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ASSESSMENT OF PREFERENCES FOR CLASSIFICATION DETAIL IN MEDICAL  
INFORMATION: IS UNIFORMITY BETTER?

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## ABSTRACT

The growing acceptance of evidence-based decision making in healthcare organizations has resulted in recognition of information classification and retrieval as a key area of both strategic and operational management. In the emerging information-intensive healthcare environment, healthcare managers are beginning to understand the increased need for formal, continuous information classification and coding in health services, creating a need for enhanced information retrieval, delivery of services and quality management. Variation in classification preferences across practice settings poses healthcare quality management problems for evidence-based medicine in such an environment. This paper reports results from a major national study into the perceived variation reported by health information managers related to the relevance-efficiency trade-offs of information classification across regions and practice settings. This study provides: (1) a benchmark of the degree of such variation, examining how classification preferences vary across organization types, regions, and management indicators, and (2) the extent to which managers prefer more descriptive classification systems, despite nationwide mandates to adopt greater non-descriptive categorization of information. Findings suggest that due to major regional variation, stringent national information standards may be counterproductive for some healthcare practice settings and geographic locations. Implications for healthcare information classification and retrieval are further examined and discussed.

(Keywords: health, classification, retrieval, coding, evidence-based, medical)

## INTRODUCTION

To what extent are accredited health information managers willing to sacrifice information processing efficiency in order to achieve greater relevance of medical information? Are these preferences consistent across organizations and areas? Current regulations proposed under the Health Insurance Portability and Accountability Act (HIPAA) leave little doubt that greater uniformity and mandatory efficiencies require more coding and classification of medical information (CMS, 2002). HIPAA adopts standards for a number of coding and classification sets to be used in healthcare information-based transactions. It also contains requirements concerning the use of these standards by health plans, health care clearinghouses, and certain health care providers (P.L.104-191, 1996; CMS, 2002). Such efficiencies are achieved, however, with a loss of detailed descriptive patient information. This study seeks to assess, through a nationwide survey, managers preferences for descriptive detail in patient data. Such detail comes at the expense of processing speed and efficiency, however, where virtually all data is required to be categorized into numerically coded classification schemes.

Studies to date related to classification detail have limited the focus to organization-specific processes, using localized practices as independent information management systems. In healthcare, the implementation of standardized, mandated classification practices, and the need for consistent extra-organizational information for comparative analysis across areas, is crucial. Such an expanded view shows that detailed classification of data often requires more than the application of code sets. There is a growing need to expand the traditional framework for classification assessment and management, including wide area benchmarks across regions, markets, and practice settings. No study to date has sought to define the relationship between increased information relevance (through descriptive detail), compared to greater processing efficiencies (through classification). Further, at a national level, the dynamic interaction of a classification relevance-efficiency tradeoff has received little examination, highlighting the variation across regions and practice settings. If significant, such effects suggest that recently

imposed stringent national information standards in healthcare may be counterproductive for some organization types and geographic areas.

The use of such standard classification and coding sets are proposed to improve the effectiveness and efficiency of the health care information delivery by simplifying the administration systems and enabling the efficient electronic classification, retrieval and transmission of medical and health information. Requirements toward this end have been codified within the Administrative Simplification subtitle of the Health Insurance Portability and Accountability Act of 1996 (P.L.104-191, 1996).

The use of uniform classification systems, or “code sets”, is also a requirement of HIPAA. Under HIPAA, this mandate includes any set of codes used for encoding medical information elements, such as tables of terms, medical concepts, medical diagnosis codes, or medical procedure codes. Medical information code sets used in the health care industry include coding systems for diseases, impairments, other health related problems, and their manifestations; causes of injury, disease, impairment, or other health-related problems; actions taken to prevent, diagnose, treat, or manage diseases, injuries, and impairments; and any substances, equipment, supplies, or other items used to perform these actions. Code sets for medical information are required for information elements in the administrative and financial health care transaction standards adopted under HIPAA for diagnoses, procedures, and drugs (P.L.104-191, 1996).

