CLASSIFICATIONS SYSTEMS, CASEMIX AND DATA QUALITY: IMPLICATIONS FOR INTERNATIONAL MANAGEMENT AND RESEARCH APPLICATIONS

Barnes C., Krinsky T.

The MEDSTAT Group, Santa Barbara, CA USA

Communications to Barnes C., The MEDSTAT Group, 5425 Hollister Avenue, Suite 140, Santa Barbara, CA, USA 93111-2348; Ph +1.805.6815865, Fax +1.805.6815810, E mail Cathy.Barnes@medstat.com

ABSTRACT

Automated clinical data are used across all geographic boundaries but these data do not come in the same format from all locations. This paper explores some considerations for both users and originators of clinical data for hospital inpatients and points out the variations that could affect the reliability, validity, and comparability of the results obtained. Financial incentives based on a prospective payment system are intended to streamline processes, decrease lengths of stay, and minimise unnecessary procedures. The introduction of DRGs in the United States led to a worldwide examination of the healthcare industry infrastructure. Other casemix methodologies are also being used to adjust data for financial, quality or care, and management analyses. This paper presents a brief overview of the diagnosis, procedure, and casemix classification systems used in Australia, Ireland, Italy, the Netherlands, and the United States. Discussions of data quality issues for each country are included, along with implications for the comparability of data classified in one system as input to an application created in and for another system. As with any data, improvement in the quality of clinical coding is a desired goal to make such comparisons more meaningful and to provide a firm basis for both clinical and management decisions.

KEYWORDS: Casemix, Coding, Classification Systems, DRGs, Disease Staging, Data Quality

BACKGROUND:
As healthcare management decisions rely more and more on automated clinical data, both the users and originators of that data must have confidence in the reliability, validity, and comparability of the results obtained. Clinical coded data are collected in various ways throughout the world and used in many applications, some unique, some complementary to each other. These data are used in both financial and management applications in several countries.

Soaring medical care costs in the United States during the 1960s and '70s led to a restructuring of the fee-for-service and per diem compensation systems of that era. It was presumed that a prospective payment system (PPS) would give medical facilities incentives to streamline processes, decrease lengths of stay, and minimise unnecessary procedures. The PPS would pay a predetermined fixed amount for each patient discharged from an acute care hospital.

In order to implement a prospective payment system, there needed to be a basis for determining what amount a hospital should be paid for a given patient. Diagnosis Related Groups (DRGs) were developed at Yale University in the late 1960s and first applied on a large scale in New Jersey in the late 1970s. DRGs relate a hospital’s casemix to the intensity of resource use and the consequent costs. Diagnosis Related Groups (DRGs) probably represent the most widely applied casemix methodology using encoded healthcare data at this time. But many questions arise as clinical data are analysed more closely. Does everyone use the same version of DRGs, or do they perform some adjustments to make variant versions comparable? What if a group, state, country, or Organisation uses a coding system other than ICD-9-CM? How are codes from other classification systems mapped into DRGs? Or, for that matter, how is version control obtained for any classification or casemix methodology that is used for multiple management purposes?

OBJECTIVES:

This paper will explore some underlying foundations of encoded clinical data in selected countries, especially for the acute inpatient hospital setting. The intent of this paper is to emphasise the importance of comparable encoded data within health care communities that cross many boundaries.

The authors reviewed several articles and presentations to identify the major classification systems in use throughout the world. They identified systems developed by the World Health Organisation as well as systems used in the following countries: Australia, Ireland, Italy, the Netherlands, and the United States. The systems in use include various revisions of the World Health Organisation’s
International Statistical Classification of Diseases and Related Health Problems (ICD), some country specific modifications of ICD, surgical and procedural classification systems, and casemix applications such as DRGs and Disease Staging Clinical Criteria. Coding methodologies, reimbursement needs, and data quality projects from several of these countries were also reviewed. Implications of the impact of any comparisons between case-mix findings from various countries are presented in the final section of this paper.

