READMISSIONS:
Are They An Indicator of Quality of Care?

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ABSTRACT

Hospital readmission rates have long been touted as a quality of care indicator, both in the health care literature and in the conventional wisdom of health care professionals. However, not all readmissions represent negative outcomes of care. On the contrary, there is an important distinction to be made between readmissions that are expected based on the clinical condition of the patient and readmissions that are unexpected and potentially preventable. Only the latter type of readmissions should be included in the development of an indicator of quality care.

In this study, a methodology is developed to differentiate expected from unexpected readmissions and that method is used to analyze readmission rates as an indicator of quality care. Results indicate that, when the clinical condition of the patient in the initial hospitalization is taken into account, more than 80 percent of readmissions are in fact expected and thus should not be included in a screen to identify potential quality problems. The remaining unexpected readmissions are potentially preventable and represent a more valid quality of care indicator. When this screen was applied to a large database of patients discharged from 88 acute care hospitals, it was found that unexpected readmissions represented both a small percentage and a small number of patients at any single institution. Furthermore, these readmissions appeared to be isolated cases rather than representative of ineffective practice patterns.

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With the advent of Medicare's Prospective Payment System and the widespread implementation of cost containment measures by many payers, the issue of quality has become more of a concern. Simply stated, we all need assurance that quality is not being sacrificed in the process of cost restraint. Quality medical care, however, is such a multidimensional concept that there is little agreement regarding what it is and much less agreement on how to measure it. Not only are there problems in measuring quality, but frequently there is also much confusion about the level of analysis that will be most useful to effect quality improvement—a patient level review of quality or a more aggregate indicator of quality at the provider level.

The most direct, retrospective measure of quality at the patient level is medical record review. Since review of all patients' records is not feasible, however, health care administrators and researchers have sought other measures of quality to use as screening tools. Such tools have been used 1) to identify patients who were treated inappropriately or who had preventable adverse outcomes and 2) to target hospitals or other providers who have more than their share of inappropriately treated cases or preventable adverse outcomes. In the first case, individual patients are identified so that providers can learn from documented mistakes. Presentation of individual patient records at clinical seminars such as grand rounds is a good example of this attempt at quality improvement. In the second case, individual patients are identified to form the basis of more aggregate measures that can be used to establish patterns of care that suggest inappropriate or ineffective care. The identification of readmissions and the derivation of hospital-specific readmission rates form the basis on one such aggregate measure of quality care.

Hospital readmission rates have long been touted as a quality of care indicator, both in the health care literature and in the conventional wisdom of health care professionals. However, not all readmissions represent negative outcomes of care. On the contrary, there is an important distinction to be made between readmissions that are expected based on the clinical condition of the patient and readmissions that are unexpected and potentially preventable. In this study, a methodology is developed to differentiate expected from unexpected readmissions and that method is used to analyze readmission rates as an indicator of quality care.

BACKGROUND

Although patients readmitted for treatment have long been associated with high resource use and high costs (Schroeder, Showstack and Roberts, 1979; Zook and Moore, 1980), it is only recently that readmission rates have been considered and used as aggregate indicators of quality, or more precisely, as indicators of a lack of quality (Holloway, Thomas and Shapiro, 1988; Holloway and Thomas, 1989). The common belief is that someone who must come back for service twice didn't get the job done correctly the first time. In health care, however, this axiom is an oversimplification, primarily because many readmissions are in fact expected as part of the course of the illness or its appropriate treatment.

A comprehensive review of the readmission literature completed by Wray, DeBehnke, Ashton and Dunn (1988) highlights both of these conclusions:

- Readmissions are a significant component of hospital use and costs; and
- Clinical variables show the most consistent association with readmission and readmission rates.

