Accurate HCC Coding - Technology Best Practices

CAPSTONE REPORT

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Abstract

This annotated bibliography focuses on references that examine the process of

Hierarchical Condition Category (HCC) coding and the technologies that offer the most promise

in supporting the coding of and data collection for HCCs. The literature selected was published

between 2008 and 2014. The literature will help healthcare executives make decisions as they

relate to capital investments in technology that will improve the accuracy of HCC coding and

Medicare Advantage plan revenue.

Key words: Medicare Advantage, hierarchical condition category, HCC, reimbursement,

payment, accurate coding, health technology.

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Introduction to the Annotated Bibliography

Problem

The Affordable Care Act (ACA) is a comprehensive healthcare reform act that was signed into law in March of 2010 ("Summary of the affordable care act", 2013). The ACA requires health systems to significantly reduce costs. A strategy that large health systems deploy to reduce costs is to launch health plans that typically include a Medicare Advantage (MA) product offering. If the MA product is managed effectively, it can be a lucrative line of business for the health system because the number of Medicare-aged enrollees is projected to increase as the baby boom generation ages (Demko, 2014). One of the challenges every health plan faces in making an MA product profitable is the effective collection and management of Hierarchical Condition Category (HCC) coding.

According to the Centers for Medicare and Medicaid, also known as CMS (HHS Risk Model, 2012), the HCC classification system "provides the diagnostic framework for developing a risk adjustment model to predict medical spending" (p. 6). Within the system, diagnoses are classified into diagnostic groups and then coded into condition categories. Hierarchies are then applied to the condition categories to illustrate the risks associated with those conditions. CMS provides reimbursements to health plans for the care of MA members who enroll in their MA plan; the CMS payments to health plans are based on the risk factors of the health plans' members. The higher the risk factor, the higher the payment from CMS and the more revenue a health plan receives to care for the health plan's MA members. A physician's ability to code

HCCs accurately and comprehensively, based on a patient visit, is critical to a health plan's

profitability.

The ineffective use of technology is one component that leads to inaccurate coding of

HCCs. According to the Institute of Medicine (2001), "IT must play a central role in the redesign

of the health care system if a substantial improvement in health care quality is to be achieved

during the coming decade" (p. 165). Another component of the coding problem is the process

used to code conditions. According to Verdon (2014), "nearly 42% of Medicare claims for

evaluation and management services are incorrectly coded" (p. 55), leading to $6.7 billion in

incorrectly coded claims.

Purpose

The purpose of this annotated bibliography is to present literature that addresses the

problem of ineffective data collection of Hierarchical Condition Categories and how the data

collection process can be optimized to increase accuracy. Lewis (2007) states "potentially, the

average plan can increase its Medicare reimbursement by 20% by coding MA members more

completely and accurately" (p. 1). Research sources include articles that outline the MA

program, including a description of risk adjustment techniques and the role that accurate risk

adjustment plays in ensuring appropriate reimbursement. Additional research is performed to

provide details on how errors in data collection for HCCs contribute to incorrect claims and lost

revenue. Finally, both technologies and techniques that lead to more accurate HCC data

collection and coding are explored, with an emphasis on best practices.

Research Question

Core research question. What technologies offer the most promise in supporting the coding of and data collection for Hierarchical Condition Categories to enable the development of more accurate patient risk profiles?

Audience

The primary stakeholders of this study are health plan and health system executives. Executive leaders are interested in the information from this research to inform their capital investment strategies, particularly as they relate to technology capabilities. The stakes are high with any technology investment, and for healthcare companies the stakes are even higher when they relate to Medicare-aged populations. Hood (2011) explains this impact by stating:

People older than 65 make up thirteen percent of the US population but account for 44 percent of hospital care, 38 percent of emergency medical services responses, 35 percent of prescriptions, 26 percent of physician office visits, and 90 percent of nursing home use. (p. 18)

Chief Financial Officers (CFOs) of health systems and CFOs of the health plans are interested in understanding the return on investment that any technology purchase for the coding of and data collection for Hierarchical Condition Categories will have. In this case the cost for the technology will likely be covered by the health system, with the financial benefit going to the health plan entity. Both CFOs will want to understand the overall impact to the parent company health system.

Chief Information Officers (CIOs) of health systems want to understand how technology solutions integrate with their current technology stacks and their technology roadmaps. The

CIO is interested in ensuring that any strategic investment in technology will not undermine the ability to innovate in the future and create a drain on resources to maintain or improve the technology over time.

The Chief Operations Officer (COO) of the health system wants to understand how the technology will integrate with operational resources. The COO wants to understand impacts to his or her organization's processes and any corresponding increases in operational resource requirements.

Search Report

Search strategy. The University of Oregon Library's One Search and Google Scholar are leveraged for the initial search strategy. The top search results on Google Scholar are the most current and relevant. However, the search tools on University of Oregon One Search related to searching by subject and sorting by sub-categories are extremely useful in narrowing the results prior to accessing the articles.

Many different key word combinations are used; the best search results use the following key words:

- Medicare advantage reimbursement

- Medicare advantage profitability

- Hierarchical condition category collection

- Medicare risk adjustment factor

- Medicare coding

- Medicare coding technology

The databases that return the best results are as follows:

- Factiva

- Academic Search Premier

- Business Source Complete

- EconLit

- Health Source

- PubMed

- Lexis Nexis Academic

- Academic One

The highest quality results are returned when using the key words in the business and medical/health subject areas on University of Oregon One Search and by using the same criteria with the general search in Google Scholar. The references below are the most relevant to the current problem under consideration.