The most widely used code set, The International Classification of Diseases, Ninth Revision (ICD-9), was developed initially to facilitate the collection of statistics on the incidence of disease morbidity and mortality throughout the world, and was first formalized in 1893 as the Bertillon Classification or International List of Causes of Death. (While the title has been amended to make clearer the content and purpose and to reflect the progressive extension of the scope of the classification beyond diseases and injuries, the familiar abbreviation "ICD" has been retained). In 1983, the Health Care Financing Administration (HCFA) began using ICD-9 codes for the Medicare prospective payment system. A proposed update, ICD-10, is the latest in the

ICD series and includes enhanced use of body systems as a classification scheme for both morbidity/mortality tracking and reimbursement calculation (GPO, 1999).

Many healthcare providers argue that classification and coding of healthcare information inevitably leads to a one-dimensional view of the patient and their condition, since it is through the use of descriptive text, notes, diagrams, and drawings that the provider adds “richness” to the overall depiction of the medical patient. Nonetheless, a modification of ICD-9, (ICD-9-CM) was developed specifically for use in Medicare reimbursement. On the basis of ICD-9-CM diagnostic codes, patients are assigned to specific diagnosis-related groups (DRGs) that carry a specific reimbursement level. With advances in high-speed information processing capabilities, and the increasing reliance on information systems in the coding, classification and retrieval of information used in the clinical practice of medicine, there will no doubt be some loss of personalized, provider-specific information in the name of uniform information collection and management (Schulz, et al., 1998).

Related code sets include the Current Procedural Terminology (CPT), used for reporting medical services and procedures performed by physicians. Its purpose is to provide a uniform language that accurately describes medical, surgical, and diagnostic procedures, thereby providing an effective means for reliable procedure-specific communication among physicians, patients, and third parties. This system of terminology is the most widely accepted nomenclature for the reporting of physician procedures and services under government and private health insurance programs (AMA, 1997). A summary of code sets and classification systems is provided in Table 1.

[Place Table 1 Here]

With the increased adoption of patient information systems in U.S. medicine, the representation of the patient, and ultimately the organization’s measured quality of care, is often represented by information rather than by physical contact with the patient. This information is usually maintained on a computerized retrieval system, and is dependent on adequate functioning

of the system in order to serve as a tool in the overall delivery of care (Hersh, 1996). Determining how to measure healthcare quality and organizational performance, then, remains a key factor in continuing the provision of quality care as the implementation of classification and retrieval systems in healthcare delivery settings continues to grow (Dada & White, 1999).

Traditional approaches to coding, classification and retrieval of medical record information by health information management professionals relied on classification books containing the many codes and their definitions. Today, many of these functions are incorporated into automated information processing systems, with less opportunity for access to descriptions and supporting context notes readily available to aid classification decisions (Prophet, 1998). Within the boundaries of current mandates for system-based uniformity, there is little room to negotiate greater richness or descriptive enhancement within the clinical information fields themselves though richer description would allow non-standardized variation in the information system information.

Within the bounds of current technology, one option for better information accuracy is to make changes within the specificity level of current coding and classification systems (more or less detail in categories themselves), or allow some area for explanatory, extraneous comments, outside of the definition of the category or class. An understanding of how managers and providers support changes to specificity levels and annotation of current coding sets is crucial to the development of medical informatics and the more effective retrieval and management of medical information. Several previous studies, summarized below, have examined different aspects of classification, both within and external to healthcare settings.

## RELATED STUDIES

Health care databases provide a widely used source of data for health care research, but their accuracy remains uncertain. In a landmark coding validation study, Fisher, et al., (1992) re-abstracted and reassigned ICD-9-CM diagnosis and procedure codes from a national cross-section

of medical records. They sought to provide an assessment of coding accuracy of specific diagnoses and procedures. They determined that the percentage of agreement between the principal diagnosis on the re-abstracted record and the original hospital record, when analyzed at sublevels of classification, improved slightly, but the accuracy of diagnosis and procedure coding varied substantially across conditions. They concluded that variability in the accuracy of diagnosis coding continued to pose a problem that must be overcome if classification research is to achieve its full potential (Fisher, et al., 1992).

Others have focused primarily on measuring the accuracy of the coding for diagnosis-related payment groups in hospitals using Medicare reimbursement data. Employing medical-record specialists, Hsia, et. al., (1992) re-abstracted ICD-9 codes to assign correct payment groupings to discharged patients. The correct groupings were then compared with those originally assigned by the physician and the hospital administration. The study revealed an error rate of 20.8 percent in coding. Errors were distributed equally between physicians and hospitals. Small hospitals had significantly higher error rates. They also found that a statistically significant (61.7%) of coding errors favored the hospital. These errors caused the average hospital's case-mix index, a measure of the complexity of illness of the hospital's patients, to increase by 1.9 percent. As a result, hospitals received higher net reimbursement from Medicare than was supportable by the medical record text (Hsia, et al., 1992; Hsia, 1988).

