bound to affect the workforce. In addition, there are process factors transforming the whole process as more healthcare providers convert to electronic record systems and computerized systems to obtain strategic advantages over the use of paper records and manual data processing and report generation.

**Skill Requirements for a Technology-Enabled Automated Workflow**

Some say the best jobs in 2015 have yet to be created. This may not be more applicable anywhere than in the HIM field. As HIM professionals ponder the skills required for a successful career, those managing clinical data may want to begin with a dictionary of terms. In 2004 an e-HIM® work group defined CAC as:

“The use of computer software that automatically generates a set of medical codes for review/validation and or use based on clinical documentation provided by healthcare practitioners”.  

This definition attempted to separate the emerging technology used in coding workflows from the traditional use of encoding systems. Encoding systems have been in use for more than 20 years to assist coding professionals in selecting codes best reflecting the content of the health record in a form suitable for secondary data use.

What seemed to be a clear distinction in 2004 is more difficult to confine to this definition today. New functionality takes advantage of innovation and technology tools not available in the previous systems. Technology applications now gather clinical information from electronic documents. The acronym CAC is now used in conjunction with data management going beyond code selection for indexing and claims processing. As noted earlier, the same systems enable data abstraction to collect data once and use many for various purposes.

Workforce requirements continue to be a concern in this area of HIM practice. The shortage of qualified workers is accelerating. The Office of Economic Advisors in July 2009 projected 48 percent growth in HealthCare Support between 2000 and 2016 versus 12 percent in other sectors. Threats to coding professionals without competencies start to emerge as the shift to automation continues. In light of technological advancements, coding professionals must assess their current knowledge and skills with an eye on future requirements. Coding professionals can begin evaluating traditional and new skills with the following list:

- Knowledge of current code sets, guidelines, and principles.
• Experience in working with coding decision support tools, including encoder, abstracting systems, and indexing tools

• Literacy and proficiency in computer technology (networking, information security, and interfaces) and health information applications needed for departmental efficiency, in addition to data collection, access, control, transmission and transparency.

• Knowledge of structure and content of electronic health records (EHR) used as coding source documents

• Ability to adapt to change in the coded data workflow, with increased automation moving the coding process closer to the point of care

• Knowledge of the regulatory environment involving coded data such as the Healthcare Insurance Portability and Accountability Act (HIPAA) of 1996 and subsequent legislation related to reimbursement changes

• Ability to recognize dependencies, integration, and interface requirements between coded data and its defined use case

• Synthesis of information and discernment between useful tools and those that distort information integrity or introduce compliance risks

• Understanding of NLP and structured data input and how these technologies link to codes

• Knowledge base of the relationship of SNOMED CT® used in health records and how this clinical terminology relates to the administrative code sets used for secondary use reporting.

While opportunities for coding professionals with technology backgrounds exist, what is lacking is a well-developed employment ladder and competitive compensation to motivate professional development. The AHIMA salary studies show salaries for those with certification and experience are higher for those with two or more years of experience in a coding position. By 2015, the expectation for coding professionals is solid proficiency in automated coding work process flow and management of coded data integrity. Healthcare reform further necessitates the coding process reduce administrative costs while providing greater reliability and consistency of results. The role of a coding professional continues to be a key stakeholder on the healthcare team.

Roles for Coding professionals Frequently Depend on Provider Setting or Type

The traditional coding professional’s role is defined as assigning diagnosis, procedure, and other medical services codes using ICD-9-CM and HCPCS/CPT coding classifications, and consulting validated coding references (such as Coding Clinic for ICD-9-CM, Coding Clinic for HCPCS, CPT Assistant, National Correct Coding Initiative (NCCI) edits, medical dictionary, pharmaceutical and drug references, laboratory references, anatomy and physiology references). Code assignment traditionally happens using paper-based coding manuals, encoders, or a combination of both based upon paper, hybrid (paper and electronic), or (EHRs). This traditional role summarizes the primary responsibility of coding professionals working in inpatient care settings, hospital ambulatory care settings, ambulatory surgery centers, and academic or large outpatient clinics. In solo or group practice provider settings, long-term care facilities, and other non-acute settings, the responsibility for coding encounters and services may be performed...
by professionals with additional clinical or administrative responsibilities. Current usage of CAC is found in hospital settings (inpatient and ambulatory) and physician practices, impacting those roles.

In automated workflow environments the current role evolves to a clinical coding editor. Rather than assigning codes and entering them into computers, the technology now suggests codes for confirmation. The traditional role of the coding manager becomes a hybrid of clinical coding analyst, process improvement engineer, and terminology asset manager. Technology tools are changing the coding workflow process in the various healthcare settings. However, CAC won’t replace the coding professional’s knowledge, skills, and ability to ensure clinical code assignments are accurate and in compliance. Coding professionals will always play an important role in data integrity and quality management of coded data.

Different individuals will perform the roles of clinical coding editor and clinical coding analyst in acute care inpatient and outpatient settings. In non-acute care settings and provider settings, cross-over or mergers of these roles are likely. See below for a critical analysis of the duties performed by the clinical coding editor and the clinical coding analyst positions using CAC tools.

<table>
<thead>
<tr>
<th>Clinical Coding Editor</th>
<th>Clinical Coding Analyst</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Straightforward assignment of clinical codes</td>
<td>1. Participate on documentation improvement teams, serving as a resource on specific documentation elements needed to assign codes to the highest degree of specificity.</td>
</tr>
<tr>
<td>2. Validate accuracy of codes assigned by CAC tool; recognize inappropriate application of clinical coding rules and guidelines.</td>
<td>2. Ensure data integrity within multiple internal systems and reporting integrity issues (for example, working within inpatient and outpatient systems to combine charges to comply with the three-day window rule.</td>
</tr>
<tr>
<td>3. Interpret documentation for correct code assignment</td>
<td>3. Educate others in the area of data retrieval, data analysis, internal data systems, and data integrity.</td>
</tr>
<tr>
<td>4. Request clarification in ambiguous documentation, (for example, initiating provider query to clarify diagnostic statement).</td>
<td>4. Use report-writing tools to retrieve data from multiple databases</td>
</tr>
</tbody>
</table>
5. Apply reporting guidelines, (for example, National Coverage Determinations, National Correct Coding Initiative edits, Local Coverage Determinations).

5. Interpret “maps” created for clinical terminologies or classifications, (for example, map symptoms and diagnoses from SNOMED-CT® to ICD-9-CM (and ICD-10-CM/PCS) classifications).

6. Interpret “maps” created for clinical terminologies or classifications, (for example, map symptoms and diagnoses from SNOMED-CT® to ICD-9-CM (and ICD-10-CM/PCS) classifications).

6. Educate others in CAC software technology and EHR documentation, (for example, how NLP or structured or codified input (SI) is applied to locate appropriate information in clinical documentation).

6. Interpret coded data to access protected health information, (for example, assisting the provider in identifying individual cases documenting a specific disease process for a research study).

7. Query providers on diagnosis and procedure documentation in health records.

7. Evaluate CAC tools, (for example, develop use cases or coding scenarios to test CAC software applications for accuracy).

7. Evaluate CAC tools, (for example, develop use cases or coding scenarios to test CAC software applications for accuracy).

8. Seek clarification of official coding guidelines or obtain input professional resources when official coding guidelines do not provide clarification.

8. Participate with the vendor in CAC tool maintenance, (for example, ensure clinical coding updates are incorporated into CAC software tools).

As a clinical coding editor, the coding professional must validate the accuracy of codes assigned by CAC tools. The coding professional will recognize inappropriate application of official coding policy and guidance and verify the application of NCCI edits and National and Local Coverage Determinations. The clinical coding editor affects the clinical documentation improvement process. By working with providers on key information dictated in encounter notes, operative reports and other health record documents, the clinical coding editor supplements the CAC tools. Structured input is designed with updated clinical coding classifications such as ICD-10-CM/PCS in mind. The clinical coding editor is a vital part in the successful implementation of this coding classification with providers. The transformation of the clinical coder to an editor role requires the same critical thinking skills used in clinical decision support tools, and engages coding professionals to contribute to the design of these support and provider documentation tools. Thus, both clinical coding editors and clinical coding analysts continually improve the clinical coding workflow process at all stages: development, implementation, and evaluation.

