The Computerized Severity Index
A New Tool for Case-Mix Management

Susan D. Horn, Ph.D., and Roger A. Horn, Ph.D.

We describe the new Computerized Severity Index (CSI) that is obtained from an expanded discharge abstract data set, based on a 6th-digit severity addition to the ICD-9-CM coding system. The new 6-digit code book (called ICD-9-CMSA) is used to label existence and severity of each principal and secondary diagnosis. It can be used to produce an overall severity of illness level for each hospital inpatient. The impact of severity-adjusted DRGs on prospective payment and uses of the CSI for assessing quality of care, efficiency, physician practice profiles, and prediction of posthospital resource needs are discussed.

INTRODUCTION

Prospective payment is now in place as one means to control expenditures for hospital care of Medicare (and other) patients. A prospective payment system provides good incentives for hospitals to control the costs of treating patients. However, such a system should be equitable so that hospitals are reimbursed adequately, but not excessively, for the types of patients they treat. We investigated the current DRG-based prospective payment system, whose validity for equitable prospective payment remains unsupported by any published study.

CHARACTERISTICS OF DRGs

The prospective payment system for Medicare patients now mandated by law uses diagnosis-related groups (DRGs) to describe hospital inpatients. The 467 DRGs are medically meaningful in that they attempt to group together patients and procedures that fall together naturally in the practice of medicine. On the other hand, researchers and hos-
Hospitals have observed that many of the 467 DRGs have a great deal of variability with respect to resource use; in some DRGs, patient charges vary from less than $1,000 to greater than $200,000. This is quantified by large standard deviations of DRG data; standard deviations are often larger than the mean of the charges or length of stay within a DRG.1,2 Overall, DRGs explain only about 30 to 40% of the variability in resource use of hospitalized patients.3–7 In a prospective payment system based on DRGs, the 60 to 70% of variability in resource use not explained by DRGs causes great uncertainty for hospital administrators, physicians making patient management decisions, and purchasers of health care who need to know what product they are buying.

**DRGs Do Not Account for Severity**

Many observers have attributed a major part of the large spread of resource use within DRGs to inadequacies in assessing differences in severity of illness. Although other case-mix systems have been developed that claim to take into account severity of illness, such as the disease staging system,7 they, too, explain about the same amount of variability in resource use as DRGs. So far, no matter how researchers have tried to use discharge abstract data to form case-mix groups, the resulting case-mix grouping systems still leave unexplained 60 to 70% of the variability in patient resource use.

Part of this unexplained variability in resource use is due to differences in physician practice patterns. Some physicians perform more tests and keep similar patients in the hospital longer than some of their colleagues. But a large additional part of the unexplained variability in resource use is due to differences in severity of illness that are not captured in the current discharge abstract data base. For this reason, a Severity of Illness Index has been under development and testing at the Johns Hopkins University over the past 5 years.2–6,8–11

**SEVERITY OF ILLNESS**

The quantitative evaluation of illness severity presents a complex and challenging problem. Any approach to solving this problem necessarily entails compromises. For example, in order to avoid the influence of practice patterns and examine only illness-related factors, it would be desirable to employ data that would not be affected by actions taken by patient care personnel. On the other hand, exclusion of such elements, particularly data related to complications and the patient’s response to treatment, would ignore factors critical to the determination of the patient’s total burden of illness.

Most systems of patient classification, even those currently employed as a basis for prospective payment, accept this compromise to some degree to avoid loss of important information. For example, the DRG classification system includes procedures such as cardiac catheterization and operations that are chosen by the patient’s physician, as well as complications and comorbidities that can be influenced by the care given. This approach recognizes that to ignore such elements would preclude adequate characterization of the patient’s illness. Similar approaches were used in developing the Severity of Illness Index and the Computerized Severity Index, but the influence of hospital-related factors was minimized.