Such studies in classification of medical data have focused almost exclusively on the application of code sets and impact on reimbursement, ignoring, for the most part, the broader context of classification, such as the formation of preferences and perceptions regarding information management. Perhaps more problematic, such studies have presumed, a priori, that the current global health information classification system is inflexible to change. In the U.S., such systems serve the dual purpose of a morbidity/mortality tracking mechanism as well as the foundation for healthcare reimbursement determination. Such conditions may change however, as the increased use of information in day-to-day medical decision making heightens requirements

for comparative, consistently-classified analysis of information, aggregated across geographic and temporal boundaries.

Previous studies outside of healthcare settings have further, to some extent, identified limitations of viewing classification as merely application of code sets within service organizations. Frants and Kamenoff (1993), for example, demonstrated the value of constructing classifications of users and clustering of documents from a needs-based perspective by classifying and categorizing search requests. They highlighted the importance of feedback in the construction of this classification scheme, allowing it to be changed in response to the evolving environment. In examining information strategies that classify terms according to their meaning, Aldous (1998) likewise suggested that accessing useful information from a complex database requires knowledge of the structural classification of information as well as an understanding of the methods of information retrieval. Such a multi-level view highlights the need for classification as a means of code execution from information stored in a database, overcoming inherent knowledge barriers found in narrow-domain databases. Their classification identified how potential users can create relevant responses to queries expressed in an adaptive format, using structured code modules as integral parts of a database.

As an alternative enhancement to relevance, Major and Ragsdale (2000) identified how the problem of classification aggregation can be overcome by allowing decision makers options in the classification of cases based on group membership predictions from multiple experts. They suggested that the best performance resulted from specified performance measures that can be used to create a knowledge base of information for a distributed expert system, or one that acquires prediction information from the Internet. They did not, however, address the influences of processing efficiency on the innovation examined.

## RESEARCH GOAL

Our exploratory study is designed to identify the effectiveness of classification systems, by level of detail, as reported by accredited US health information managers. This will be assessed by identifying perceived improvement related to the efficiency-relevance tradeoff in an efficiency-mandated regulatory environment. Despite recently imposed government guidelines which mandate efficiency-maximizing classification of medical information, there remains the question of whether the loss of relevance-producing descriptive detail obtained through the use of coded and classified data is acceptable to managers. The degree to which managers prefer greater descriptive detail over mandated classification initiatives provides an initial benchmark regarding the level of trade-off managers prefer between two competing information management goals.

## RESEARCH DESIGN

### Data Collection

Data from a nationwide survey of U.S. accredited health information managers served as the basis for this study. Samples for surveys were selected from a database of certified health information managers provided by the Foundation for Record Education (FORE), and contained current and historical information on all credentialed health information professionals in the United States. Accredited health information managers included Registered Records Administrators (RRA's) as well as Accredited Records Technicians (ART's). Managers were asked to state preferences for improving information accuracy, related to the most commonly used classification schemes, ICD-9 (diagnosis), and CPT (procedures). Specifically, they were asked the following:

In your opinion, which of the following would increase the accuracy of your patient information?

- a. Make ICD-9 codes more detailed
- b. Make ICD-9 codes less detailed
- c. Make CPT codes more detailed
- d. Make CPT codes less detailed
- e. Allow for more comments and explanations, within current coding categories

f. None of the above would help

Responses were cross-tabulated by categories of geographic region (see Table 2), and by key practice setting variables. These included practice setting (grouped as hospital, outpatient setting, or other), management status (manager/non-manager), geographic region (derived from home address zip code), and recent involvement in an organizational merger (within the previous 2 years).

[Place Table 2 Here]

Work settings captured in this study included: hospitals and medical centers, group practices, ambulatory care clinics, managed care offices, long-term care and rehabilitation facilities, colleges and universities, consulting firms, government agencies, software product companies, pharmaceutical companies, and self-employed HIM professionals (see Table 3).