**Educational Level Impact of CAC for Coding Job Descriptions**

As the workflow changes from the narrow process of reviewing paper records and assigning codes, to analysis and synthesis of data gathered and for wider use of the codes, it is important to assess the educational level required for success in these emerging positions.

**Formal Education Factors Related to Automated Coding Workflow**

Formal education demonstrates the basic skill set required in all professional work. Formal education complemented by experience defines proficiency. Employers expect coding
professionals to demonstrate basic skills related to clinical information, coding principles, and guidelines at the time of hiring.

**Compensation and Market Value Influence of Formal Education**

Employers calculate the basic skill set into the coding professional’s compensation package. By enhancing the current basic skill set to include experience with CAC tools, the coding professional’s value to the organization is increased. The coding professional has the ability to understand how the CAC tool identifies the multiple suggestions on coding a specific situation, and can choose the correct code from the many suggested codes.

Additionally, the employer expects the coding professional to participate in continuing education activities to improve his or her basic skill set. Formal education instills the coding professional with an eagerness to increase knowledge and improve skills. Ideally, the employer provides educational opportunities for the coding professional.

**Technology and Clinical Knowledge Base Are Both Factors in Formal Education**

Just as technology and clinical knowledge affect the coding professionals, they also drive curriculum development of formal education programs. Programs must consider the following factors to prepare future, competent coding professionals:

- With increasing complexity in EHR documentation, the documentation is segregated into different parts of the record. Pertinent clinical information and CAC technology tools are vital for a coding professional searching different parts of the record.
- As technology advances in the area of NLP, structured input and concepts associated with EHRs, such as metadata and clinical document architecture, education of these concepts is important.
- Learning how the technology changes the workflow is another key step.
- Learn clinical terminologies and classifications: SNOMED-CT®, ICD-9-CM, ICD-10-CM and PCS.
- Proficiency with clinical encoder applications, knowledge of clinical documentation in the health record, ability to apply clinical coding conventions and guidelines, and knowledge of disease process and surgical procedures.

**Missing Competencies in HIM Program Curricula**

Educational programs are always engaged in environmental scanning to ensure students master competencies required in a changing job market. HIM positions are particularly difficult to keep current because the healthcare industry pace of change is accelerating. For the transition to CAC, three important competencies emerge:

- Automated coding workflow design incorporating CAC-enabled products
- Discernment and critical thinking skills to sort truth from fiction
- Clinical training strength (anatomy, physiology, pharmacology, and pathophysiology)

Automation requires knowledge about technology and how it can be leveraged to improve the coding process. As more coding decision support tools are made available to the coding
professional to improve the accuracy and consistency of the process, proper code discernment is necessary. Frequently, information is gathered from various sources, rather than a single source in automated environments, so this discernment becomes an important skill to acquire and refine.

The transition to the ICD-10-CM and ICD-10-PCS code sets and the increasing adoption of SNOMED CT® in electronic records increases the need for a solid foundation in clinical terminology and associated clinical language definitions and use.

Table 1 outlines gaps in current HIM Program Curricula. These gaps must be considered to prepare for automation.

Table 1: Missing Competencies and Curricular Components in Current CAHIIM HIM Programs

<table>
<thead>
<tr>
<th>CAC Competencies</th>
<th>Current Associate Degree Competencies and Curricular Components</th>
<th>Current Baccalaureate Degree Competencies and Curricular Components</th>
<th>Comments—Gap Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automated coding workflow design</td>
<td>Not addressed directly</td>
<td>Not addressed directly</td>
<td>Workflow included in competencies but not specific to CAC coding workflows. Baccalaureate degree competencies focus on managing the process, while associate degree competencies focus on technical proficiency in coding.</td>
</tr>
<tr>
<td>Discernment and critical thinking skills to sort truth from fiction</td>
<td>Conduct analysis to ensure documentation in health record supports diagnosis and reflects the patient’s progress, clinical findings and discharge status.</td>
<td>Ensure documentation in the health record supports the diagnosis and reflects the patient’s progress, clinical findings and discharge status.</td>
<td>The allocation of student time in programs is insufficient to practice discernment and critical thinking skills with an increasing entry-level HIM body of knowledge.</td>
</tr>
<tr>
<td>Validate coding accuracy using clinical information found in the health record.</td>
<td>Maintain processes, policies and procedures to ensure the accuracy of coded data.</td>
<td></td>
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<td>---</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Resolve discrepancies between coded data and supporting documentation.</td>
<td>Implement and manage applications and processes for clinical classification and coding.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clinical training</th>
<th>Basic curricular requirement defined by individual college curriculum committee.</th>
<th>Basic curricular requirement defined by individual college and university curriculum committee.</th>
<th>The competency level is the same in associate degree and baccalaureate degree programs, without a defined standard for the number of credit hours.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anatomy</td>
<td>Technology</td>
<td>AHIMA’s Vision 2016 whitepaper outlined the “blueprint” to realign associate degree education to “specialty concentration” in several areas including coding and e-HIM®.</td>
<td></td>
</tr>
<tr>
<td>Physiology</td>
<td>Networking Internet and Intranet</td>
<td>All types of systems (not just CAC support tools) are embedded in the competencies, but a gap exists between “users” and “managers”.</td>
<td></td>
</tr>
<tr>
<td>Pharmacology</td>
<td>Information Security</td>
<td>Use technology including hardware and software, to ensure data collection, storage, and analysis and reporting of information.</td>
<td></td>
</tr>
<tr>
<td>Treatment protocols, disease processes</td>
<td>Knowledge</td>
<td>Implement and manage the use of technology, ensure data collection, storage, analysis and reporting of information.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interfacing with other systems</td>
<td>Use specialized software in the completion of HIM processes such as record tracking.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electronic Health Records</td>
<td>Contribute to the development of networks, including intranet and Internet applications to</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dictation and transcription systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specific CAC software systems</td>
<td>release of information, coding, grouping, and the like.</td>
<td>facilitate the EHR, personal health record, public health, and other administrative applications. Select electronic applications for clinical classification and coding.</td>
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</table>

**Questions and Concerns to be Addressed as Roles and Competencies Are Considered for Revision**

Exploration concerning gaps in competencies for formal educational programs may benefit from stakeholders asking the following questions or expressing the stated concerns affecting their local workforce:

1. What level of clinical knowledge is currently offered in education programs?
2. Associate and baccalaureate degree programs provide a “generalist” training not emphasizing coding workflow design. Does this inhibit important skill development for HIM professionals?
3. Baccalaureate degree program competencies focus on managing information while the associate degree program competencies is more hands on and task-driven. Is this distinction affecting job performance and versatility of skills related to the use of technology tools?
4. Is there a defined need for hands-on experience with automated coding workflow for problem solving in the educational programs, or can this competency be acquired in professional practice internship or on the job?
5. Concerns have been voiced about the coding credentials not requiring a formal educational foundation. How does this affect the availability of a prepared workforce for coding-related positions requiring more knowledge than using the required code sets?
6. Are there adverse effects from the fact that coding programs do not need to be approved or accredited? Does this result in employers not requiring formal education in job descriptions, thus resulting in less technology training and workflow development knowledge?
7. Is there a current or projected need for advanced coding training beyond generalist education of HIT? If so, how can this gap be filled?
8. How do we change coding professionals from production workers into knowledge workers?
9. Are data analyst skill sets merging with coding? (for example, aggregate data and identify patterns) If so, how do we emphasize the gap in analytics training for coding professionals?