Documentation approach. The research tool, Zotero, is utilized to document, store, and cite search results. The title, author name, and journal are tracked along with the full text article. All references are categorized in terms of their relevance to the research topics. The categorization that is used is as follows: (a) background on the financial aspects of Medicare Advantage plans, (b) inaccurate Medicare Advantage coding, or (c) potential solutions.

Reference evaluation criteria. The evaluation criteria by Bell and Frantz (2014) that is provided on the University of Oregon library website is utilized to determine whether a reference is useful.

- **Authority** of the author and the background of the publisher. Sources are selected from peer reviewed and academic journals.

- **Objectivity** of the author. For this study authors without an association with a product or service are selected to ensure objectivity.

- **Quality** of the work. Sources are selected that are well-organized, use good grammar, and are free of errors.

- **Currency** of the work. Sources created after the Affordable Care Act was enacted in 2010 are preferred. Sources prior to 2010 are included to provide historical background on the Medicare Advantage program. The program existed prior to 2010 and HCC coding issues were also present.

- **Relevancy** of the work. Sources relevant to Medicare Advantage and HCC coding are selected, with an emphasis on scholarly sources.

Annotated Bibliography

The following Annotated Bibliography presents 15 references that examine the process of HCC coding and the technologies that offer the most promise in supporting the coding of and data collection for Hierarchical Condition Categories. References are selected to help healthcare executives address the technology needs for improving the accuracy of HCC coding.

References are presented in three categories that focus on literature that addresses the challenges with HCC coding and technology best practices to address these challenges: (a) background on the financial aspects of Medicare Advantage plans, (b) inaccurate Medicare Advantage coding, and (c) potential solutions. Each annotation consists of three elements: (a) the full bibliographic citation, (b) an abstract, and (c) a summary. The summaries illustrate the need for multiple technology capabilities to accurately document and extract HCC codes. These capabilities provide a technology roadmap for healthcare executives to leverage to improve HCC coding accuracy.

Category 1*: *Background on the Financial Aspects of Medicare Advantage Plans

Clemens, J., & Gottlieb, J. (2014). Do physicians' financial incentives affect medical treatment

and patient health? *American Economic Review, 104*(4), 1320-1349. Retrieved from:

[http://www.sciencedirect.com.libproxy.uoregon.edu/science/article/pii/S01677187100 01360](http://www.sciencedirect.com.libproxy.uoregon.edu/science/article/pii/S0167718710001360)

Abstract. We investigate whether physicians' financial incentives influence health care supply, technology diffusion, and resulting patient outcomes. In 1997, Medicare consolidated the geographic regions across which it adjusts physician payments,

generating area-specific price shocks. Areas with higher payment shocks experience significant increases in health care supply. On average, a 2 percent increase in payment rates leads to a 3 percent increase in care provision. Elective procedures such as cataract surgery respond much more strongly than less discretionary services. Non-radiologists expand their provision of MRIs, suggesting effects on technology adoption. We estimate economically small health impacts, albeit with limited precision.

Summary. This article focuses on whether higher payments to physicians affect the care that is delivered to enrollees. The author evaluates whether the high payments also have an effect on the adoption of technology. The article concludes that in regions where payments are higher there is a higher supply of health care providers with no evidence of increased care and health benefits to enrollees. The article explains the MA reimbursement process and the impacts of various payment methods utilized by CMS. This article explains how the MA reimbursement process works and sets the stage for the importance of accurate HCC coding.

Demko, P. (2014). Despite cuts, Medicare advantage enrollment, insurers' stocks, still surging. *Modern Healthcare, 44*(14), 17-19. Retrieved from:

http://www.lexisnexis.com.libproxy.uoregon.edu/hottopics/lnacademic/?verb=sr&csi=8291&sr=HEADLINE(Despite+cuts%2C+Medicare+Advantage+enrollment%2C+insurers%27+stocks%2C+still+surging)%2BAND%2BDATE%2BIS%2B2014

Abstract. U.S. Centers for Medicare & Medicaid Services' proposed cuts to the Medicare Advantage plans and rising stocks of insurance companies. Topics discussed include reduced payments to Medicare Advantage plans mandated by the U.S Patient

Protection and Affordable Care Act leading to enrollment reductions, healthy seniors' enrollment in the advantage plans of the insurance companies and the EmblemHealth's Medicare Advantage HMO.

Summary. This article discusses the Medicare Advantage (MA) health plan market and the ability of insurers to increase profitability while MA plans are expected to see reductions in payments from the U.S. Centers for Medicare & Medicaid Services (CMS). The article describes a 40% growth in MA enrollees since 2010 and states the government spent $146 billion on the program in 2013. The article describes the competitiveness within the market and the pending reduction in payment from CMS. The market is dominated by large health plans like United Health, Kaiser Permanente, Humana, and Cigna. The article notes that 5 health plans control over 50% of the MA market. MA plans will see reduced payments as a result of the Affordable Care Act, which is the health care reform law that was signed into law in 2010. These are key points as they relate to the importance of accurately coding HCC codes to increase revenue. The author recommends health plans do not increase premiums as the typical Medicare enrollee is on a fixed budget. The author highlights the health plan's focus on Star ratings, which is a CMS program focused on quality of care. HCC coding is important as it relates to Stars to ensure conditions are properly coded so they can be effectively managed clinically. The additional benefit would be higher reimbursements for those coded conditions. The article provides the financial context for why the need for accurate coding of HCC codes is critical given the anticipated reduction in payment from CMS.