[Place Table 3 Here]

Topics were formulated and pre-tested by convened groups of practicing information managers to represent a broad range of activity areas. Questions that had not been used previously in any known surveys of health information professionals were pre-tested prior to the survey fielding to evaluate the wording and ordering of questions and to determine the ability of respondents to provide the desired information. From a gross response rate of 16,805 responses, we eliminated 1,921 respondents with missing or incomplete demographic or practice information, yielding 14,884 usable responses analyzed in this study.

As part of the post-survey program review, the design and methodology were examined to identify areas needing improvement. After data entry was complete, an evaluation was made of the impact of survey and item non-response rates and various potential methods for adjusting results to correct for non-response. Related preliminary findings were reported elsewhere (Lorence, 1999). Preliminary findings indicated significant variation in coding accuracy and miscoding of information across practice settings.

## RESULTS

### Coding Accuracy

In providing for means to increase coding accuracy, nearly one-half of respondents (49 percent) felt that allowing for more comments and explanations within current coding categories is the best way to affect more accurate-coding (Table 4).

[Place Table 4 Here]

Rather than providing less detail and individual comments in coding the medical record, a significant number of health information managers report that the use of supporting descriptive text may improve the quality of patient information. Where the use of more comments and explanations within current coding categories was the favored change, about 35.4 percent believe that making ICD-9 codes more detailed would improve accuracy and 9 percent indicate that making CPT codes more detailed would help.

### Practice Setting

Of interest, hospital practice setting respondents (39%) prefer to make ICD-9 codes more detailed to increase the accuracy of patient information when compared to clinic (15%) and “Other” (33%) setting respondents (Table 5).

[Place Table 5 Here]

Clinic practice setting (27%) respondents would prefer to make CPT codes more detailed compared to hospital (6%) and “Other” (9%) practice setting respondents.

### Managerial Level

To increase the accuracy of patient information, Managers (4%) feel ICD-9 codes should be less detailed (Table 6).

[Place Table 6 Here]

This is significantly different from “Other” job title (2%) respondents. Respondents with a job title other than Manager (50%) feel that allowing for more comments and explanations within

current coding categories would most increase the accuracy of patient information when compared to Managers (47%).

### Regional Variations

The study shows that Pacific region (41%) respondents significantly differ from West North Central (33%) respondents when stating preferences for making ICD-9 codes more detailed to most increase patient information accuracy (Table 7).

[Place Table 7 Here]

Mountain region (55%) respondents believe allowing for more comments and explanations within current coding categories would increase patient information accuracy most than Mid Atlantic (45%) and South Atlantic (46%) respondents.

### Merger Status

The data shows little difference based on the merger status of the respondent's healthcare setting. Most respondents wanted more comments and explanations within current coding categories, and preferred making codes more detailed (Table 8).

[Place Table 8 Here]

## DISCUSSION

In providing for a means to increase coding accuracy, most respondents felt that allowing for more comments and explanations within current coding categories is the best way to effect more accurate-coding. Of interest here was a significant difference in preferences between hospitals and outpatient clinics. Hospitals were much more likely to suggest greater detail in ICD (diagnosis) classification, while outpatient settings were much more likely to recommend greater detail in CPT (procedural) classification. Both settings invariably make use of both classification sets, but to different degrees, with outpatient settings relatively more likely to use CPT codes. The classification relevance, therefore, varies across settings and is dependent on usage. While both settings achieve efficiency through greater standardization of either classification scheme, the

finding here nevertheless suggest that such efficiency is often outweighed by the perceived greater relevance achieved through the use of less-efficient descriptive documentation.

Also of note here was the existence of preference differences between managers and non-managers. Managers were somewhat less likely to perceive a need for more descriptive detail. Given the preference for more efficiently-processed information at higher organizational levels, preference for greater descriptive detail at lower levels demonstrates that, rather than having universal appeal, there exists incremental trade-offs between perceived processing efficiencies and level of descriptive detail. This preference also suggests that greater detail is often needed for information users to perceive an information unit as relevant to their specific role.

Perhaps of greater impact here is the existence of regional variation in classification preferences. Pacific region respondents were relatively most likely to favor greater detail in ICD (diagnosis) categories; New England respondents, in comparison, were most likely to suggest more detail in CPT (procedural) categories. In contrast, respondents from the Mountain region were most likely to favor greater descriptive detail. While this could be the result of market differences or patient mix, it demonstrates that perceived relevance does not occur uniformly across geographic regions. This makes the comparison of aggregated medical information across such areas difficult, if interpretation of such information requires the interpreter to infer different degrees of relevance to similarly classified information.