10. Is there enough focus on the data flow and use affecting the coding process?

11. Is there enough coursework and emphasis placed on the development of interpersonal skills (for example, effective communication skills, consulting skills, and critical decision making) in our educational programs?

Automated Workflow Influenced by Technology
Coding Source Document Access, Format, and Structure

Automated workflows require a holistic assessment of a particular process. The guidelines for use of the code sets and specific reporting requirements determine the location in the source document appropriate for code assignment for defined purposes. For example, diagnoses are obtained from records prepared by clinical professionals licensed to practice medicine. Since emerging software systems and re-engineered workflows enable tracking of documentation eligible for encoding for secondary use it may be helpful to create and use a minimum “designated record set” for the code selection and data abstraction process. Such a “designated record set” would include the health record information used in making clinical code assignments.

Healthcare organizations must have policies and procedures in place to ensure all information required to properly assign codes to a health record for claims and other secondary uses is available. A known reliability of code assignment risk, based on incomplete documentation availability or use of inappropriate data sources as the basis for code assignments, exists. A well-designed computer-assisted process can improve reliability of the process by designating when a record is ready for coding. This saves time wasted when analyzing a record for code assignment, only to discover, halfway through, documents required for full analysis are missing.

Some CAC tools have additional features enabling better management of the coding process, including identification and tracking of missing documents or pending physician queries. The true potential of CAC has not been discovered, because systems using computer-assisted features to enhance the workflow are just starting to be reviewed and embraced. Above and beyond automation of suggested codes, which CAC is recognized for, there are many other tools and ways these programs or systems can function to support an efficient coding process:

- Streamline the coding workflow
- Support clinical documentation improvement programs
- Facilitate data mining
- Create problem lists for physician review and validation
- Support ICD-10 CM education
- Provide Recovery Audit Contractor (RAC) audit trails
Interfacing with other systems

CAC software requires integration to the EHR whether from designated electronic record systems or multiple systems such as transcription, radiology, emergency department, laboratory, and others common to health systems. The reason integration is required is to acquire the documents necessary for the NLP engine to encode the documents and present the results, including the source of the codes within the documentation to a coder for review and validation. Common systems interfaced to CAC software applications include:

- EHRs
- Dictation and transcription systems
- Financial systems
- Clinical systems

Figure 1 illustrates where these systems reside in a typical implementation.
EHRs produce a rich source of digitized documentation. However, these systems can be difficult to integrate into the coding process. Multiple storage locations containing required documents including digital images and scanned images of paper records or printed test results may exist. CAC system technology provides a bridge between the documentation incorporated into electronic records and the healthcare financial systems used to process administrative uses of the data.

The specific care setting where CAC applications traditionally worked best is outpatient services. Today, the trends are changing to include the inpatient setting with new tools and functions that provide support for the more complex coding and abstracting tasks required in the acute care hospital coding environment.

The use of the structured input technology is more common in the outpatient setting where documents are primarily template-based for ease of data capture for clinicians. Using a template or form, the user selects from a list or fills in a field resulting in consistent data capture of the desired information in a consistent and organized format useful for reporting or analysis.

The use of NLP is more common in the inpatient setting, where documents are more free-form and the technology leverages the existing transcription and health record data capture and storage systems. For more information on NLP technology see *A Coder’s Guide to Natural Language Processing and Coded Data*.

Some CAC applications provide a menu of the various documents in the medical record, whether paper or electronic. This enables “point and click” functionality, menu-driven choices and the use of hypertext to support efficient data capture and meeting documentation requirements. Coding professionals can easily move from document to document, reviewing the hyperlinked terms as they relate to the associated suggested codes produced by the computer-assist features of the software.

**Completeness and Authentication Status of Entries**

For each record, the automated system places codes into a queue for the coding professional to review, edit, approve, and finalize. Coding professionals begin the coding process by viewing suggested codes instead of working from scratch to find a code. Starting with a list of recommended codes greatly improves productivity and elevates the coding professional’s role from production worker to a knowledge worker.

Records have initial codes available to review, even when all the documents required for quality code assignment are not yet available. With CAC systems, coding professionals can set a flag that holds a record for a specific document (that is, Pathology Report is missing). When the document is available in the system, an alert is sent to the coding professional for final review.

This feature enables the “designated record set” approach where the end-user may designate what data sources are required for the coding process. This makes the process more efficient as the record does not appear in the coding professionals’ work queue until the record is deemed eligible for coding. This provides a reliable source of missing documentation for analysis and trending to improve the timeliness of post-visit or discharge health record completion.
CAC applications may also have the capability for billing resubmissions. After the record is final coded and the bill has dropped if a document is added to the record which may or may not affect the final bill, the coding professional is sent an alert to re-review the record for possible code changes. The timeframe limitation for account re-billing can be configured in the system.

**Audit Trails, Recording of Documentation Present at Time of Coding**

Computer-assisted coding systems not only provide a suggested code for consideration but also provide an audit trail to the word or phrase connected to the code(s). This audit trail provides both diagnosis and procedure codes and shows the exact record location. This feature also indicates all record locations in which the code is found, and what document and word it is connected to. This tool is very helpful, whether the facility or physician practice is conducting an internal or external audit of a previously coded record.

In some applications, there is a mapping feature to cross-reference each diagnosis and code with the exact document to confirm where the code was derived. Furthermore, this feature can also include color-coding, such as any diagnosis in red was only documented in the discharge summary. The coding professional then realizes the diagnosis was determined or occurred during the patient stay. Other CAC tool tracking features include:

- Productivity
- Accuracy
- Compliance

**Impact of Coding Decision Support Tools on the Coding Process**

In addition to the ability to suggest codes for reporting from existing record entries, there are systems that provide useful decision support tools for those who manage coding workflow in healthcare systems.

A variety of statutes and regulatory rules must be followed that are specific to the code set used, the health plan paying for the care, and the intended use of the encoded data. Parts of the workflow changes incorporate these tools into the work process to optimize compliance and enhance knowledge about the business requirements and financial impact of the code selections.

These systems provide an enhanced ability for tracking, assessment, and analysis of the coding process by facilitating the evaluation and monitoring of data quality and examination of coding productivity benchmarks. As the nation changes to ICD-10-CM/PCS by 2013, a focus on benchmarking to minimize productivity losses caused by unfamiliarity with the code sets will increase. Providers will seek all possible productivity gains due to enhanced feedback and information tools, making it easier to select and report the appropriate code(s).

All coding professions should be aware of the five quantifiable and qualitative measures of CAC use:

1. Impact on productivity. What is the difference between a traditional coding process where every code requires manual look up and data entry, compared to automated suggestion of codes presented for validation?
2. Accuracy of results: CAC software links the resulting codes back to the documentation supporting the code assignment. This facilitates clinician review and correction when it is required to be as close to the point of care as possible.

3. Reliability: Systems are able to “learn,” so identified errors are corrected and stay corrected for greater reliability.

4. Consistency of coding patterns: Consistency is fostered by knowledge base and decision support tools built into the workflow and readily available at the press of a button or click of a mouse. Because the rules and guidelines are readily available in the same system as the code sets, consistency of results is achieved by all coding professionals applying the rules in the same way.

5. Transparency: For reviews, the transparency of what documentation the code is based on is assured since the system displays the code source and additional information related to the code for easy verification of results.

Benchmarks can be set for each measure for comparison over time to monitor and evaluate the value and efficiency of the system and, where important, to justify the return on investment for acquisition and use of CAC software. Now that use of these tools is increasing, data is becoming available for comparison and decision making.

**Does Mastering of CAC Tools Result in Less Compliance Risk?**

Management of coding decision support tools has the potential to result in less compliance risk because it facilitates use of references and resources to make sure the codes reported are appropriate for the use case. The software enables independent vetting of the tool by auditors, carriers, payers creating both a transparent and a more accurate assessment of the veracity of the data. When the guidelines, rules, and warnings concerning code combinations are readily available to codes within their workstations, they are more likely to be used.