Duggan, M. , Starc, A. , & Vabson, B. (2014). Who benefits when the government pays more?

Pass-Through in the Medicare Advantage Program. National Bureau of Economic

Research, Inc, NBER Working Papers: 19989. Retrieved from:

http://www.nber.org/papers/w19989

Abstract. Nearly 15 million Medicare recipients are currently enrolled in private

Medicare Advantage (MA) plans. Many previous studies have estimated the impact of

MA enrollment - relative to traditional fee-for-service Medicare - on program

expenditures, quality of care, and health outcomes. Surprisingly little work has explored

how these effects vary with the generosity of plan reimbursement. In this study, we aim

to fill this gap by exploiting a substantial policy-induced increase in the reimbursement

of MA plans in MSAs with a population of 250 thousand or more relative to MSAs just

below this threshold. Our findings demonstrate that the additional reimbursement leads

more plans to enter these markets and to an increase in MA enrollment. However, our

findings suggest that less than one-third of the additional reimbursement is passed

through to consumers in the form of better coverage. Our results further suggest that

this incomplete pass-through is not primarily driven by selection and instead suggest

that imperfect competition in the market for MA plans plays a key role. Our results have

implications for a key feature of the Affordable Care Act that will reduce reimbursement

to MA plans by $92 billion from 2014 to 2019.

Summary. This article focuses on an analysis that was performed to assess the impact of

higher reimbursement payments for Medicare Advantage (MA) plans in metropolitan

statistical areas (MSA) that have populations greater than two hundred and fifty

thousand people. The authors analyze whether the larger payments are passed through to enrollees in the form of better care. The authors conclude that less than a third of the additional payments are passed on to the patient in the form of plan quality or treatment changes. The article suggests the additional payment is driving health plans to invest in additional marketing, which drives up enrollment but does not improve care. This article explains the MA reimbursement process and the impacts of payment methods utilized by CMS. The article sets the stage for the importance of accurate HCC coding by detailing the reimbursement process and specifically describing how reimbursement payment is adjusted based on health risk factors driven by HCC coding.

Elliott, A. M. (2011). Medicare as technology regulator: Medicare policy's role in shaping technology use and access. *Berkeley Technology Law Journal, 26*(3), 1489-1522. Retrieved from:

http://web.a.ebscohost.com.libproxy.uoregon.edu/ehost/detail/detail?sid=24f81a87-ffaa-4022-adec-f1251d9309c0%40sessionmgr4002&vid=0&hid=4109&bdata=JnNpdGU9ZWhvc3QtbGl2ZSZzY29wZT1zaXRl#db=cph&AN=74237063

Abstract. The Medicare program faces a serious challenge: it must find ways to control costs but must do so through a system of Congressional oversight that necessarily limits its choices. We look at one approach to prudent purchasing — competitive pricing — that Medicare has attempted many times and in various ways since the beginning of the program, and in all but one case unsuccessfully due to the politics of provider opposition

working through Congress and the courts. We look at some related efforts to change Medicare pricing to explore when the program has been successful in making dramatic changes in how it pays for health care. A set of recommendations emerges for ways to respond to the impediments of law and politics that have obstructed change to more efficient payment methods. Except in unusual cases, competitive pricing threatens too many stakeholders in too many ways for key political actors to support it. But an unusual case may arise in the coming Medicare fiscal crisis, a crisis related in part to the prices Medicare pays. At that point, competitive pricing may look less like a problem and more like a solution coming at a time when the system badly needs one.

Summary. This article focuses on competitive pricing within Medicare Advantage. Competitive pricing is a process where health plans submit bids on the price of services to the Centers of Medicare and Medicaid (CMS). CMS typically sets the pricing of the services at the average of these bids. MA plans submit bids based on the typical costs they experience in treating conditions related to those services. Accurate coding of condition codes affects the accuracy of the service bid. This article explains the MA reimbursement process and the impacts of various payment methods utilized by CMS. The article explains how HCC coding impacts bids on the prices of service that are submitted to CMS and provides a context for why accurate HCC coding is important to ensure maximum reimbursement.

Morrisey, M. A., Kilgore, M. L., Becket, D. J., Smith, W., & Delzell, E. (2013, June). Favorable

selection, risk adjustment, and the Medicare advantage program. *Health Services*

Research, 48(3), 1039+. Retrieved from

http://go.galegroup.com/ps/i.do?id=GALE%7CA332789622&v=2.1&u=s8492775&it=r&
p=AONE&sw=w&asid=b809d0078a73ae316970013f9b9057e2

Abstract. Objectives. To examine the effects of changes in payment and risk adjustment on (1) the annual enrollment and switching behavior of Medicare Advantage (MA) beneficiaries, and (2) the relative costliness of MA enrollees and dis-enrollees. Data. From 1999 through 2008 national Medicare claims data from the 5 percent longitudinal sample of Parts A and B expenditures. Study Design. Retrospective, fixed effects regression analysis of July enrollment and year-long switching into and out of MA. Similar regression analysis of the costliness of those switching into (out of) MA in the 6 months prior to enrollment (after disenrollment) relative to non-switchers in the same county over the same period. Findings. Payment generosity and more sophisticated risk adjustment were associated with substantial increases in MA enrollment and decreases in disenrollment. Claims experience of those newly switching into MA was not affected by any of the policy reforms, but disenrollment became increasingly concentrated among high-cost beneficiaries. Conclusions. Enrollment is very sensitive to payment levels. The use of more sophisticated risk adjustment did not alter favorable selection into MA, but it did affect the costliness of dis-enrollees.