As outlined here, more description of detail provides greater potential for relevance, but is less efficient; more categorization has generally less potential for information to be relevant to users, but provides greater processing efficiency. Despite industry requirements and government regulations mandating greater efficiency through consistent categorization, a significant number of managers continue to indicate better information is achieved through increased use of descriptive detail, suggesting that greater potential relevance of information in this environment is effected through less categorization.

Managers' preoccupation with increased processing efficiency with more coded data is not without limits. Managers will sacrifice efficiency for the greater relevance achieved through increased descriptive detail. Confounding this issue, however, is the consistency of code sets within medical classification systems themselves. The World Health Organization (WHO) has designated a significantly modified version of the current (ICD-9) medical classification system, namely the Tenth Revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10). In this updated classification system, conditions have been re-grouped in a way that was felt to be most suitable for epidemiological assessment purposes and evaluation of health care. To date no comprehensive study has been accomplished that assesses the impact this new version of ICD will have on morbidity and mortality tracking and reimbursement management.

Introducing such a radically changed replacement classification system requires an assessment of the compatibility of the new system with the old. Historical coded information is routinely used for time series analysis relating to healthcare management, health planning, and epidemiology studies. The need to ensure a reliable linkage and coding consistency between ICD-9 and ICD-10 is also crucial in the short term, since it is unlikely everyone will adopt ICD-10 at a uniform pace, and in consistent detail.

Also, given the current state of readiness in U.S. healthcare regarding ICD-10 conversion, it is probable that the move to ICD-10 will not be uniform across the entire health system and that some organizations will continue to use ICD-9CM for several years after ICD-10 is mandated. There is a growing need to examine the extent to which mapping from ICD-10 to ICD-9 achieves a result that is consistent with current practices. Given the different levels of specificity within the two classification systems, there is little chance there will be a 100% match rate between systems. Beyond this incompatibility, there exists a need to compare the profiles of the codes from one classification that are recorded against a specific code in the alternate classification. This can be accomplished by testing mapping tables designed to map from ICD-10 to ICD-9 (historical,

backward mapping), or by testing mapping tables that map from ICD-9CM to ICD-10 (logical, forward mapping) (Schulz, et al., 1998).

Such mapping problems illustrate how information processing issues can often extend beyond the realm of information classification, further confounded by a broader reimbursement impact for the healthcare industry as a whole. The U.S. has adopted a prospective payment system to reimburse hospitals for inpatient care. When a patient is discharged, the hospital or fiscal intermediary assigns and groups the classification codes to a payment group. From this adjusted and weighted group designation, a specific reimbursement amount is paid. In national cost analysis, classification variation based on comparison of coded information will be of limited use unless uniformity of coding, classification and consistent information retrieval is achieved.

Beyond the consistency of codes themselves, some measurement must be made of how payment groups will change using the new (ICD-10) classification categories. The pervasiveness of this consistency will provide an index of classification reliability, and will be supplemented by a like index of the distribution of classification "misses" between the two systems, shown by the number of alternate payment groups against which an individual group is mapped.

## CONCLUSION

In a regulatory environment which mandates increased uniformity and efficiency of information classification, managers in this study nevertheless promote the use of greater detail in coded patient data. Preferences for such detail vary across organizational settings and geographic regions, making comparisons across data repositories difficult where classification practices are even partially discretionary. Despite the difficulty of incorporating more descriptive detail in medical information systems, there is an inevitable loss of information processing efficiency when such detail is allowed. Managers here perceive relevance from detail, and are willing to sacrifice the efficiency inherent in processing only classified and coded data in order to achieve this relevance.

Government guidelines outlined under HIPAA regulations mandate the maximization of information processing efficiency through coding and the use of data interchange standards. Here, we find that managers want more than maximum efficiency. Relevance, as operationalized through descriptive detail, is needed as well. Relevance and efficiency are not mutually exclusive, but exist on a continuum.