Using decision support tools wisely is also an emerging skill requirement and competency for coding professionals. Consider these three precautions related to compliance value.

- Keep all references updated since reporting requirements change frequently. If a decision support system is subscribed to, both the coding systems and references are kept current and ensure timely access to the latest information. Not using these systems correctly could increase compliance risk.
- Coding professionals must understand the content of coding decision support systems and know where to go for help if they do not understand the rules, guidelines, or laws involved.
- CAC software requires knowledge of what is useful and appropriate to apply to the case in question, so discernment is required to avoid reliance on irrelevant information.
- Building in fraud prevention is possible with automated tools, due to look up and tracking functionality. This enables identification and the ability to analyze trends and patterns indicating a need for further investigation of fraudulent billing, or misrepresentation of facts to trigger financial gains.
Summary

Embracing CAC technology in the coding workflow process is an important step for coding professionals as they begin to evaluate their current skills. Knowing how the technology impacts the coding process, in addition to the technology’s capabilities, plays a role in a coding professionals’ role shift. Preparing today for tomorrow’s role requires a variety of methods based upon each individual’s assessment of their current skills. Coding professionals should evaluate their skills in order to smoothly transition to automated coding workflow environments.

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The AHIMA Marketplace
As a medical coding professional, you hear terms such as “Natural Language Processing (NLP),” “Natural Language Understanding (NLU),” “Automated Speech Recognition (ASR),” and “structured data.” These ideas are often discussed in highly technical language that is hard to understand unless you have the right background. The aim of this article is to provide the knowledge you need to understand these ideas as a medical coder. Questions addressed include “What is Natural Language Processing (NLP)?”, “How will NLP affect your career in medical coding?”, “What is ‘structured data’ and how is it different from narrative text?”, and “How does NLP differ from ASR?”. To answer these questions, we will explore what you must know about NLP and the unfamiliar terms that surround it. This article briefly explains how NLP works using non-technical terms.

To begin, let’s define a few terms.

- **Automated Speech Recognition (ASR)** is computer software for turning speech into text.
- **Natural Language Processing (NLP)** is a computer process that extracts implied facts from the text. NLP analyzes text and “extracts” the facts from the text as very carefully constructed and coded facts. Such facts are often referred to as “structured data.”
- **Natural Language Understanding (NLU)** is another term for NLP, one used to emphasize the goal of NLP to go beyond the text and understand the meaning of what it implies.

Understanding NLP is easier with a “walk through” of how NLP affects a coder’s job. To make this clearer, consider this parallel with ASR and how ASR affects medical transcriptionists’ work.

In the transcription industry, ASR is used to assist the medical transcriptionist in producing a final typed product. ASR generates a rough draft for the transcriptionist to finish. An efficient ASR can help a transcriptionist complete twice the usual output in a given amount of time. Occasionally, ASR is used directly by physicians, eliminating the transcriptionist from the process. For the most part, however, ASR has simply changed the details of the transcriptionist's job, helping them increase efficiency and focus their efforts on the more challenging tasks.
A parallel is seen in the effect of NLP on the role of the medical coder. NLP analyzes the text of a document and finds the relevant information within that text. The NLP also makes deductions about the codes that should be applied to the document. In some situations, the NLP may be accurate enough to allow the coding to pass without human review. However, many cases, especially difficult ones, require a medical coder to review and edit the coding by NLP. The NLP points out the relevant information for review, making the work of the coder faster than it would be without NLP.

Let's walk through a typical example of such a case. Imagine the NLP has reported a clinical note from an ED visit supports an E/M code, another CPT-4 code for a minor procedure, a primary ICD-9-CM diagnosis code, and several secondary ICD-9-CM codes. Typically, NLP output also grants a level of confidence for the coding overall and for each of the codes. If the level of confidence is high, that means previous testing of NLP coding for similar documents resulted in codes human review considered accurate. The institution may choose to allow high-confidence documents to pass to billing without a human coder's review.

On the other hand, the NLP may report that confidence is only moderate or low. In that case, the NLP report indicates which code is (or which codes are) associated with the low or moderate confidence. These low confidence scores might be associated with text that may not justify being coded, or which should be associated with different codes. The human coder selects one of the codes given low confidence. The NLP code-review editor shows the coder the text associated with the low-confidence code. This text may be only a few terms in one sentence or many terms from several places in the document. These associated terms are highlighted within the context of the entire document, so the coder can review the information in context. The coder may decide the NLP code is correct and indicate approval, or edit the code before approval. If more codes must be reviewed in the document, the coder selects the next low-confidence code. Once all codes are reviewed, the entire document is marked as approved and the coder moves on to the next case in the queue of documents to be reviewed. A note on terms: wrong codes produced by the NLP are sometimes referred to as “false positives.”

The NLP may also report a level of confidence concerning whether or not there could have been missed codes. This indicates confidence that there were no “false negatives” found for these codes. If there is such a report of a possible “false negative,” it means the NLP found difficult to process text that might justify a code’s addition. In this case, the NLP code-review editor indicates the difficult text and highlights it for review in the context of the entire document. Again, the coder may choose to edit the case by adding a code, or may indicate the document needs no additional coding.

As this walk-through shows, using the output of NLP coding changes the workflow of the coding process. Some documents may not need to be reviewed. Other documents must be reviewed by a coder, but that review is facilitated by a NLP code-review editor. The coder may need to review only parts of the document. Ideally, this translates into higher throughput and better use of the training of coders. The biggest change for the coder will be the requirement to review these cases by using a computer. Another new idea is that sometimes it is acceptable to review only the parts of the document in question, rather than the entire document.

In addition, the coder may need to become familiar with a few terms such as “false positive” and “false negative”. These aid in understanding that NLP accuracy is composed of two parts. One
measure of accuracy is Precision, which is the percentage of correct codes reported. The other measure of accuracy is Recall, meaning the percentage of codes that should be found that are actually found. In other words, low Precision means many errors of commission. Low Recall means many errors of omission.

The coder does not need to know in any detail how NLP works under the proverbial hood in order to become an effective user of NLP coding tools. However, a coder may want to know a little more about how NLP works, just out of professional interest, or perhaps to gain greater confidence in the entire business of NLP-assisted coding. With these goals in mind, let's briefly look at how NLP works.

Depending on the NLP-vendor the exact combination of tools differs, but all NLP uses a combination of electronic dictionaries, rules, and statistical analysis. First, rules are used to find all the boundaries between words, sentences, paragraphs, and sections of the document. Next, a combination of rules and statistics is used to find subsets of words within sentences, paragraphs, or sections known (from dictionaries) to be associated with key concepts. In sophisticated NLP systems, this part of the process may use “parsing” of the sentences (you may remember this as diagramming sentences in English classes). Parsing helps figure out which words were intended to go together, especially in complex sentences. This also helps discover which words are negated by simple (not) or complex (denied any history of) forms of negation. By this point in the process, the NLP has found all the key concepts referenced by the words and discerned which are negated or uncertain (such as possibly). Finally, NLP uses a combination of rules or statistical processes to translate the pattern of concepts in the document into specific codes. More rules or statistical associations are used to associate codes with one another, such as associating CPT-4 codes with their supporting primary ICD-9-CM codes.

Confidence in the codes is measured in various ways. In one method, each of the above steps contributes to a calculation of the overall certainty of each code. Codes associated with uncertain steps (for example, sentences difficult to diagram), will be marked as uncertain. A completely different process of figuring the uncertainty of a code is also performed using historical experience with each code and a so-called gold corpus. The gold corpus approach involves accumulating a large number of documents for which the coding has been done in a rigorous and highly reliable manner by human coders. Next, the output of the NLP coder is compared to the human coders’ answers for the gold corpus of documents. Using this information, the historical accuracy of the NLP engine can be figured for the specific codes represented in the large gold corpus. Using highly sophisticated statistical processes (you might encounter the terms maximum entropy or artificial neural network), the comparison of the NLP results to the gold corpus helps find those features of documents that lead to errors. Whenever these features are present in future cases, the NLP engine can mark the codes associated with such features as being low confidence.