Summary. The article focuses on a study that examines the impacts of payments and risk adjustment models on enrollment behavior and costliness of MA enrollees. The article states that when HCC codes were implemented they were intended to reduce

favorable selection, which occurs when enrollees are selected because they offer

financial value to the MA plan; however, evidence does not support a reduction in

favorable selection. The article describes changes in payment methodology that have

had impacts on enrollment. For example, in certain rural counties higher payments were

offered by CMS to encourage increased recruiting and enrollment by MA plans. The

authors also note that the adoption of the HCC methodology has driven an increase in

payments and subsequently an increase in enrollment; as payments increase, MA plans

pursue additional enrollees to increase revenue. The study did not identify higher

incidences of favorable selection. The article does state that with pending payment

reductions from the Affordable Care Act, enrollment in MA plans will also be reduced as

MA plans will not recruit MA enrollees as often. The article explains HCC payment

methodology and outlines the impact HCC codes have on payments and

reimbursement.

Newhouse, J.P., Price, M., Huang J., McWilliams, J.M., & Hsu, J. (2012, December). Steps to

reduce favorable risk selection in medicare advantage largely succeeded, boding well for

health insurance exchanges. *Health Affairs, 31* (12), 2618-2628. doi:

10.1377/hlthaff.2012.0345.

Abstract. Within Medicare, the Medicare Advantage program has historically attracted

better risks-healthier, lower-cost patients-than has traditional Medicare. The

disproportionate enrollment of lower-cost patients and avoidance of higher-cost ones

during the 1990s-known as favorable selection-resulted in Medicare's spending more

per beneficiary who enrolled in Medicare Advantage than if the enrollee had remained in traditional Medicare. We looked at two measures that can indicate whether favorable selection is taking place-predicted spending on beneficiaries and mortality-and studied whether policies that Medicare implemented in the past decade succeeded in reducing favorable selection in Medicare Advantage. We found that these policies-an improved risk adjustment formula and a prohibition on monthly disenrollment by beneficiaries-largely succeeded. Differences in predicted spending between those switching from traditional Medicare to Medicare Advantage relative to those who remained in traditional Medicare markedly narrowed, as did adjusted mortality rates. Because insurance exchanges set up under the Affordable Care Act will employ similar policies to combat risk selection, our results give reason for optimism about managing competition among health plans.

Summary. This article focuses on favorable risk selection within Medicare Advantage. Favorable risk selection is defined as healthier enrollees, whose care costs less and who would be favorable to a health plan in terms of reimbursement from the Centers for Medicare and Medicaid (CMS). MA plans receive additional payments from CMS based on the health of their member population, which is driven by HCC codes. MA plans also receive a minimum payment for each member regardless of whether they are completely healthy or seek services. The healthier the population, the lower the costs incurred by the MA plan. This article provides context to the problem of inaccurate HCC coding. It explains the financial implication of healthy MA members on MA plan revenue

and outlines how HCC codes increase CMS reimbursement above the minimum

payment received from CMS.

Newhouse, J.P., McWilliams, J. M., Price, M., Huang, J., Fireman, B., & Hsu, J. (2013, December).

Do Medicare Advantage plans select enrollees in higher margin clinical categories*?*.

Journal of Health Economics, 32 (6), 1278-1288. doi: 10.1016/j.jhealeco.2013.09.003.

Abstract. The CMS-HCC risk adjustment system for Medicare Advantage (MA) plans

calculates weights, which are effectively relative prices, for beneficiaries with different

observable characteristics. To do so it uses the relative amounts spent per beneficiary

with those characteristics in Traditional Medicare (TM). For multiple reasons one might

expect relative amounts in MA to differ from TM, thereby making some beneficiaries

more profitable to treat than others. Much of the difference comes from differences in

how TM and MA treat different diseases or diagnoses. Using data on actual medical

spending from two MA-HMO plans, we show that the weights calculated from MA costs

do indeed differ from those calculated using TM spending. One of the two plans (Plan 1)

is more typical of MA-HMO plans in that it contracts with independent community

providers, while the other (Plan 2) is vertically integrated with care delivery. We

calculate margins, or average revenue/average cost, for Medicare beneficiaries in the

two plans who have one of 48 different combinations of medical conditions. The two

plans' margins for these 48 conditions are correlated (r = 0.39, p < 0.01). Both plans

have margins that are more positive for persons with conditions that are managed by

primary care physicians and where medical management can be effective. Conversely

they have lower margins for persons with conditions that tend to be treated by

specialists with greater market power than primary care physicians and for acute

conditions where little medical management is possible. The two plan's margins among

beneficiaries with different observable characteristics vary over a range of 160 and 98

percentage points, respectively, and thus would appear to offer substantial incentive for

selection by HCC. Nonetheless, we find no evidence of overrepresentation of

beneficiaries in high margin HCC's in either plan. Nor, using the margins from Plan 1, the

more typical plan, do we find evidence of overrepresentation of high margin HCC's in

Medicare more generally. These results do not permit a conclusion on overall social

efficiency, but we note that selection according to margin could be socially efficient. In

addition, our findings suggest there are omitted interaction terms in the risk adjustment

model that Medicare currently uses.