THE WORLD HEALTH ORGANISATION (WHO)

To understand the variations in diagnosis classification systems, one must first understand the main underlying disease classification system (ICD), the oversight for that system (WHO), and the process for updates. In the past, WHO has updated the International Classification of Diseases (ICD) approximately once per decade. The two most recent versions, ICD-9 (adopted 1979) and ICD-10 (adopted 1992) or modified versions of these classifications, are the most widely used for codifying medical records. The effective date for implementation of new ICD versions for reporting within a country depends on many factors. Some of the most important factors to consider before implementation are: a) availability of a version of the classification in the official language of the country; b) extent of information system requirements for a newly mandated classification system; c) lead time needed to educate those who will assign codes and submit data using the new system.

Another factor in the selection of the ICD classification system version is that the basic WHO version of ICD contains only diagnosis entities. Surgical procedures and other medical services are not included in these classifications, so each country must decide how services will be reported within their own country, without regard for any other international reporting requirements they may have.

For each of the countries below, we identify the diagnosis and procedure classification systems used, any crosswalks between classifications, and the application purposes of various casemix methodologies in use. Any issues of data quality that impact casemix are also noted.

AUSTRALIA

Diagnosis Classification Systems
Australia used ICD-9-CM for both diagnosis and procedure coding as input to the Australian version of DRGs prior to the introduction of ICD-10 by WHO. In order to adopt ICD-10 for use in Australia, many data issues had to be considered. As a result, Australian officials realised the need for a modified version of ICD-10. The National Centre for Classification in Health (NCCH), Australia, produces ICD-10-AM, the Australian Modification of ICD-10. Adhering to the guiding principles of ICD-10, NCCH assured that the creation of ICD-10-AM followed the format of ICD-10, the content of 3 and 4 digit categories were not changed, and the ability to compare data over time was not compromised. This meant that any code modifications were made only at the 5th digit level. The ICD-10-AM also modified notes in the classification to make the terminology compatible with Australian medical language patterns. The third revision of ICD-10-AM was published in 1995.

Procedure Classification System

In order to continue with the use of a reimbursement system based on ICD codes in Australia, NCCH also had to produce a procedure classification system to be used in conjunction with ICD-10-AM diagnosis codes. Australian clinicians were already familiar with the Commonwealth Medicare Benefits Schedule (MBS) used in Australia. This flexible fee schedule for consultations, procedures and other interventions is easily updated. Therefore, NCCH chose the MBS as the basis for the new procedure classification system, rather than one of the many options developed in other countries. They modified MBS to include diagnostic imaging, procedures performed by allied health professionals, and other procedures performed outside of the traditional operating room venue. This modified system is known as the MBS-Extended, or MBS-E.

Casemix Systems

The Australian National DRG (AN-DRG) Grouping system (based on ICD-9-CM codes) was used prior to the introduction of ICD-10-AM. The AN-DRG system is the financial basis for reimbursement. Upon introduction of ICD-10-AM, the AN-DRG system was refined using ICD-10-AM codes, resulting in the Australian Refined Diagnosis Related Groups (AR-DRGs). In order to compare data across time, crosswalks are needed to establish one basis of comparison, whether it be the old or the new system. Ideally, all mappings of variant clinical classification systems should be one-to-one, where each code in each system maps only to one code in the other system. Many mappings, or crosswalks, between various versions of ICD classifications were developed in Australia. First, ICD-9-CM codes were mapped to WHO's ICD-10 version, followed by a reverse mapping from ICD-10 to ICD-9-CM in 1993. Another mapping was then produced to show equivalent ICD-9-CM codes for the new ICD-10-AM codes. These mappings allow comparative analyses over time based on both new and historical data. Mappings were also created between procedural coding systems. Each MBS-E concept was mapped back to an ICD-9-CM procedure code, resulting in many-to-one mappings because of the greater extent of
MBS-E when compared to ICD-9-CM. Forward mappings from ICD-9-CM to MBS-E were also created to assure all concepts in ICD-9-CM were included in MBS-E.