As demonstrated, coders who work in settings where NLP coding is used can expect a few changes in the way they do their work. The work is in some ways more complex (for example, use of computers, exposure to new terms and ideas) but also more streamlined and easier to use to track progress. Potentially, the NLP will make coders’ work more interesting by handling the routine elements and allowing the coder to focus on the more challenging and interesting cases.
Top Ten Questions to Ask the Vendors about Computer-Assisted Coding (CAC)

Evaluating CAC systems may seem challenging at first. In addition to standard vendor questions the following questions can be a guide.

1. How does the CAC system determine the suggested code?
2. What is the process for supporting clients’ coding issues and responding to questions or concerns?
3. Which code sets are in the system? Is ICD-10-CM/PCS in addition to ICD-9-CM and HCPCS/CPT in the tool?
4. How does the CAC system integrate into current HIM functions? For example, what types of documents are accepted by the tool?
5. What are the interface and other technical requirements of the CAC system in order to gain maximum benefit?
6. Please explain the coding management capabilities of the system, such as what reports are generated by the system and to what extent the coding workflow can be customized?
7. Does your company have documentation describing the return on investment of the CAC system in addition to references?
8. How is ongoing maintenance of the CAC system handled?
9. What implementation services are provided by your company?
10. Does the system ever send codes directly into a billing system without coder review? If so, how do you ensure the system is making the right decisions and what evidence does it use to make those decisions?

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“Show Me the Benefits: Capabilities of CAC Products”

Did you know computer-assisted coding (CAC) is able to:

✓ Automate the coding process workflow
✓ Increase productivity performance and decrease backlogs
✓ Impact the revenue cycle by reducing human coding errors and improving coding consistency
✓ Reduce or eliminate dependency on outsourcing or contract coding
✓ Support clinical documentation improvement initiatives
✓ Provide benefits even if you don’t have a full electronic health record

Computer-assisted coding (CAC) is able to integrate with existing electronic medical/health record (EMR/EHR), health information system (HIS) and encoders by:

✓ Gathering patient information from the record from various sources via an interface (frequently HL7 compliant);
✓ “Reading” the documents with technology called Natural Language Processing (NLP);
✓ Presenting coders with a set of suggested codes for confirmation and sequencing
✓ Relying on electronic documentation for both inpatient and outpatient coding.

Even in facilities still migrating to electronic records there are benefits. Facilities in a hybrid record environment will find value in most systems.

What Coding Process Benefits Can I Expect?

The implementation of a CAC solution has the potential to dramatically improve the coding workflow. It provides a more standardized and streamlined process enabling coders to complete work in less time with more accuracy.

Consistency and Productivity Benefits

✓ Generating the same codes when given the same input, no matter what methodology is used and independent of the order that the documentation is presented
✓ Scanning the entire available record for areas of interest and presenting information to coding professionals for review and refinement

✓ Reducing variability in coder performance and minimizing the effects of human factors that cause differences in code selection

✓ Providing a focused overview making time spent with each case more efficient in accomplishing more coding with the same time investment

**Record Review Benefits**

Health information management (HIM) now has a veritable alphabet soup of regulatory agencies (including the RAC, MAC, MIC, ZPIC, and many more…) requesting charts for coding and reimbursement review. Use of CAC simplifies the review process for both internal and external reviewers. The system highlights the relevant portions of the record—allowing them to quickly and easily see how the coder arrived at each individual code.

**Queries Anyone?**

CAC provides support for physician queries to make sure records are encoded completely and represent the clinical facts of the case accurately. Physician queries have been increasing with the complexity of reimbursement systems and other regulatory requirements. The implementation of ICD-10-CM/PCS in 2013 will require additional communication between coding professionals and physicians for optimal encoding. Benefits of query management include:

✓ Supporting a complete overview of the entire record and pointing out relevant clinical information showing where it is desirable to obtain more specific documentation of the clinical picture

✓ Providing dashboards within CAC systems to retrieve and respond to queries for an efficient and timely process during the care process or after discharge

**Q: How does adding technology to the coding workflow provide real benefits?**

**A: Through the power of measurement**

The answer to this question is closely related to how one measures the impact of CAC. In fact, the task of developing a systematic way to measure the impact of CAC is, in itself, one of the benefits of implementing CAC. It is as easy as 1-2-3!

1. Improved productivity and lowering of cost due to the CAC’s ability to “read”

2. Detailed analysis provided by the CAC process to enhance coder insight

3. Explicit connections made and recorded - useful for audits
To understand this better, let’s begin with some CAC Benefits and general principles in several specific scenarios, including Meaningful Use and RAC audits.

<table>
<thead>
<tr>
<th>Obvious Benefits</th>
<th>Measurement Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Productivity boost</td>
<td>The most obvious benefit and probably the most easily measured is the improvement in coder productivity, which can also be defined as a decrease in the cost of coding a record.</td>
</tr>
<tr>
<td>Decreased cost per record coding</td>
<td>Changes in productivity are relatively easily measured, and external variables can for the most part be easily controlled.</td>
</tr>
<tr>
<td>CAC read = records coded per hour, shift, or day</td>
<td>There is a direct correlation between the amount of the clinical information needed to code a patient record that can be “read” by the CAC solution and the improvement in coder productivity.</td>
</tr>
</tbody>
</table>

Productivity without complete and accurate coding is not a viable goal. Ambiguity of the rules of coding is a chief source of variation in coding outcome by even well-trained coding professionals. Implementing computer-based solutions, such as CAC, which apply coding rules consistently based on established algorithms, results in more specific coding standards and reduced variation in coding practices.

<table>
<thead>
<tr>
<th>Direct Benefits</th>
<th>Description of Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed analysis of coding process</td>
<td>A direct benefit of CAC occurs as a result of the detailed analysis that occurs during the CAC process.</td>
</tr>
<tr>
<td>Problem list encoding</td>
<td>For instance, by coding the problems addressed, the CAC output can contribute to a coded problem list for the patient. This helps to meet one of the requirements for Meaningful Use of the EHR.</td>
</tr>
<tr>
<td>Decision support</td>
<td>Coded problems can also help to trigger appropriate computer reminders and computer decision support, thus helping to meet another of the requirements of Meaningful Use.</td>
</tr>
</tbody>
</table>
### Connecting source and code

Additional direct benefit of CAC results from the explicit connection that CAC draws between parts of the documentation and specific rules and coding standards. That is, as each case is processed, the CAC software not only provides an appropriate code, it also provides a record of the text, standard, and rule that supports that coding choice.

### Audit – ability enabled

This can be extremely useful and effective when it comes to responding to an audit requests such as a RAC audit. The electronic access to the record itself and the record of how the code was chosen make the task of responding far simpler.

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**Presto Change-O**

We must understand that implementing CAC often changes the process of information capture. In pre-CAC standard practices, documentation may take place in a number of ways that are not useable in the CAC environment (for instance, handwritten notes). Changing this is often one of the most difficult tasks of implementing CAC but by making all documentation electronically accessible to the CAC software, there are several other benefits:

- Documentation is more readily available for clinical use in the EHR.
- The CAC analysis of the documentation can be retraced at any time, providing an audit trail for how the visit was coded.
- The information is electronically accessible for any number of other analyses by software for other purposes such as administrative and clinical research.

Another indirect effect that results from setting up a system for measuring the benefits of CAC is learning more about the actual quality of coding processes. Using this technology enables measurement of the quality of the new computer aided process to compare with the old manual process. Actually measuring those benefits to show the difference in both production and quality—priceless!

**Wait There’s More…**

Computer-Assisted Coding (CAC) is quickly gaining acceptance but its true potential has not yet been realized. In addition to automating time consuming manual coding processes, CAC positively impacts many other aspects of health information management.