Summary. This article focuses on a study conducted on two health plans and their

Medicare Advantage (MA) business. The study sought to determine if the two health

plans selected enrollees based on their clinical conditions and ability to bring in

additional revenue through higher reimbursements from the Centers of Medicare and

Medicaid (CMS). CMS reimburses MA plans based on the HCC codes that are

documented. Documenting more HCC codes results in higher payments from CMS so

that the MA plan is paid appropriately to take care of members who require more care.

The study sought to determine if there was evidence that the two health plans had

selected enrollees with more conditions to increase payments from CMS. An MA plan

would benefit from selective enrollment if they received a higher payment but did not

deliver a higher level of care. Ultimately, the study did not find evidence of selective

enrollment. This article provides context to the problem of inaccurate HCC coding by

explaining the CMS payment process as it relates to the MA program.

Category 2: Inaccurate Medicare Advantage Coding

Mamykina, L., Vawdrey, D. K., Stetson, P. D., Zheng, K., & Hripcsak, G. (2012). Clinical

documentation: composition or synthesis? *Journal of the American Medical Informatics*

Association, 19(6), 1025–1031. doi: 10.1136/amiajnl-2012-000901

Abstract. Objective: To understand the nature of emerging electronic documentation

practices, disconnects between documentation workflows and computing systems

designed to support them, and ways to improve the design of electronic

documentation systems. Materials and methods: Time-and-motion study of resident

physicians' note-writing practices using a commercial electronic health record system

that includes an electronic documentation module. The study was conducted in the

general medicine unit of a large academic hospital. Results: During the study, 96 note-

writing sessions by 11 resident physicians, resulting in close to 100 h of observations

were seen. Seven of the 10 most common transitions between activities during note

composition were between documenting, and gathering and reviewing patient data,

and updating the plan of care. Discussion: The high frequency of transitions seen in the

study suggested that clinical documentation is fundamentally a synthesis activity, in

which clinicians review available patient data and summarize their impressions and

judgments. At the same time, most electronic health record systems are optimized to support documentation as uninterrupted composition. This mismatch leads to fragmentation in clinical work, and results in inefficiencies and workarounds. In contrast, we propose that documentation can be best supported with tools that facilitate data exploration and search for relevant information, selective reading and annotation, and composition of a note as a temporal structure. Conclusions: Time-and-motion study of clinicians' electronic documentation practices revealed a high level of fragmentation of documentation activities and frequent task transitions. Treating documentation as synthesis rather than composition suggests new possibilities for supporting it more effectively with electronic systems.

Summary. This article focuses on physician coding practices and the use of electronic health records (EHRs) in improving coding and documentation processes. The article outlines the structure and results of a study on a sample of physician documentation practices including time and motion studies. The article concludes that EHR systems are typically structured to support uninterrupted composition and that clinical documentation is a process of synthesizing information. For the EHR to be effective it needs to integrate with the process of synthesizing. Often specific medical conditions are related to broader conditions that affect still other medical conditions. For instance, if you are diagnosed with diabetes it may be that you are obese and obesity typically drives other medical conditions to be prevalent such as sleep apnea and hypertension. In order to properly document medical conditions a physician needs to

synthesize the data they have and determine if additional conditions exist. The author

suggests EHR systems can be designed to help support this synthesizing through

workflow tools, alerts, and data mining. The article provides context to issues

surrounding the inaccurate coding of HCC codes.

Category 3: Potential Solutions

Adler-Milstein, J., & Bates, D. (2010, March). Paperless healthcare: Progress and challenges of

an IT-enabled healthcare system. *Business Horizons, 53* (2), 119-130. doi:

10.1016/j.bushor.2009.10.004

Abstract. For most Americans, a trip to the doctor's office or a hospital stay necessitates

that medical personnel search through paper charts and records as care is administered.

This remains the status quo, despite the increasingly large role that electronic

communication plays in other aspects of our business and personal lives. The elevated

use of information technology (IT) in healthcare settings—primarily via utilization of

electronic health records (EHRs), which allow information to be readily communicated

and shared among healthcare providers—has been advocated as a means of improving

quality of care and helping to control healthcare costs over the long term. Yet, hastened

implementation of healthcare IT will require considerable cost incursion in the near

term, and will present various other challenges that must be addressed. Herein, we

examine the merits and benefits of healthcare IT, as well as the costs and other

challenges that may serve as obstacles to its wider implementation and use. We

conclude with a set of recommendations designed to increase the likelihood that extensive expansion in the use of healthcare IT will yield the desired benefits.

Summary. The article focuses on the benefits of health information technology (HIT) and the adoption of electronic health records (EHR). The article describes the ways EHR systems offer hospitals significant benefits including quality of care and reimbursement. Specific benefits identified by the authors include more accurate coding of conditions to increase reimbursement and better decision making supported by the EHR's capability to integrate data and alert physicians based on the data. Despite these benefits, the article also describes low adoption rates and the barriers to adoption, including costs and implementation resource requirements. EHR systems cost multi millions of dollars and a smaller health system may not have the capital to make such a significant investment. The article notes that 81% of hospitals point to increased reimbursement due to more accurate coding as a key benefit of EHRs. One potential technology solution noted by the authors is leveraging the EHR system to code conditions more accurately, which would help the health system attain those higher reimbursements. The article illustrates a potential technology solution for more accurate HCC coding.

