THE COMPUTERIZATION OF PATIENT MANAGEMENT CATEGORIES:  
CLINICAL BASIS FOR A CASE MIX APPLICATION

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This paper describes the development of a patient classification system that can differentiate the case mix of one hospital from that of another. Physicians delineated Patient Management Categories and specified the components of care required for effective management of the typical patient in each category. Two versions of these categories were computerized, one utilizing commonly available data elements and the other requiring two special data elements. ICD-9-CM codes were mapped to all data elements. Both versions reviewed five final diagnoses without regard to sequence. Categories representing different clinical presentations of a disease or disorder are grouped into modules to prevent the overestimation of co-morbidity.

Introduction

The research performed by Blue Cross of Western Pennsylvania resulted in the development of a patient classification system that can differentiate the case mix of one hospital from that of another. There has been no way to demonstrate that the patient types in one hospital differ from those in another institution with respect to the costliness of resources required to manage them, nor is the extent to which they differ known. Identifying a hospital's case mix (or product diversity) is not only valuable for reimbursement, but it is also necessary for effective facilities planning and quality assurance.

Clinical Approach to Patient Classification

The Patient Management Category classification system developed by Blue Cross of Western Pennsylvania's Health Care Research Department is a unique approach to defining a hospital's case mix for several reasons, including the ability to provide clinically relevant patient categories from currently available patient abstract data. The Patient Management Categories constitute a clinically defined patient classification that is then computerized using patient abstract data. That is, clinical criteria for categorization are established by physicians before ICD-9-CM codes are used to operationalize the system. In contrast to this clinically defined system, other patient classification systems use clinical input secondarily - after aggregations of ICD-9-CM codes have been defined statistically.

The clinical definition of each Patient Management Category has been meticulously preserved through each stage of the operationalization from the mapping of ICD-9-CM codes to the computerization of the categorization decision rules. Severity has been incorporated into the definitions of the Patient Management Categories so that clinical presentations of a disease or disorder that require different levels of management are maintained as different categories. The sequence of diagnoses on the patient abstract is ignored because of the limitations of the ICD-9-CM coding system that require more than one code to describe a clinical presentation.

Patient Management Categories receive their clinical basis from patient management paths defined by physician panels. These paths not only describe clinically homogeneous groups of patients but an expected management strategy is associated with each patient type. Since different patient types within a disease or disorder require different management, individual paths are provided. For instance, "acute myocardial infarction with pulmonary edema" is a distinct patient type from "acute myocardial infarction with bradyrhythmias or heart block" and therefore constitutes two separate categories. As shown in Figure 1, each path includes a description of the diagnostic and treatment components that would usually be employed for that particular patient type. These two paths, along with all other paths that are specific for acute myocardial infarction, are grouped into a disease or disorder module.

Computerization of Patient Management Categories

In order to assess whether available data elements were sufficient for categorization or if certain additional patient descriptors were necessary, two computerized versions of the Patient Management Categories were developed. The software version that most closely approximates the clinically specified patient management paths requires two data elements not generally found in patient abstract data, chief problem necessitating hospitalization, and elective operative procedure if applicable. These two elements describe the reason for the patient's hospitalization.
of chief problems include abdominal pain, fever and palpable mass. Elective operative procedures are those procedures for which patients are specifically admitted such as pacemaker insertion, kidney transplantation, or herniorrhaphy. These data elements can be mapped to ICD-9-CM codes, but are only available on a limited number of patient abstracts.

In contrast to these special data requirements, the second set of computer decision rules was developed to approximate the clinically specified Patient Management Categories utilizing data elements currently available in patient abstract data. The Proximate Patient Management Categories are slightly less sensitive to differences in severity and resource use among patient types than the Patient Management Category software described above, but it is much more readily transportable at this time.

Mapping of Codes

In order to utilize diagnoses and procedures from patient abstract data, ICD-9-CM codes had to be mapped to Patient Management Categories without diminishing their clinical definitions. Since the ICD-9-CM classification system was not designed for this type of application, the codes do not necessarily separate unique clinical presentations or maintain a consistent level of detail. For these reasons, a one-to-one mapping of ICD-9-CM codes to a Patient Management Category is a rare occurrence. Instead, the mapping process usually identifies a list of codes that, when appearing separately or in combinations, represents a particular clinical patient type. For instance, the category "benign or malignant neoplasms of the small bowel with obstruction" is linked to a list of diagnosis codes for neoplasms of the small bowel as well as a list for obstruction. At least one code from each list must be present on the patient's discharge abstract for placement in this category.

Mapping from the clinical statement instead of using a statistical breakdown of the ICD-9-CM codes aided identification of codes that were not appropriate for inpatient categorization. For instance, the nonspecific diagnosis code "Burn, unspecified degree" is not an acceptable code for patient categorization. This lack of specificity in the ICD-9-CM codes did generate some difficulties by preventing the translation of a few physician defined patient types into operational Patient Management Categories.

Modular Design

Within a disease or disorder module such as acute myocardial infarctions, patients may have two or more clinical conditions related to the same disease. For example, a patient with an acute
myocardial infarction can have bradyrhythmias and cardiogenic shock - two conditions that require different clinical management, and thus have separate Patient Management Categories. Physicians felt that one of the categories could sufficiently describe the management if the conditions occurred together. Hierarchies were identified so that cases would be placed in the category whose management encompasses the management of those below it in the hierarchy. In the example listed above, the patient would be categorized in the cardiogenic shock category because the treatment encompasses the treatment of the bradyrhythmia category. Therefore, only one category assignment per module is possible. Patients with unrelated conditions, i.e., not in the same module, will receive multiple category assignments.

Software Design

Following the natural design suggested by the application, the software consists of independent hierarchical modules written in standard FORTRAN. Each module consists of the decision rules that relate the mapped ICD-9-CM codes to each category and defines the hierarchy of categories. The decision rules review the first five diagnoses on the patient abstract and categorize cases based on these diagnoses regardless of the order in which these diagnoses appear. The sequence of the codes is considered too restrictive since more than one code may be necessary to describe a single clinical representation. It should be emphasized that the presence of multiple codes does not imply co-morbidity. The decision rules also utilize procedures and age if necessary to finalize categorization. The data is always searched for the presence of specific procedures, not just the presence of any procedure.

The structure that coordinates access to the modules is not hierarchical and permits access to all modules that are applicable to a particular patient abstract. Applicability is determined by the presence of a key code in one of the first five final diagnoses.

Conclusion

The final product of the Patient Management Category software can be adapted to fit the purpose of the study, presenting data grouped by disease or disorder module, by individual category, or by a special study variable that can be designated in the first two digits of each category number. The use of clinical rather than statistical category definitions has been an asset for developing a meaningful case mix tool, and it has not introduced operationalization difficulties. This system will be more acceptable to the medical community because of its clinical basis and to hospital administrators because of the importance that expected resource use received in the original design of categories. The relative cost weights developed for each Patient Management Category provides a means for analyzing differences in the cost of care among hospitals.

Selected Bibliographies


3. Young, Wanda W., Swinkola, Robert B., and Hutton, Martha A. Assessment of the AUTOGRP patient classification system, Medical Care, 1980; 18:228-244.