- **Automating the Workflow** by providing tools to managers to automatically determine what charts need to be coded by specific coders or assignment of prioritized records
- **Concurrent Running DRG’s** aid the clinical documentation team by providing a working DRG, expected reimbursement and the total charges of a patient upon admission. **Recovery Re-Submission** alert coders when additional documents are received on a chart after it has been final billed that may require re-submission or correction.
- **Patient Problem Lists** can be generated, assisting the physician in their documentation
✓ **Data Mining and Auto-Abstraction** alleviates the burden of manually gathering and entering that information into an abstract.

✓ **Audit Tools** via a mapping feature automatically provide a cross-reference so that the location of diagnoses and documentation can be easily traced and thoroughly supported from QA and RAC appeals.

✓ **ICD-10 CM Preparation** and training can begin now with the help of CAC tools. ICD-9 CM codes along with the suggested ICD-10 codes can be provided for each chart to better assist with the training right now.

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SPONSOR COMMENTARIES

3M

3M Health Information Systems delivers comprehensive software and consulting services to help organizations worldwide improve documentation, quality, and financial performance across the healthcare continuum. 3M offers integrated solutions for transcription, speech recognition, clinical documentation improvement, documentation management, computer-assisted coding, quality, and revenue cycle management, effectively meeting the industry’s changing needs.

Artificial Medical Intelligence

Artificial Medical Intelligence, premier innovative developer of Computer Assisted Coding software, NLP, and custom driven data abstractions utilizing proprietary Natural Language Processing techniques, advancing the efficient procurement of electronic information for healthcare. AMI provides adaptive core technologies and customizable solutions responding to fiscal reality, governmental regulation, and burgeoning clinical complexity.

INGENIX

Ingenix and A-Life Medical have combined capabilities to offer a sophisticated computer-assisted coding solution that improves coding speed and accuracy and eases the transition to ICD-10. Ingenix also provides a comprehensive suite of innovative print and electronic coding references and insightful consulting gained from more than 25 years of experience.

NUANCE

Nuance Healthcare’s portfolio of Medical Intelligence solutions empower healthcare provider organizations, payers, and individual physicians worldwide to deliver higher quality care, improve financial performance and enhance compliance efforts. Nuance employs a range of technologies and services including: speech recognition, clinical language understanding, decision support, test results management and data analysis.

QuadraMed

Studies have shown that CAC has increased coder productivity in Canada by as much as 20 percent, while decreasing coder overtime by as much as 80 percent and decreasing external audit fees as much as 50 percent. CAC provides health systems with powerful automated coding technology that helps them to accelerate claims and billing processes, improve cash flow, enable cross-departmental communication, and mitigate the risk of productivity loss due to the transition to ICD-10.

The opinions expressed by the sponsoring companies are those of the contributors and not necessarily those of AHIMA.
Computer-Assisted Coding: Making Innovation Possible

Commentary by 3M Health Information Systems

CAC 2010: Industry Outlook and Resources Report is a much-needed assessment by AHIMA of the current state of computer-assisted coding (CAC) technology, its many benefits, and the ramifications for the health information management (HIM) community at large. In looking to the future, the authors note that, beyond automation of suggested codes, for which the technology is recognized, “…the true potential of CAC has not been discovered, because systems using computer-assisted features to enhance the workflow are just starting to be reviewed and embraced.”

Fortunately, the true potential of computer-assisted coding is not years away. Today, CAC is a key component of a technology transformation that is revolutionizing and automating a wide array of hospital care and business functions. There is growing recognition that computer-assisted coding can pave the way for new streamlined processes and workflows that have far-reaching benefits, helping facilities rein in costs, respond to new regulatory requirements, promote more efficient and effective care delivery, and improve financial performance.

The decision to move forward with computer-assisted coding is, in fact, an investment in strategic innovation and future advantage, especially in supporting the following initiatives:

EHR Adoption

The passage of ARRA established new federal incentives supporting EHR adoption, leading many industry analysts to project that, over the next five years, the patient record at most hospitals will become completely text-based, machine-readable and portable.

By bringing together patient data from across the continuum of care, EHRs can significantly improve access to clinical and financial information and provide a more complete picture of the patient for coding, quality reporting, financial analysis, and most important, patient care. However, coders are finding that EHRs require careful navigation through an ever increasing volume of documentation, often two to three times more documentation than the paper chart. This information overload can impact coder productivity and many facilities have seen an immediate slowdown in coding workflow during an EHR’s initial implementation.

Implementing computer-assisted coding in conjunction with an EHR implementation can help coders sift through vast quantities of available information to focus on the pertinent clinical facts that are critical to the coding process. In a recent study, the Advisory Board recommended
hospitals evaluate the volume of discrete encoded data within the facility and develop strategies to implement CAC as part of their EHR transition plan.

**ICD-10**

ICD-10 will make it possible for hospitals and other providers to meet the growing information demands of today’s complex care environment. It will enable higher quality information, which will lead to improved quality measures, patient safety, disease management, more accurate payment, and more.

As HIM professionals well know, ICD-10 brings a dramatic increase in the number of codes and changes the length of the codes to accommodate a much greater level of specificity. Past practices of memorizing codes for direct code entry in encoding systems will be virtually impossible under ICD-10. The structure and specificity of ICD-10 and the steep learning curve for coders to become effective and efficient in ICD-10 coding are driving healthcare organizations to increase reliance on computer-assisted coding systems. Implementing CAC technology now can help offset initial coding productivity losses anticipated with ICD-10 implementation.

**Documentation Improvement**

Healthcare reform, federal and state quality initiatives, and the move to outcomes based payment are challenging the way physicians document the patient episode. The complex transition to the ICD-10 coding system will put clinical documentation tools and processes to an even greater test.

Physicians who rely on the same 10 or 20 codes for their routine procedures will be faced with too many variations under ICD-10, making it impossible to memorize a few codes or record them on a pocket-sized note card. Physicians are already challenged to meet documentation requirements under ICD-9, so establishing a clinical documentation improvement (CDI) initiative is a critical step in every hospital’s ICD-10 transition.

CAC technology can be an essential tool in achieving success with CDI efforts. Computer-assisted coding can speed documentation review and promote productivity gains by helping coders and clinical documentation specialists quickly identify missing or incomplete information in the patient record. Using computer-assisted coding today, coding staff can pinpoint the precise questions requiring a physician response, making the query process much more efficient.

As CAC and CDI technologies become more sophisticated, the process of documentation improvement can be automated to an even greater extent, making it fully concurrent with patient care. This will decrease queries to the physicians, and queries that do need to be sent will go directly into the physician’s worklist.

**Physician Workflow**

As noted, physicians face mounting pressure to produce better, more precise clinical documentation. Electronic documentation systems currently used to collect patient information have had limited success in clinical practice because of the intricacy of structured data entry workflows and the inability of templated clinical notes to fully capture the physician narrative.
As NLP, CAC, and CDI technologies evolve, healthcare facilities will be able to move key processes to the point of service. For example, integrating CDI prompts with voice recognition tools can help identify gaps and ambiguities in the dictated note and alert physicians with pertinent and focused suggestions to improve the narrative. CAC technology can take this workflow to the next level by applying autocoding to the physician narrative, automatically transmitting codes through the transcription process to billing systems.

In addition, sophisticated applications for mobile devices can offer coding advice and prompts to physicians while capturing charges on their personal smartphones. Using CAC technology to enhance this type of portability not only improves claims accuracy and speeds time to billing, it also promotes greater efficiencies for physicians, enabling them to spend less time on administrative work and more time with patients.

**Next-generation Data Analytics**

New reimbursement models are emerging to incent payment for quality instead of payment for quantity. In this new regulatory era, hospitals are under enormous pressure to implement greater efficiencies to reduce administrative costs, while still maintaining superior patient care.