**Data quality issues**

After the forward and backward mappings were created, the two mappings were compared and many differences found. If one ICD-10-AM code mapped to many ICD-9-CM codes, one code was chosen based on the grouping that code in the AN-DRG system. The developers referred to this as *logical* mapping. However, the developers also refer to *historical* mapping, where the code map is created to achieve the most appropriate code match based on clinical meaning. Most of the time, logical and historical maps result in the same code. These nuances are often a difficult concept to understand. To reiterate, often a code historically, or clinically, will match the description of the code where the procedure (or diagnosis) would have been coded had the new code not been created. But in order to map it into the most meaningful AN-DRG, the *logical* map has to assign a code close enough in clinical terms that will group into the desired AN-DRG. Where mappings appropriately have some logical match for reimbursement purposes, there could be concerns by clinicians that these groupings are then inappropriate to use for any other analysis, such as quality of care or risk and severity adjusted utilisation comparisons. For such clinically based purposes, the historical mapping is more appropriate.

**IRELAND**

**Diagnosis and Procedure Classification Systems**

In 1969 a pilot program in Ireland required ICD-8 (the 8th revision of ICD by WHO) for diagnosis coding. A system called Surgical Coding, issued by the General Registrar in London, was used for coding procedures. ICD-9 was introduced in 1981 for coding diagnoses, and at that point surgical procedures were captured using the Classification of Surgical Procedures, produced by the Office of Population Censuses and Surveys (OPCS) in London. Ireland has used ICD-9-CM for both diagnosis and procedure coding since January 1, 1990. Beginning in January 1995, the October 1994 edition of ICD-9-CM has been used to codify clinical documentation. At present, it is not deemed practical to change versions with each new revision of ICD-9-CM, so updates happen only every five years or so.

**Casemix Systems**

Since the implementation of the Health Act of 1970, healthcare in Ireland has been provided regionally, with oversight provided by eight health boards. In 1971, the Hospital In-Patient Enquiry (HIPE), a computer-based health information system, was established for the collection of clinical data from acute-care general hospitals.
The Department of Health in Ireland has used HIPE data and hospital financial information from the Specialty Costing system to measure and compare hospitals’ performance. Casemix adjustment for large acute general hospitals has been available since 1993, and the casemix directly influences funding given to a hospital. More efficient hospitals are rewarded at the expense of the less efficient.

**Data Quality Issues**

The HIPE system contains dozens of data edits that ensure uniformity of data and allow validation and editing to occur at the hospital level, before transfer of data occurs. Another advantage of the system is the guarantee that the same validity checks are carried out on each hospital’s data, and a further benefit is that every hospital supplies data in the same format. Ireland encountered many of the same obstacles faced by other countries when they institute new methodologies. Ireland's physician training program presents a unique challenge: junior physicians, who have responsibility for discharge summaries, are transferred every six months, leaving behind cases with incomplete summaries that need to be coded. Coders in Ireland, as elsewhere, are encouraged to approach physicians for clarification of medical record documentation, but do not always do so. Managers of coding departments are hired for their management skills, but often do not have any coding or medical record experience. The fact that the coding is done with a version of ICD-9-CM up to five years old means that advances in medical technology cannot always be captured in sufficient clinical detail.

**ITALY**

**Diagnosis Classification Systems**

Italian hospitals currently use ICD-9 to code diagnoses. These codes are entered into *la scheda di dimissione ospedaliera*, or SDO, which is the Italian discharge abstract. These codes may not be specific enough for some of the case-mix adjustment uses of the data, including financing, outcomes management, and hospital administration. Hence, there is a consideration to switch to the ICD-9-CM system used in the United States (q.v.) for diagnosis code reporting. This change may occur in 1999 or later. The reasons for moving to ICD-9-CM rather than ICD-10 are very complex and beyond the scope of this paper.

**Procedure Classification System**

Italian hospitals report procedures in codes from Volume 3 of ICD-9-CM, the Clinical Modification of ICD-9 developed for use in the United States.
Casemix Systems

Hospital financing in Italy has been dependent on the DRG system for allocation of funds to hospitals since the early 1990s. Disease Staging, a methodology to determine the severity of illness individual without regard for treatment rendered, has also been used extensively in Italy for hospital administration (e.g., departmental reorganisation). It has also been used to monitor quality of care and outcomes (e.g., untimely admissions, readmissions).