Iezzoni, L. I. (2010), Multiple chronic conditions and disabilities: Implications for health services research and data demands. *Health Services Research, 45*: 1523–1540. doi: 10.1111/j.1475-6773.2010.01145.x

Abstract. Increasing numbers of Americans are living with multiple chronic conditions (MCCs) and disabilities. Addressing health care needs of persons with MCCs or

disabilities presents challenges on many levels. For health services researchers,

priorities include (1) considering MCCs and disabilities in comparative effectiveness

research (CER) and assessing quality of care; and (2) identifying and evaluating the data

needed to conduct CER, performance measure development, and other research to

inform health policy and public health decisions concerning persons with MCCs or

disabilities. Little information is available to guide CER or treatment choices for persons

with MCCs or disabilities, however, because they are typically excluded from clinical

trials that produce the scientific evidence base. Furthermore, most research funding

flows through public and private agencies oriented around single organ systems or

diseases. Likely changes in the data landscape—notably wider dissemination of

electronic health records (EHRs) and moving toward updated coding nomenclatures—

may increase the information available to monitor health care service delivery and

quality for persons with MCCs and disabilities. Generating this information will require

new methods to extract and code information about MCCs and functional status from

EHRs, especially narrative texts, and incorporating coding nomenclatures that capture

critical dimensions of functional status and disability.

Summary. The article focuses on the high percentage of patients who have multiple

chronic conditions (MCC) and the importance of coding these conditions correctly to

improve care. The article describes how critical electronic health information is, along

with the advantages of electronic medical records (EMR). The article details the process

of using an EMR system along with electronic algorithms and natural language

processing (NLP) to build condition lists. NLP is an interaction between technology and human languages. As it relates to EHR systems, NLP is leveraged to extract information from the EHR system to build condition lists. This approach lessens the manual effort required, reduces costs, and greatly increases the number of health records that can be analyzed in a short period of time. These condition lists can be used for more accurate HCC coding.

Kumar, S., & Thomas, K. M. (2011). Development of a hospital based menu driven clinician coding tool to implement quality reimbursement process in the U.S. - A cardiologist's diagnoses as an illustration. *Technology & Health Care, 19*(6), 423-434. doi: 10.3233/THC-2011-0639

Abstract. The purpose of this study is to review current in-hospital based coding techniques and explore various means by which clinicians and HIM (Healthcare Information Management) staff members (which include Coding Technologist or "Coders") miss potential technical fee reimbursement due to poor dictation and/or lack of knowledge of the newer MS-DRG coding system in the U.S. Methods. An analysis of the 2008 implemented MS-DRG reimbursement system was conducted to compare it to the older DRG system in use prior. With the help of a practicing Cardiologist, five randomly selected inpatient charts were reviewed to identify whether or not there was an opportunity to push deeper in to the patient diagnosis and treatment plan to determine if an opportunity existed to code each patient's diagnosis plan at a higher level due to poor documentation practices. Results: The review of five in-hospital

patients charts seen by a Cardiologist, found that by correctly understanding the newer

MS-DRG coding specifications and documenting patient diagnosis and comorbidities to

appropriate reimbursement levels the hospital could have increased technical fee

payments by about $50,000. Conclusions: By educating clinicians and HIM staff

members to be rigorous in their dictation and interpretation of the patients MS-DRG

diagnosis, comorbidities and treatment protocol, hospitals will be able to reclaim

potentially millions of dollars annually. As more facilities adopt EMRs (electronic medical

records), the introduction of "reminders" or drop down lists within an EMR could aid on

the whole coding completeness, thereby increasing overall technical fee reimbursement

levels while ensuring possibility of not overcharging accounts.

Summary. The article focuses on a study of hospital coding techniques and missed

revenue from inaccurate condition codes. Within the study, a retrospective chart review

was conducted on a sample of five hospital chart documents. The study revealed

inaccuracies with condition coding across all the charts, which would have resulted in

significant additional reimbursement. The article describes simple solutions to help

address the problem of inaccurate chart coding, including utilizing an electronic health

record (EHR) with simple drop down lists to select conditions. The authors also discuss

the benefits of having the EHR recommend additional conditions based on the initial

conditions selected by the physician, as multiple conditions can be related and not

documented. These technology solutions would also improve the accurate coding of

HCC codes.

Linder, J. (2012). Method of electronic health record documentation and quality of primary

care. *Journal of the American Medical Informatics Association*, (6), 1019-1024. doi:

10.1136/amiajnl-2011-000788.

Abstract. Physicians who more intensively interact with electronic health records (EHRs)

through their documentation style may pay greater attention to coded fields and clinical

decision support and thus may deliver higher quality care. We measured the quality of

care of physicians who used three predominating EHR documentation styles: dictation,

structured documentation, and free text.

Summary. This article outlines a study of physicians' patient visit documentation. The

study compared physicians who manually dictated their notes into a hard copy medical

file and physicians who entered their own notes in electronic health record (EHR)

systems. Physicians who manually dictate their notes typically have a medical coder

review their notes and select the appropriate HCC codes based on the medical coder's

interpretation of the notes. The study concluded that physicians who entered their

notes into EHR systems with structured Smart Forms were much more accurate with

their documentation than those who manually dictated their notes or those who

entered notes in an EHR without the structured Smart Forms. Smart Forms are

templates in an EHR that can be configured to help a physician make real-time clinical

decisions. Rules can be configured in the Smart Form to prompt or remind the physician

to take an action like coding other conditions that are related to a condition that they

may have already entered. The study also concluded that entry into an EHR with

structured Smart Forms created data that was better suited for natural language

processing (NLP) to collect this data. NLP is an interaction between technology and

human languages. As it relates to EHR systems NLP is leveraged to extract information

from the EHR system to build condition lists. The article illustrates a potential

technology solution for more accurate HCC coding.