Computer-assisted coding integrated with CDI technologies can enable advanced data analytics for evaluating quality outcomes data and aligning it with financial performance. Many hospitals have been able to identify key areas for improvement and fast-track solutions to address problem areas, often resulting in a 2 to 3 percent increase in case mix index. The increased accuracy delivered by CAC technology, in tandem with the expertise of HIM coding professionals, can also increase the accuracy and completeness of the data analyzed.

**The Power of Codes**

The ability to capture accurate data and manage documentation, coding and grouping processes is a primary focus for hospitals. Today’s economic climate makes this focus more important than ever.

While the transition to any new technology requires adjustment and a willingness to adapt, the benefits of computer-assisted coding can be substantial. HIM professionals who choose to lead their facilities in adoption of CAC technology will become the ‘go-to’ experts, moving their facilities toward a more competitive position while simultaneously raising their own value in the organization.

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Cognitive Limitations and Coding Bias: Why ICD-10 Will Make Things Worse and How CAC Can Help

Commentary by Artificial Medical Intelligence

M. Elliott Familant, PhD; Lance Post; Stuart Covit; Andrew B. Covit, MD
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Using the present ICD-9 disease classification system provides a typical inpatient coder could, theoretically, consider the application of over 18,000 codes while coding an inpatient chart. No human coder does this for the simple reason that the amount of information is too great to consider in any reasonable amount of time. The amount of information is high and the time to apply this information to the task is small, meaning that medical coders are performing a task characterized by cognitive psychologists as one of high cognitive load (Cooper, 1998). Because exhaustive search of the ICD-9 corpus is not possible, coders likely rely on a set of heuristics, rules of thumb, which allow them to complete their task (Tversky & Kahneman, 1974).

As experimental psychologists Amos Tversky and Daniel Kahneman have demonstrated (Tversky & Kahneman, 1974) these heuristics frequently lead to biases in response that are heavily influenced by the cognitive limitations of the person performing the task. One well known bias is a byproduct of the Availability Heuristic (Tversky & Kahneman, 1973). The Availability Heuristic causes people to make responses, not because it is the correct response, or the response most reasonable based on the available information, but because it is the easiest to recall or produce. For example, the Availability Heuristic explains why people overestimate the likelihood of airline crashes and nuclear power plant explosions (Fischhoff, 1990). The overestimation of these events is based more on the saliency of the event (high) instead of its frequency (low).

When applied to medical coding, the Availability Heuristic would suggest that coders would tend to overuse certain codes because they are the ones that are most familiar to them (most available). This would result in undercoding of less familiar disease states and procedures. The literature provides ample evidence of this phenomenon occurring in various situations including the underreporting of sepsis (Ellis, John, & Kinaswitz, 2010), pregnancy related mortality (Deneux-Tharaux, Berg, & Bouvier-Colle 2005), Alzheimer's disease and related dementias (Greco, et al., 2005), cerebrovascular disease (Hasan, 1995) and anal sphincter lacerations (MacNeil, 1996) among others.
Because heuristic induced bias is a result of cognitive and task constraints that are not expected to change any time soon, the introduction of ICD-10 will not improve the underreporting problem. In fact, the opposite is probably true since the marked increase in available codes in the ICD-10 classification scheme will likely increase the amount of underreporting and misclassification of disease states.

To understand this, consider a simple model of medical coding consisting of a medical classification scheme comprised of 20 diagnosis codes, a medical coder who only can assign 10 of those codes at any given time (because of cognitive and task limitations), and a state of affairs such that every disease state corresponding to the classification scheme occurs with the same likelihood. Furthermore, let us assume that the coder always identifies a disease state correctly if it is among the 10 codes that she can assign. Cases of diseases that are among the ten the coder can assign are the positive class and those cases consisting of diseases that the coder does not have the ability to assign are the negative class. Errors will occur 50% of the time, but the errors will be of one kind only. The coder will only make errors if the true disease state is one of the 10 medical codes that she cannot assign. From information theory, two metrics can be calculated that quantify this. The coder's precision is 50% (true positives divided by the total number of cases that are true positive and false positive) however her recall is 100% (true positives divided by the sum of the cases that are true positive plus the cases that are false negatives). Two simple equations summarize these relationships:

\[
\text{Precision} = \frac{\text{True Positives}}{\text{True Positives} + \text{False Positives}} \quad \text{Recall} = \frac{\text{True Positives}}{\text{True Positives} + \text{False Negatives}}
\]

Now consider what happens as the number of disease states and the corresponding number of diagnosis codes doubles from 20 to 40. The coder still only can code 10 codes. When encounters actually represent disease states corresponding to those ten codes, the coder still codes with 100% accuracy. Recall is still 100%. The coder always assigns an actual disease state correctly and never falsely rejects a case as not corresponding to one of the 10 disease codes she can assign (false negatives are zero). However, the precision of her coding declines markedly. Instead of a precision of 50%, under this new larger code set scenario, her precision drops to 25%. In fact, as the number of potential codes increases, the precision of the coder drops in a linear fashion.

With relatively modest alterations, this model is directly applicable to the situation that will confront coders when ICD-10 is introduced. With ICD-10 they will still be faced with the same cognitive and performance limitations and the same task constraints as with the present ICD-9 code set that causes them to employ heuristics with the resulting undercoding and biased coding. However, with the number of potential codes that could be coded increasing eight fold, inevitably, coding accuracy will decline. This will be due to a decline not only in precision as the model suggests, but also compounded by a decline in recall as well. Again, cognitive factors suggest why this is likely to occur. Coders need to learn the new coding system and the combination of relative unfamiliarity with the new coding system and interference between what they know about ICD-9 and what they need to know about ICD 10 (May et al, 1999) is likely to cause a decline in their ability to produce the correct codes, even for diseases and procedures with which they were previously familiar.
Can the introduction of Computer Aided Coding (CAC) help mitigate this looming problem? Evidence to date suggests that it can. At a hospital where CAC was recently deployed, we compared the number of codes that coders used in the week prior to the introduction of CAC with the number of codes that were used in the week after the introduction of CAC. The results are shown in Figure 1:

**Figure 1**

Figure 1 show a dramatic 36% increase in the number of codes used after the introduction of CAC and a significant rise in the hospital's case mix index. Given how CAC technology interacts with a coder, this is expected. Coders no longer need to rely solely on their ability to recall codes (or in their ability to look those codes up in an encoder or reference book). The CAC system suggests codes to the coder and that person simply needs to accept or reject them. Because CAC systems do an exhaustive search of the medical classification system for each encounter processed, coding is more complete. As valuable as this capability is now in improving ICD-9 coding, it will become absolutely essential in the future when the increase in the number of codes associated with the ICD-10 code set becomes a part of the daily reality that coders will have to negotiate.

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Measuring the Performance of Computer-assisted Coding

Commentary by INGENIX

Introduction

Healthcare organizations nationwide are adopting computer-assisted coding (CAC) to streamline coding processes and prepare for the transition to ICD-10. Technology that started out in physician practices is now proving benefits for hospitals. Coders are recognizing that CAC represents the largest change to the HIM profession since the introduction of PC-based encoder software over 20 years ago. Managers are faced with the challenge of transforming their workforce to effectively use the new technology while also demonstrating the performance benefits to executives and decision-makers. CAC metrics can address this challenge and can be used to monitor operations, track quality, and measure key results.

With CAC, coding professionals are significantly more productive and accurate, but how should manager and executives measure these benefits? Oftentimes, managers use dashboards and auditing tools to monitor CAC technology and their own coding team. To respond to daily operations and external audit requests, a CAC application provides a flexible platform to retrieve, review and organize the entire coding and auditing process.