Data quality issues

Recent concern over quality has motivated more in-depth monitoring of coded clinical data. A study conducted between 1995 and 1997 showed improvement in the accuracy of the coding and an increase in the number of diagnoses listed on the SDO. This more complete coding resulted in more accurate assignment of DRGs, especially those with complications and comorbidities. It also provided a more accurate Casemix measurement of severity of illness using the Disease Staging methodology. One major factor that must be considered is the need to map ICD-9 codes into ICD-9-CM for implementation of the case-mix systems. The same considerations mentioned in regard to the Australian mappings would apply here. A move to the ICD-9-CM diagnosis coding system will eliminate the need for those mappings in these applications in Italy.

NETHERLANDS

Diagnosis and Procedure Classification Systems

In the Netherlands, ICD-9-CM is used for reporting both diagnoses and procedures. There is a desire to use ICD-10, but since no translation is yet available in the Dutch language, they continue with ICD-9-CM.

Casemix Systems

As with other countries, the increasing cost of health care delivery in the Netherlands makes financing based on patient groupings an attractive alternative to control costs. In 1994 a project in the Netherlands defined 100 Diagnosis Treatment Combinations (DBC) to develop a financing mechanism that was more appropriate for the care delivered by hospitals. The DBC is based on AP-DRGs. The Academic Medical Center of the University of Amsterdam is currently researching medically relevant patient groups for the management of hospital care. Many systems were evaluated for theoretical preference, comprehensibility, number of categories, handling of nonspecific health conditions, and inclusion of complications and comorbidities. Three systems were chosen for in-depth analysis: Disease Staging, AP-DRGs and
ICD-9-CM three digit categories. Disease Staging was found to be preferable for their needs and will be used to create activity and cost profiles over the next three years.

Data quality issues

Current medical reporting often uses only the first three digits of the ICD-9-CM principal diagnosis code. This is the most basic categorisation available, and conforms to the WHO structure. It provides an easy mechanism for epidemiological comparisons with other countries, but then requires manipulation of any other grouping system to map these shortened codes into the proper category. For example, in DRGs, the principal diagnosis code is the entry point into a Major Diagnostic Category (MDC). Within a 3 digit category, several different MDCs may be possible, depending on the 4th and 5th digits of a code. For example, there are 8 possible MDCs (1, 4, 6, 8, 9, 10, 11, or 17) for the codes in the 3 digit category 239.

Systems developed in the Netherlands for electronic medical records hold promise for improving data quality. The BAZIS health information system includes a Common National Thesaurus with over 28,000 items to classify all hospital services and is used in 55, or about 35%, of the hospitals in the Netherlands.

UNITED STATES

Diagnosis and Procedure Classification Systems

The United States currently uses the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) for diagnostic and procedural classification of hospital inpatient services. ICD-9-CM was developed using the World Health Organisation’s International Classification of Diseases, Ninth Revision (ICD-9) as a foundation. Alterations were necessary to structure ICD-9 to meet the complex needs of clinical data collection in the United States. The revisions included the addition of a classification for reporting medical and surgical services and procedures, refinement of some diagnosis codes to capture additional clinical detail, and other modifications to make the ICD-9 system functional for the United States. Two federal agencies have the responsibility for keeping the ICD-9-CM system current. The National Center for Health Statistics (NCHS) takes the lead role in revisions to the disease classification; and the Health Care Financing Administration (HCFA) is keeps the procedure codes consistent with current clinical technology and practices. A formal mechanism for public input allows interested parties an opportunity to provide input and propose amendments to the system; these proposals are released for public consideration and comment. The final list of changes is published in the Federal Register in advance of implementation on the first day of October every year. A clinical modification of ICD-10, referred to as ICD-10-CM, is nearly complete and is expected to be required for reporting sometime after the year 2000. A new system for coding medical and surgical services, ICD-10-PCS
(Procedure Coding System), is also being developed, but it is unknown when it may be implemented. ICD-10 is used for reporting mortality statistics.