There will likely exist an unwavering group of managers who feel that classification, categorization and consistent retrieval of medical information, though increasing the efficiency of information processing, inevitably leads to a one-dimensional view of the patient and their condition, since it is through the use of descriptive text, notes, diagrams, and drawings that the information repository adds “richness” to the overall depiction of the medical patient. Such information manipulation inevitably affects the perceived relevance of classified information to users. With advances in high-speed information processing capabilities, and the increasing reliance on information systems in the coding, classification and retrieval of information used in the clinical practice of medicine, there nevertheless exists some inevitable loss of personalized, provider-specific information in the name of standardized, uniform information collection and management.

As healthcare organizations in the US migrate toward more information-driven, or evidence-based, medicine, the proper management of patients will often equate to the proper management of information. Where detail determines the perceived level of information relevance, health information managers will be faced with the challenge of optimizing the relevance trade-offs inherent to information management.

#### REFERENCES

Aldous, K.J. (1998). A system for the automatic retrieval of information from a specialist database. *Information Processing and Management*, 3 (2), 139-154.

AMA (American Medical Association), (1997). *Current Procedural Terminology (CPT) V. 6.0 User Manual*, AMA Publishing, Chicago, IL.

CMS, Center for Medicare and Medicaid Services (2002). *HIPAA Insurance Reform, Center for Medicare and Medicaid Services*. <http://cms.hhs.gov/hipaa/hipaa1/default.asp>.

Dada, M., & White, W. (1999). Evaluating financial risk in the Medicare prospective payment system. *Management Science*, (March), 316-329.

Fisher, E.S., Whaley, F.S., Krushat, W.M., Malenka, D.J., Fleming, C., Baron, J.A., Hsia, D.C. (1992). The accuracy of Medicare's hospital claims data: progress has been made, but problems remain. *American Journal of Public Health*; 82(2):243-8.

Frants, V. I., & Kamenoff, N. I. (1993). One approach to classification of users and automatic clustering of documents. *Information Processing & Management*, 29(2), 187-189.

GPO (1999). U.S. Government Printing Office, *ICD-9-CM Manual, Volume 3*. Washington, DC: US Government Printing Office; 1999.

Hersh, W. (1996). *Information retrieval: A health care perspective*. Springer-Verlag.

Hsia, D., Ahern, C, Ritchie, B., Moscoe, L., Krushat, W. (1992). Medicare reimbursement accuracy under the prospective payment system, 1985 to 1988. *JAMA*, 268(7), 896-899.

Hsia, D., Krushat, W., Fagan, A., Tebbutt, J., Kusserow, R. (1988). Accuracy of diagnostic coding for Medicare patients under the prospective-payment system. *New England Journal of Medicine*, 318(6), 352-355.

Lorence, D. P. (1999). National implementation patterns of computer-based patient records. *Proceedings of the National Conference on Health Statistics, National Center for Health and Vital Statistics, Washington DC. August 1999*.

Major, R., & Ragsdale, C. (2000). An aggregation approach to the classification problem using multiple prediction experts. *Information Processing & Management*, 36(4), 683-696

P.L. 104-191. (1996). *Health Insurance Portability And Accountability Act Of 1996*. Public Law 104-191, 104th Congress, 1996.

Prophet, S. (1998). *Health information management compliance: A model program for healthcare organizations*. Chicago: American Health Information Management Association.

Schulz S., Zaiss, A., Brunner R., Spinner, D., & Klar, R. (1998). Conversion problems concerning automated mapping from ICD-10 to ICD-9. *Methods of Information in Medicine*, 37(3), 254-9.

Table 1. Summary descriptions of code sets.

<u>HIPAA Code Set</u>	<u>Description</u>
ICD-9-CM volumes 1 & 2	International Classification of Diseases-9th Revision-Clinical Modification (for diseases, injuries and impairments)
ICD-9-CM volume 3	International Classification of Diseases-9th Revision-Clinical Modification (for procedures)
HCPCS	Health Care Financing Administration Common Procedure Coding System
NDC (11-digit)	National Drug Codes
CPT-4	Current Procedural Terminology, Fourth Edition
CDPN	Code on Dental Procedures and Nomenclature

Table 2. Regional groupings of respondent state locations.