Ohno-Machado, L. (2013). Natural language processing: Algorithms and tools to extract

computable information from EHRs and from the biomedical literature. *Journal of the*

American Medical Informatics Association, (5), 805. doi: 10.1136/amiajnl-2013-002214

Abstract. The increasing adoption of electronic health records (EHRs) and the

corresponding interest in using these data for quality improvement and research have

made it clear that the interpretation of narrative text contained in the records is a

critical step. The biomedical literature is another important information source that can

benefit from approaches requiring structuring of data contained in narrative text. For

the first time, we dedicate an entire issue of JAMIA to biomedical natural language

processing (NLP), a topic that has been among the most cited in this journal for the past

few years. We start with a description of a contest to select the best performing

algorithms for detection of temporal relationships in clinical documents (see page 806),

followed by a general review of significance and brief description of commonly used

methods to address this task (see page 814).

Summary. This article focuses on natural language processing (NLP) and its use in mining

clinical data from electronic health records (EHR). The article gives an overview of NLP

then focuses on the results of a study of algorithms used to pull clinical data. The study

revealed that NLP was highly effective in documenting health conditions. The article also

notes that developing the right algorithms to extract clinical data through NLP is key to

the effectiveness of NLP. This article illustrates a potential solution as it relates to the

accurate coding of HCC data; the authors concluded that NLP can be leveraged to more

accurately identify HCC codes.

Schnipper, J. (2008). "Smart Forms" in an electronic medical record: Documentation-based

clinical decision support to improve disease management. *Journal of the American*

Medical Informatics Association, (4), 513-523. 10.1197/jamia.M2501

Abstract. Clinical decision support systems (CDSS) integrated within Electronic Medical

Records (EMR) hold the promise of improving healthcare quality. To date the

effectiveness of CDSS has been less than expected, especially concerning the

ambulatory management of chronic diseases. This is due, in part, to the fact that

clinicians do not use CDSS fully. Barriers to clinicians' use of CDSS have included lack of

integration into workflow, software usability issues, and relevance of the content to the

patient at hand. At Partners HealthCare, we are developing "Smart Forms" to facilitate

documentation-based clinical decision support. Rather than being interruptive in nature,

the Smart Form enables writing a multi-problem visit note while capturing coded

information and providing sophisticated decision support in the form of tailored

recommendations for care. The current version of the Smart Form is designed around

two chronic diseases: coronary artery disease and diabetes mellitus. The Smart Form

has potential to improve the care of patients with both acute and chronic conditions.

Summary. This article describes the use of Smart Forms within electronic medical

records (EMR) that supports a physician in more accurately writing a multi-problem visit

note while simultaneously capturing diagnosis codes accurately. The author identifies workflow integration as a key barrier to the use of the technology and illustrates the effectiveness of the Smart Form when it is tailored to a physician's workflow and EMR technology. The article highlights the Smart Form as a potential technology solution for the accurate coding of HCC codes by promoting its integration into an EMR and a physician's workflow.

Wu, S. (2013). Automated chart review for asthma cohort identification using natural language processing: An exploratory study. *Annals of Allergy, Asthma & Immunology*, (5), 364-369. 10.1016/j.anai.2013.07.022

Abstract. Background: A significant proportion of children with asthma have delayed diagnosis of asthma by health care providers. Manual chart review according to established criteria is more accurate than directly using diagnosis codes, which tend to under-identify asthmatics, but chart reviews are more costly and less timely. Objective: To evaluate the accuracy of a computational approach to asthma ascertainment, characterizing its utility and feasibility toward large-scale deployment in electronic medical records. Methods: A natural language processing (NLP) system was developed for extracting predetermined criteria for asthma from unstructured text in electronic medical records and then inferring asthma status based on these criteria. Using manual chart reviews as a gold standard, asthma status (yes vs no) and identification date (first date of a "yes" asthma status) were determined by the NLP system. Results: Patients were a group of children (n = 112, 84% Caucasian, 49% girls) younger than 4 years (mean 2.0 years, standard deviation 1.03 years) who participated in previous studies.

The NLP approach to asthma ascertainment showed sensitivity, specificity, positive predictive value, negative predictive value, and median delay in diagnosis of 84.6%, 96.5%, 88.0%, 95.4%, and 0 months, respectively; this compared favorably with diagnosis codes, at 30.8%, 93.2%, 57.1%, 82.2%, and 2.3 months, respectively.

Conclusion: Automated asthma ascertainment from electronic medical records using NLP is feasible and more accurate than traditional approaches such as diagnosis codes. Considering the difficulty of labor-intensive manual record review, NLP approaches for asthma ascertainment should be considered for improving clinical care and research, especially in large-scale efforts.

Summary. This article focuses on the results of a study where natural language processing (NLP) was used to extract pre-determined asthma criteria from electronic medical records to determine asthma status. Asthma is often under diagnosed in young children when physicians miss the indicators of the condition. The author concludes that NLP is less labor-intensive than manual chart review and more accurate than the use of diagnosis codes. Rather than having to read through pages of clinical notes from multiple visits, NLP can be quickly leveraged to identify the asthma indicators in an automated way. Given the heavy workloads that most physicians have, this automation support is critical. Additionally, NLP can be used to analyze large populations of patient data, thereby greatly reducing the manual effort that is typically required. The article illustrates a potential technology solution for more accurate HCC coding. NLP can be leveraged to identify HCC codes from electronic medical records that were either not coded or coded incorrectly.