Table 1. Types of Coding Errors found in 126 Hospital Audits

<table>
<thead>
<tr>
<th>Type of Error</th>
<th># of Errors</th>
<th>% of Total Errors</th>
<th>Accuracy Rate (100–Error rate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC* not coded when apparent in chart</td>
<td>451</td>
<td>4.8%</td>
<td>95.2%</td>
</tr>
<tr>
<td>CC not coded, information unavailable at time of coding</td>
<td>53</td>
<td>0.6%</td>
<td>99.4%</td>
</tr>
<tr>
<td>Omission of code to specify nature of a complication</td>
<td>14</td>
<td>0.2%</td>
<td>99.8%</td>
</tr>
<tr>
<td>Incorrect coding of principal diagnosis</td>
<td>324</td>
<td>3.4%</td>
<td>96.6%</td>
</tr>
<tr>
<td>Incorrect coding of secondary diagnosis</td>
<td>45</td>
<td>0.5%</td>
<td>99.5%</td>
</tr>
<tr>
<td>Incorrect procedure code</td>
<td>56</td>
<td>0.6%</td>
<td>99.4%</td>
</tr>
<tr>
<td>Incorrect sequencing of principal diagnosis code</td>
<td>255</td>
<td>2.7%</td>
<td>97.3%</td>
</tr>
<tr>
<td>Procedure code omitted per operative report present</td>
<td>53</td>
<td>0.6%</td>
<td>99.4%</td>
</tr>
<tr>
<td>Procedure code omitted, information unavailable at time of coding</td>
<td>10</td>
<td>0.1%</td>
<td>99.9%</td>
</tr>
<tr>
<td>Unclear or insufficient physician documentation</td>
<td>417</td>
<td>4.4%</td>
<td>95.6%</td>
</tr>
<tr>
<td>Physician disagrees with coding or sequencing official guidelines</td>
<td>0</td>
<td>0.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td>Data entry error</td>
<td>28</td>
<td>0.3%</td>
<td>99.7%</td>
</tr>
</tbody>
</table>

*CC= DRG-defined Complications or Comorbidities

Casemix Systems

Since 1983, reimbursement for provision of inpatient medical care for certain types of patients (e.g., Medicare) in the United States has been based on DRGs. Subsequently, there has been an increased use of DRGs as a reimbursement mechanism by other payers as well, including managed care Organisations. Some states mandate use of other casemix methodologies to risk adjust clinical data. A few systems require data collection beyond the minimum Uniform Hospital Discharge
Data Set (UHDDS). Several multi-hospital Organisations, universities, and researchers apply the automated version of Disease Staging to their UHDDS data to adjust for clinical patient factors. Various other casemix methodologies are used in non-acute hospital settings.

**Data Quality Issues**

In the United States, there is great emphasis on correct coding. Clinical coding must be reliable, valid, complete, and timely\textsuperscript{13}. Clinical data quality depends on the quality of medical documentation. Complex clinical documentation, inexperienced coding personnel, and illegible handwritten medical record entries all contribute to inaccurate classification. Errors in data, whether deliberate or accidental, have cost payers of healthcare services billions of dollars. A 1996 study of coding accuracy by the New Jersey Hospital Association is encouraging. Previous studies have shown accuracy rates as low as 80-88%. The New Jersey study of 126 separate audits in 33 hospitals showed accuracy rates between 95% and 100% for specific coding guidelines. Table 1 presents various the number and percent of error types for the 1,706 coding errors found, and shows the calculated accuracy rates for the various coding guidelines\textsuperscript{14}. The U.S. federal government enacted the Health Insurance Portability and Accountability Act (HIPAA) in 1996. This legislation seeks to reduce errors in coded data by mandated monitoring of claims data. These audits detect both intentional and inadvertent errors in reporting codes. Intentional reporting of inaccurate data is fraud; inadvertent errors in data, or those errors where it cannot be determined if intent to defraud was present, are classified as abuse of the system. The possibility of being subjected to a fraud and abuse investigation (and the subsequent penalty of $10,000 US or more if found at fault) has prompted physicians and hospitals to take steps to assure the quality of their coded data and to insure compliance with federal coding guidelines.