**New England:** Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont

**Middle Atlantic:** New Jersey, New York, and Pennsylvania

**East North Central:** Illinois, Indiana, Michigan, Ohio, and Wisconsin

**West North Central:** Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota

**South Atlantic:** Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, and West Virginia

**East South Central:** Alabama, Kentucky, Mississippi, and Tennessee

**West South Central:** Arkansas, Louisiana, Oklahoma, and Texas

**Mountain:** Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming

**Pacific:** Alaska, California, Hawaii, Oregon, and Washington

Table 3. Summary of respondent organization types (n=16,805) \*

	%	n
Hospitals and medical centers	51.4%	8638
Long-term care and rehabilitation facilities	6.5%	1092
Group practices	7.8%	1311
Consulting firms	4.9%	823
Colleges and universities	2.9%	487
Government agencies	4.2%	706
Managed care offices	3.6%	605
Ambulatory care clinics	2.2%	370
Self-employed HIM professionals	2.1%	353
Software product companies	1.2%	202
Retired	1.0%	168
Pharmaceutical companies	0.5%	84
Other	11.7%	1966

\* percentages may not sum to 100 due to rounding

**Table 4.** Preferred coding accuracy innovation (n=14,884)

	<i>%</i>	<i>n</i>
Allow for more comments and explanations within current coding categories	49.3%	7353
Make ICD-9 codes more detailed	35.4%	5258
Make CPT codes more detailed	9%	1337
Make ICD-9 codes less detailed	3%	446
Make CPT codes less detailed	3.3%	490

**Table 5.** Preferred coding accuracy innovation, by practice setting \*

	Hospital	n	Clinic	n	Other	n
Allow for more comments And explanations within current coding categories	48.3%	3679	51.9%	772	50.4%	2890
Make ICD-9 codes more detailed	39.3%	2990	14.9%	222	32.9%	1886
Make ICD-9 codes less detailed	2.3%	176	3.1%	46	4.9%	281
Make CPT codes more detailed	6.5%	496	27.3%	406	9.1%	522
Make CPT codes less detailed	3.6%	275	2.9%	43	2.8%	161

\* excludes 39 respondents with missing or incomplete practice information

**Table 6.** Preferred coding accuracy innovation, by management level. \*

	Manager		Other	
	%	n	%	n
Allow for more comments and explanations within current code categories	47.2%	2783	50.5%	4524
Make ICD-9 codes more detailed	36.8%	2170	34.6%	3099
Make CPT codes more	8.9%	525	9.2%	824
Make ICD-9 codes less detailed	3.7%	218	2.5%	224
Make CPT codes less detailed	3.4%	200	3.2%	287

\* excludes 30 respondents with missing or incomplete employment information

Table 7. Preferred coding accuracy innovation, by region. \*

	New England N=594	Mid Atlantic N=1337	East North Central N=2901	West North Central N=1634	South Atlantic N=2306	East South Central N=1188	West South Central N=1782	Mountain N=1040	Pacific N=2071
Allow for more comments and explanations for current coding categories	46.4%	45.1%	48.2%	52.3%	45.8%	51.9%	52%	54.7%	46.4%
Make ICD-9 codes more detailed	33.9%	37.9%	40.1%	32.6%	39.9%	33%	34.2%	37.6%	41.3%
Make ICD-9 codes less detailed	1.8%	3.3%	3.2%	2.5%	3.1%	2.9%	3%	1.7%	3.5%
Make CPT codes more detailed	11.6%	8.2%	4.8%	8%	7.1%	7.8%	8.4%	6.1%	6.3%
Make CPT codes less detailed	6.3%	5.6%	3.7%	4.6%	4%	4.4%	2.3%	-	2.5%

\* excludes 31 respondents with missing or unverifiable geographic information

**Table 8.** Preferred coding accuracy innovation, by merger status

	Merger	n	No Merger	n
Allow for more comments and explanations within current coding categories	49.3%	2965	49.4%	4375
Make ICD-9 codes more detailed	36%	2170	35.5%	3137
Make CPT codes more detailed	8.2%	493	9.2%	813
Make CPT codes less detailed	3.6%	217	3%	269
Make ICD-9 codes less detailed	3%	180	3%	265

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Sept 04, 2002

The enclosed revised manuscript, *Assessment Of Preferences For Classification Detail In Medical Information: Is Uniformity Better?* submitted for proposed publication in Information Processing & Management.

Thank you sincerely for your consideration.

Best regards,

Daniel P. Lorence, PhD

C: encl