THE CLINICAL EPIDEMIOLOGY OF ASTHMA IN AN HMO -- METHODOLOGIC CONSIDERATIONS

William M. Vollmer, Merwyn R. Greenlick, Kaiser Permanente Center for Health Research, and A. Sonia Buist, Molly L. Osborne, Oregon Health Sciences University
William M. Vollmer, 4610 S.E. Belmont, Portland, OR   97215

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INTRODUCTION

This paper describes some of the data systems maintained by the Kaiser Permanente Center for Health Research and illustrates their applicaiton in studying the clinical epidemiology of asthma. We also describe other applications for these data systems. The primary emphasis will be on the data systems and their linkages as opposed to any specific application.

We begin by briefly describing the research setting, since the usefulness of any utilization data system depends in part on the nature of the health care delivery system being studied and the population base it serves.

RESEARCH SETTING

Kaiser Permanente (KP), Northwest Region, is a large, federally qualified, group practice HMO that provides comprehensive, prepaid health care service to its members. The region, which is centered in Portland, Oregon, has clinics as far south as Salem, Oregon, and as far north as Longview, Washington.

Since KP was established as a community-based program in 1943, it has grown to over 350,000 members and currently enrolls about 20 percent of the Portland metropolitan population. The demographic and socioeconomic characteristics of KP members correspond closely to those of the area population as a whole.

The HMO setting provides a number of advantages for health services and epidemiologic research. First, the HMO serves a known population base, thus providing that all important denominator to accompany utilization statistics. Second, the health plan maintains a single, comprehensive medical record for each of its members. Every contact an individual makes with the medical care system is recorded in this unit chart. The existence of a single, centrally stored medical record is essential for the development of a utilization database in a non-computerized medical care system. Finally, the prepaid health benefit minimizes the financial barriers to medical care, thus reducing the effect of income on medical care utilization and measures derived from utilization data.

The Center for Health Research (CHR), which was established in 1964, is a professionally autonomous research arm of Kaiser Permanente, Northwest Region, charged with conducting a variety of health related research in the public domain.

DATA SYSTEMS

Since its inception, the CHR has developed various data systems for defining the characteristics of members and providers in a prepaid group practice setting, and for describing their patterns of health services utilization. Some of these data systems have been derived from the administrative records of Kaiser Permanente and enhanced to serve research needs. Others--most notably the Outpatient Utilization System (OPUS), which serves as as the data base for most utilization studies--have been designed, developed, and maintained entirely by the CHR (Greenlick, Hurtado, Pope, et al., 1968).

Other examples of the data systems to which CHR investigators have access include an inpatient discharge database, a centralized tumor registry of all cancer patients who have been diagnosed since 1960, and an automated prescription system that records all prescriptions dispensed from the KP outpatient pharmacies. The CHR has also undertaken specialized surveys of health plan members, KP employees, and KP physicians.

Inpatient and Outpatient Utilization Systems

The inpatient discharge summary maintained by the CHR began in 1966 and includes data about each discharge from the two hospitals of the Northwest Region of KP since that time. Data include, but are not limited to, primary discharge diagnosis and up to eight secondary discharge diagnoses, length of stay, and information about ancillary services. Patient chart number can be used to link discharge records for specific individuals over time. This permits, for example, calculation of both hospitalization rates and the proportion of health plan members hospitalized during a given period of time.

OPUS is the name given to the CHR's outpatient utilization system. OPUS is actually a set of rules for abstracting

outpatient data and a relational database structure for storing this information. A variety of data systems are maintained using the OPUS methodology, including the abstracted outpatient records for a five percent random sample of health plan members. This latter data system has been maintained since 1966, and is continuously updated with a five percent sample of new members every month. Thus this data system permits us to look at utilization for a random sample of the health plan membership at any point in time, and also to trace the utilization history of a given set of individuals over a long period of time.

OPUS data are abstracted by technicians from the CHR's Research Medical Records Department, who record information directly from the patient's medical record, including the descriptive characteristics of each contact with the system (such as time and place of visit), as well as diagnostic, symptom, and treatment information.

Every morbidity (i.e., symptom or condition) addressed during a contact is recorded, and a presenting morbidity is determined. All morbidities are grouped in the appropriate episode, both within visits and between visits, so that utilization associated with episodes of disease can be studied longitudinally. Morbidities are coded as they were recorded by the physician at the time of visit, and all morbidities are updated as new information is recorded in the medical record. Data can therefore be accessed either by morbidity as perceived by the provider at time of any visit or by current updated morbidity.

Providers of care are uniquely identified through a coding system that details both the specialty of service of the provider and the identity of the individual provider. Relative value units have been developed to relate to the various procedures so that resource utilization can be assessed (Penn, Johnson, and Vogt, 1983).

Detailed recording and coding instructions are maintained for OPUS, and when changes or updates become necessary comparability over time is always maintained. Physician and other medical care providers serve as consultants to the abstracters both routinely and when questions arise that require special clarification.

All of the CHR's data systems may be linked using each member's unique health record number. By taking advantage of the relational database structure of these data systems, we are also able to link records by other attributes as well. For example, OPUS data records can be linked by contact, morbidity, provider, and episode classifications.