<table>
<thead>
<tr>
<th>System</th>
<th>Type of system</th>
<th>Australia</th>
<th>Ireland</th>
<th>Italy</th>
<th>Netherlands</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICD-9</td>
<td>Coding</td>
<td></td>
<td>D</td>
<td></td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>ICD-9-CM</td>
<td>Coding</td>
<td></td>
<td>D, P</td>
<td>P</td>
<td>D, P</td>
<td>D, P</td>
</tr>
<tr>
<td>ICD-10</td>
<td>Coding</td>
<td></td>
<td></td>
<td></td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>ICD-10-AM</td>
<td>Coding</td>
<td></td>
<td>D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICD-10-CM</td>
<td>Coding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>MBS-E</td>
<td>Coding</td>
<td></td>
<td>P</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DRGs</td>
<td>Casemix</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Summary of Clinical Classification Systems Used in 5 Countries
<table>
<thead>
<tr>
<th>Classification System</th>
<th>Casemix</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR-DRGs</td>
<td>Casemix</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AN-DRGs</td>
<td>Casemix</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIPE</td>
<td>Casemix</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Disease Staging</td>
<td>Casemix</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>DBCs</td>
<td>Casemix</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>AP-DRGs</td>
<td>Casemix</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

D=Diagnosis, P=Procedure, M=Mortality, X=system used for reporting or other purposes
*In preparation for future use

**IMPLICATIONS**

This paper addresses variations in classification and casemix in only five countries, some having vast experience with these methods, others just beginning to explore the possibilities. Table 2 presents a summary of the classification and casemix systems used in each of these countries. As each country learns from others, they may compare their health care delivery systems, quality of care, outcomes, and financing systems. But the issues are not limited to these 5 countries. The following list poses some questions that should be asked when reviewing publications or using data from other countries.

- Are all countries coding with equal detail and precision?
- What guidelines are used for coding?
- How rigorously are the classification systems being used in their respective countries?
- Are all countries, ostensibly using the same system, equally up-to-date?
- How useful are analytic tools developed under one system for data classified in a different system?
- Can crosswalks developed for reimbursement purposes be used in other, more clinically oriented, applications?

As data systems become more sophisticated and scientific knowledge advances, the classification systems presently in place are recognised to have inherent deficiencies that may preclude their continued use. Barriers to improving the quality of coded data will be eliminated as countries gain more experience in the healthcare data management arena and as transition of medical documentation and coding system versions are facilitated on a more timely basis.

As seen in the case of historical versus logical mapping in Australia, anyone who uses a mapping to translate from one coding system to another in order to apply a case-mix methodology should proceed with caution. A DRG-like application may most appropriately use a logical map, whereas the application of severity of illness
systems would require a historical mapping. For example, in 1996 ICD-9-CM added a new procedure code for radical vaginectomy (70.42). A historical mapping would assign code 70.4 (obliteration and total excision of the vagina) as the old code closest in clinical meaning. For reimbursement purposes, however, Australia assigned code 71.5 (radical vulvectomy), so that any case with this new code would be assigned to what they considered the appropriate AN-DRG (605: Pelvic evisceration and radical vulvectomy). Does the logical mapping create a homogenous grouping of surgical patients for a clinical applications, such as evaluating the quality of care delivered to patients within either of these surgical groups (pelvic evisceration or radical vaginectomy)?

Ghiselli (1998) states the situation quite succinctly: "Quality of data, classification logic, and problems of mapping from... [one coding system to another] ... can influence aggregation of cases in final groups, and researchers must pay attention to these issues to avoid misinterpretation of casemix."

According to Taroni, et al., some outcome measurement may require a combination of systems (Disease Staging, DRGs and individual ICD-9-CM codes) to satisfactorily distinguish and describe profiles. Other analyses (e.g., timeliness of hospital admission) can be performed using only a severity of illness measure that does not confound treatment with patient health status factors.

As databases begin to capture more clinical detail, management and clinical decision support applications, especially those that risk adjust patients using casemix methodologies, become more valid because less human subjectivity is introduced. Version control then becomes a matter of updating the electronic system to incorporate the latest technologies and changes to the risk adjustment factors. This eliminates many of the concerns regarding periodic changes to the classification system, but does not decrease the need for ongoing education of those who develop the systems and interpret the data. The questions posed herein will still apply no matter how automated the classification of diseases and services becomes. International transfer and comparison of clinical data will always require diligence in understanding the underlying content and circumstances that created the data.

BIBLIOGRAPHY

7. Louis, DZ. "DRG-Based Hospital Financing in Italy" presentation at Global Perspectives of Data Quality and Coding, Washington DC, Jul 98.