Good metrics around CAC applications and the full coding process should exhibit five characteristics:

1. Meaningful to an organization—A meaningful metric is easily related to an organization’s performance standards and goals.
2. Consistent definition—A good metric should have a consistent definition and a consistent methodology for calculation.
3. Comparable across users and sites—Metrics should allow comparisons between users or sites that accurately reflect underlying differences in performance.
4. Actionable results—Results of a good metric should support management actions to correct deficiencies.
5. Useable outside of controlled experiments—Metrics should be useful within normal day-to-day operations, and not just within the constrained environment of an experiment.
Measuring Coding Operations

CAC products provide tools that allow administrators, coding managers and coders to maximize technology while managing their coding production through real-time dashboards and reporting modules. These tools are vital to measure and benchmark the effectiveness of a CAC product.

CAC products provide customized coding automation through user-defined criteria that allows specific case types to be coded by the CAC product without human intervention. The benefits of leveraging CAC software in this manner allows billing managers to focus their coding staff on the more difficult and complex cases, such as interventional radiology, critical care, surgical procedures, and inpatient encounters.

Measurements of coder productivity are derived from analyzing how the human coder is interacting with the CAC product. For example, evaluate the number of charts reviewed by the coder, divided by the amount of time the coder has been logged-on to the CAC product to assess accurate measurements of charts coded per hour. Analysis on charts coded per hour is essential in measuring a CAC’s product capability as it directly relates to the quality of the technology that is producing the suggested reimbursable codes—the more changes the coder makes to the suggested codes, the less productive they will be.

Dashboards and trend reports provide a snapshot of the users’ success by combining automated coding and production metrics. Production metrics gauge the number of charts that have been coded and those that are complete, correct and ready for bill with or without coder intervention. Additionally, production metrics should identify the number of charts that have been classified as needing review or coder intervention for documentation weakness purposes. Combining the automated coding results with overall production metrics allows for meaningful data analysis to maximize CAC efficiency and effectiveness to boost return on investment (ROI).

Coding Consistency and Quality

One of the greatest benefits to utilizing a CAC product is consistency. The computer has no bad days, late nights or distractions. But how do you measure quality? Most CAC products have auditing tools that allow users to examine the software’s output, coder output, coder changes and identify documentation weaknesses trends by physician.

Utilizing such auditing tools will enable users to measure the quality of the CAC coding output by analyzing agreement and disagreement rates between CAC output and changes made by the human coder. CAC products are producing coding agreement rates of 80 percent or higher for many types of cases. While agreement rate is not a pure measure of accuracy, it can be a good overall measure of the quality of the CAC results.

Additionally, CAC auditing tools can be leveraged for human coder feedback and training. The opportunity to conduct random audits on specific code pairs, modality types, physicians, CAC output and the human coders, creates transparency in the revenue cycle and allows for a cornerstone in any compliance program.
**Service-to-Bill Days**

At the end of the day, CAC products should result in expediting the code-to-bill process. CAC products automate the physical touch points in the coding process—from the time demographics and clinical documentation are received to the human entry of reimbursement codes—into the billing system.

There are three areas to consider when measuring how a CAC product is expediting the code-to-bill process. First, let’s look at date of service to received days. Measurement is equated by comparing the date of service with the elapsed time from when the CAC system processed and coded the charts that were received. The second measurement is received-to-code days. This measurement identifies the elapsed time from when the CAC product received the clinical documentation to when it was presented to the human coder. Finally, coded-to-billed days identifies the time from when the clinical documentation was presented to the human coder to when the codes were passed to the billing system.

**Conclusions**

Healthcare executives and coding managers should be thinking now about how they can effectively respond to the demands of ICD-10 and the increasing requirements for coded information. A consistent and up-to-date coding process is essential. Furthermore, the process must be measurable and have the transparency to clearly justify coding and billing decisions. CAC can help provide that transparency to the revenue cycle while working toward the goal of giving all stakeholders complete confidence in the technology, people, processes and results.
This is a multipart report which makes several insightful observations about the anticipated impact of computer assisted coding (CAC) on the coding professional. CAC has a number of emerging technologies which in turn create emerging roles for coding professionals. As noted, these emerging technologies go beyond use of coding for indexing and claims generation. CAC will be used in a number of roles including claims generation, quality reporting, and research, among many other roles. CAC will be essential in the transition to ICD-10 because coding professionals are still largely unfamiliar with the details of new coding standard and because physician's documentation is widely recognized to be inadequate for ICD-10. The report accurately points out that CAC will not replace the coding professional. Instead, CAC will challenge the coding professional’s ability to work in new environments and will provide a significant opportunity for professional growth.

In the year since the report was created the landscape of CAC has changed once again with the recent announcement of a collaborative effort between Nuance Communications and 3M Health Information Systems. These 2 companies are joining forces and combining extensive expertise and resources to create the next generation clinical documentation technology called computer-assisted physician documentation (CAPD). This revolutionary technology goes well beyond the traditional role of CAC which nearly suggests accurate codes for physician documentation as it is presented. Instead, CAPD will actually help the physician to produce better documentation for clinical care, quality assessment, and more accurate coding. CAPD gives immediately feedback to the physician suggesting ways in which the document can be improved based upon what has already been said.

CAPD is made possible by the unique capabilities of Nuance Communications and 3M HIS. Nuance Communications provides state-of-the-art automated speech recognition and clinical language understanding (CLU) technologies. 3M HIS provides extensive expertise and intellectual content in clinical documentation improvement systems and coding guidelines. The automation of this intellectual content with CLU in a seamless platform that is available to physicians at the point of documentation will result in higher quality clinical documents and more appropriate billing. Because Nuance Communications products are already used by so many physicians during the production of clinical documents, CAPD can take advantage of providing its input to physicians without changing their current work flow.
CAPD and CAC work together to deliver a comprehensive solution to meet the challenge of ICD-10 for physicians and coding professionals. Physicians benefit because CAPD recognizes the need for additional information to address the higher specificity in ICD-10 and help them document better. Coding professionals benefit because the documents are better and because CAC suggests the appropriate code.
AHIMA CAC 2010–11 Industry Outlook and Resources Report

Commentary by QuadraMed

By Bonnie S. Cassidy, Vice President of HIM Product Management/QuadraMed

This report is an outstanding and timely resource for every HIM Professional. It comes to the AHIMA member at a time when everyone is concerned about the HIM Workforce. The introduction of ICD-10 in 2013 provides the opportunity to strategically integrate the right people, processes and technology in our provider settings.

The CAC 2010 Industry Outlook and Resources report can actually serve as a CAC Primer and used to create presentations for your own organization. All stakeholders should to be aware of the shortage of ICD-10 ready coding professionals. Organizations must plan now for the adoption of CAC and prioritize it in the strategic IT planning process. The adoption of EHRs has provided HIM executives with the opportunity to successfully champion the movement to CAC adoption.

AHIMA regards the adoption and maintenance of electronic health records (EHRs), personal health records (PHRs), Computer Assisted Coding (CAC) and the formation and utilization of health information exchange (HIE) networks as imperative to lasting improvements in the quality of healthcare delivered in the United States. But achieving an effective electronic information infrastructure for healthcare delivery is more than a matter of technology deployment supported by a technology workforce. A distinct need exists for a qualified health information management workforce focused on the effective application of technology to improve the information used to make healthcare decisions. One of the most important technology advancements available for HIM professionals today is computer assisted coding (CAC). The automation of coding processes with the benefit of improved accuracy is a breakthrough in coding processes and marks the beginning of a significant transformation for coding professionals. The role of the coding professional is expanding from one that performs code assignment to a role of code validators.

The information in this CAC 2010 Report is aligned with AHIMA’s HIM Core Model that describes the robust set of functions and opportunities open to current and future health information managers. The HIM profession has been around for more than 80 years, but it is now that we are in the midst of the greatest transformation of the healthcare system for our profession. The advent of automated coding technology brings monumental change to the role of information processing, and offers new standards of excellence to clinicians, patients, researchers, public health management, insurers, government and others dedicated to the quality of health outcomes for all U.S. citizens. With more health information available electronically, advances in medicine, and improvement in the ways that care is delivered (and accounted for), affordable, quality healthcare is not only a possibility but something we can definitely achieve as a reality moving forward in the next few years.