APPLICATIONS

The CHR's data systems support a wide variety of research applications. These include studies of health care utilization, epidemiology and biostatistics, demonstrations and evaluations, studies of the organization and delivery of care, and health economics. Preliminary results from a study of the clinical epidemiology of asthma in the HMO illustrate the use of some of these data systems.

Reports from a number of countries noting an increase in asthma morbidity and mortality since the late 1970s have heightened interest in asthma. In the United States, for example, data from national health surveys show more than a 200 percent increase in hospitalizations for asthma from 1965 to 1983 among children aged 14 and under (Evans, Mullally, Wilson, et al., 1987).

These increases in reported asthma morbidity and mortality may have resulted from both real and artificial factors. For example, the severity of asthma may be changing due to changing environmental factors or patterns of pharmacologic management. Artificial factors would include changing diagnostic patterns among physicians. Limited information about secular trends in asthma incidence and prevalence has hampered efforts to examine these potential explanations. This lack of information results in part from the diversity of both the populations studied and the methods used in the epidemiologic literature (Burney, Detels, Higgins, et al., 1987).

The CHR's datasystems provide a unique opportunity to examine some of the proposed explanations for the increase in asthma morbidity. In particular, use of these database systems will allow study of:

1) secular trends in the prevalence and, to a lesser extent, incidence of physician-diagnosed asthma and asthma-like disorders (both inpatient and outpatient) over a period of 20 years;

2) health care utilization associated with asthma and temporal changes in utilization patterns; and

3) the natural history of asthma in selected subpopulations.

Table 1 presents some of the preliminary utilization data from the study for children aged 0-14 years. The table shows the rate of

hospitalizations for asthma for the period 1970-1987. As noted in the table, the time period encompasses two different ICDA coding revisions. Data for the years 1976-1978 were unavailable.

Column two shows the person years at risk for each of the time periods. The remaining columns show the hospitalization rate, per 100,000 person years, both overall and for each sex separately. The data have not yet been adjusted for differences in the coding of asthma between the three ICDA revisions, so analysis will focus on trends within a given ICDA system.

Between 1970 and 1975, and again between 1979 and 1984, the overall hospitalization rates show a marked increase. Note also the drop in hospitalizations post 1984. These patterns differ markedly by sex. While the hospitalization rates for females were very similar to those seen for males in the early seventies, the increase in hospitalizations is much less pronounced. We did, however, see a dropoff in hospitalization rates post 1984 for both sexes.

When we examined the proportion of health plan members hospitalized each year, as opposed to the rate of hospitalizations, we found the same pattern of increase among the boys. This suggests that we are seeing more people being hospitalized for asthma, and not just more hospitalizations per person over time. The prevalence data for the girls did not show any consistent pattern.

These preliminary results are limited in that they focus only on inpatient data. For example, if KP has been systematically shifting more of its care for acute asthma to the outpatient (in this case ER) setting, then this analysis could be very misleading. Subsequent analyses of these data will therefore look at both ER contacts and hospitalizations for asthma.

Specifically if we group ER and hospital visits into clusters respresenting well-defined acute asthma episodes, then we can replicate the previous analyses and examine the changing prevalence and rate of severe asthma episodes, as opposed to just hospitalizations. This methodology will also enable us to calculate the probability of being admitted to the hospital during a severe asthma episode and see if it has changed over time.

This episode-based analysis will require use of the OPUS database, since ER contacts are not recorded in the inpatient discharge database. Fortunately the OPUS database contains information not only on regular clinic visits, but also on ER contacts and even discharge information on hospitalizations. Eventually we will use OPUS to examine overall outpatient treated prevalence of asthma and the incidence of treated asthma within the HMO as well.

We also plan to examine the effects of natural experiments that arise due to systematic changes in the way Kaiser Permanente organizes and delivers care. For example, in 1985 KP introduced the emergency decision unit (EDU) into the ER. The EDU allows physicians to keep patients under observation in the ER for an extended period of time without having to formally admit them to the hospital. The drop in hospitalization rates for the period 1985-1987 would support the hypothesis that the establishment of the EDU has led to a decrease in the probability of being admitted to the hospital for asthma.

SUMMARY

In summary, the Center for Health Research maintains a variety of data systems for studying various issues related to health care utilization. A recently published book entitled Health Care Research in an HMO -- Two Decades of Discovery (Greenlick, Freeborn, and Pope, 1988), provides an integrated summary of the research that has been conducted at the Center over the last 25 years. The book also describes the evolution of the CHR and its datasystems.

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Table 1
Rate of Hospitalizations for Asthma*
Among Children Aged 0-14 Years,
Kaiser Permanente, Northwest Region,
1970-1987.

Year	Person Yrs (1000s)	Rate Per 100,000 Population		
		Total	Males	Females
ICDA-8				
1970-71	91	46	45	47
1972-73	105	67	86	47
1974-75	112	85	114	55
ICDA-9				
1979-80	121	110	165	52
1981-82	126	134	180	85
1983-84	128	157	237	72
1985-86	132	117	150	81
1987	68	94	120	66

*Primary Diagnosis at Hospital Discharge

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