Conclusion

Reduction in CMS reimbursement is driving a greater focus for Medicare Advantage

health plans on costs and processes. Inaccurate HCC coding has been a challenge since the

classification program was initially implemented (Mamykina, Vawdrey, Stetson, & Hripcsak,

2012), and this inaccuracy leads to inaccurate patient risk profiles and reduced potential

revenue from CMS. The challenge for most Medicare Advantage plans is finding solutions to

accuracy issues that are efficient and cost effective. This annotated bibliography contains

fifteen reference sources that help to identify technologies that offer the most promise in

supporting the coding of and data collection for Hierarchical Condition Categories to enable the

development of more accurate patient risk profiles. Literature is included that addresses the

following categories related to the research topic: background on the financial aspects of the

Medicare Advantage plans, inaccurate HCC coding, and technology-enabled solutions.

Background on the Financial Aspects of Medicare Advantage Plans

In 2013, the federal government spent $146 billion on the Medicare Advantage (MA)

program and saw a 40% growth in enrollment in the program since 2010 (Demko, 2013). MA

programs are set to receive a reduction in payments from the Centers of Medicaid and

Medicare (CMS) as a result of the Affordable Care Act (ACA) that was written into law in 2010.

Reimbursements from CMS to the MA program will be reduced by $92 billion from 2014 to

2019 (Duggan, Stark, & Vabson, 2014). With reimbursements from CMS dropping, the MA

market will become increasingly more competitive, with large health plans best positioned to

compete given their size, capabilities, and resources (Demko, 2013). As competition stiffens, it

will be critical for MA plans to ensure they are focused on optimizing their business to drive

revenue and profitability.

One of the challenges every health plan faces in making an MA product profitable is the

effective collection and management of Hierarchical Condition Category (HCC) coding.

According to CMS (HHS Risk Model, 2012), the HCC classification system "provides the

diagnostic framework for developing a risk adjustment model to predict medical spending" (p.

6). Within the system, diagnoses are classified into diagnostic groups and then coded into

condition categories. Hierarchies are then applied to the condition categories to illustrate the

risks associated with those conditions. CMS provides reimbursements to health plans for the

care of MA members who enroll in their MA plan; the CMS payments to health plans are based

on the risk factors of the health plans' members. The higher the risk factor, the higher the

payment from CMS and the more revenue a health plan receives to care for the health plan's

MA members. A physician's ability to code HCCs accurately and comprehensively, based on a

patient visit, is critical to a health plan's profitability.

Inaccurate HCC Coding

The ineffective use of technology is one component that leads to inaccurate coding of

HCCs. According to the Institute of Medicine (2001), "IT must play a central role in the redesign

of the health care system if a substantial improvement in health care quality is to be achieved

during the coming decade" (p. 165). Another component of the coding problem is the process

used to code conditions. According to Verdon (2014), "nearly 42% of Medicare claims for

evaluation and management services are incorrectly coded" (p. 55), leading to $6.7 billion in

incorrectly coded claims. Challenges related to a physician's ability to correctly synthesize data from patient visit notes to capture all relevant conditions adds to the problem of inaccurate HCC coding. Mamykina, et al. (2012) conclude that the technology that supports patient visit documentation will be more effective if it is optimized for documentation that is approached as a synthesis of information, where clinicians review available patient data and summarize their impressions and judgments, rather than approached as uninterrupted composition, which is an unrealistic requirement.

Technology-Enabled Solutions

A technology best practice identified in the research is the use of an electronic health record (EHR) along with Smart Forms to capture HCC codes. Smart Forms are templates in an EHR that can be configured to help a physician make real-time clinical decisions. Linder (2012) states "physicians who more intensively interact with electronic health records (EHRs) through their documentation style may pay greater attention to coded fields" (p. 1). Manual physician note taking from a patient visit is often done as a separate process from the entry of HCC codes. The Smart Form can be configured to integrate coding and note taking with the physician's workflow to create one seamless process.

Physicians can be challenged to properly capture all codes associated with a multi-problem visit. The use of Smart Forms within electronic health records (EHR) supports a physician in more accurately writing a multi-problem visit note while simultaneously capturing diagnosis codes accurately (Schnipper, 2008). Rules can be configured in the Smart Form to prompt or remind the physician to take an action like coding other conditions that are related

to a condition that the physician may have already entered (Kumar & Thomas, 2011), thus increasing the associated reimbursement.

Another technology best practice identified in the research is the use of natural language processing (NLP) to mine and extract clinical data from an EHR system. NLP is an interaction between technology and human languages and can be leveraged to extract information from an EHR system to build condition lists. Wu (2013) concluded that NLP is less labor-intensive than manual chart review and more accurate than the use of diagnosis codes. Rather than having to read through pages of clinical notes from multiple visits, NLP can be quickly leveraged to identify clinical data and condition lists in an automated way.

In closing, the collective 15 references explore the process of HCC coding and the technologies that offer the most promise in supporting the coding of and data collection for Hierarchical Condition Categories. Key findings are presented that highlight the use of electronic health records, Smart Forms configured to integrate with physician workflow, and natural language processing to improve the accurate entry of HCC codes. These key findings are selected to help healthcare executives make decisions as they relate to capital investments in technology that will improve the accuracy of HCC coding and maximize MA plan revenue.

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