Using a relatively gross classification of diseases (3-digit International Classification of Diseases, 8th revision), Anderson and Steinberg (1985) found variation in readmission rates by

clinical service while Gooding and Jette (1988) found variability in readmission rates among certain diagnosis groups (i.e., cerebrovascular disease, hip fracture, and congestive heart failure). These studies, however, were primarily investigating the hospital utilization and costs associated with readmissions, and thus, none differentiated the appropriateness of various types of readmissions.

There have been some studies, however, in which attempts have been made to make this distinction—specifically, to differentiate readmissions that are expected or planned from those that are not part of expected treatment and possibly indicative of inappropriate care. For example, Smith, Norton and McDonald (1985) identified elective versus nonelective readmissions as a surrogate for the subset of readmissions that represent adverse outcomes. They concluded that the preponderance of readmissions (91 percent) were adverse patient outcomes, representing new disease or complications from a previous admission. On the contrary, using a similar distinction, Ludke, MacDowell, Booth and Hunter (1990) found that only 45 percent of all readmissions are unplanned. Still, in the latter more comprehensive attempt at identifying unplanned readmissions, an appropriate readmission associated with a previously diagnosed condition was not differentiated from a complication of previous care.

A series of articles by Holloway and others explored risk factors for readmissions in various populations. Using a population of Medicare beneficiaries, Holloway, Thomas and Shapiro (1988) examined risk factors for readmission within 60 days of discharge. In this study, the authors categorized diseases into classes of risk for readmission. They reaffirmed the dominant role of clinical condition in the initial hospitalization as the principal determinant of readmissions within 31 days. For this reason, the authors concluded that readmission risk models based on medical factors could be used as indicators to monitor quality of care.

Holloway, Medendorp and Bromberg (1990) subsequently sought to identify risk factors for early readmission (within 30 days of initial discharge) in a population of veterans. Although only 22 percent of the patients had early readmissions, the preponderance of the readmissions occurred for patients in the high-risk readmission stratum, which was defined as chronic/progressive/degenerative disease. These readmissions, the authors argue, cannot generally be avoided.

Although readmission rates have been mentioned frequently as a quality of care indicator in the literature, there are limitations in the generalizability of the results of research to date (Wray, DeBehnke, Ashton and Dunn, 1988). First, readmission rates are often calculated using discharges as the denominator rather than patients (e.g., Anderson and Steinberg, 1984 and 1985). This is an approach that tends to result in an underestimate of the problem.

Second, most readmission rates are calculated internally on a hospital-specific basis because system wide data are not available (Gooding and Jette, 1985; Smith, Norton and McDonald, 1985; Fethke, Smith and Johnson, 1986). Although the majority of readmissions are to the same hospital, some do occur in other hospitals within a region. This is an important factor to include in evaluating readmission patterns as quality indicators.

Third, and most important, a better distinction must be drawn between planned or expected readmissions and unplanned, unexpected readmissions. That is, to the extent that readmissions are predictable and expected as part of the process of care, such as in staged operations, they should not contribute to the quality of care readmission indicator. Because certain types of diseases are more likely to result in readmissions as part of effective treatment, readmission rates that are used to compare hospitals must be adjusted to include only potentially inappropriate or preventable readmissions. The purpose of this study is the development of a

hospital-level indicator of quality that uses discharge abstract data and encompasses all patient diseases/conditions. Such an indicator can then be used to isolate unplanned, potentially preventable readmissions for comparison among hospitals and for use as a screen to focus subsequent medical record review.

METHODS

Defining Readmissions

A gross readmission rate is calculated by dividing a simple count of readmitted patients within a specified time lapse by a count of all patients hospitalized within a consistently defined time period. Such an estimate is, however, not precise enough to compare hospitals effectively. In this study, three refinements were made in the calculation of readmission rates in order to permit valid comparisons across hospitals. First, as mentioned previously, readmissions have traditionally been examined within a hospital; that is, the number of patients who are readmitted to the same hospital during a specified time period are identified as a proportion of the total patients admitted to the institution. In this study, this definition is broadened to include readmissions to other hospitals within a specified geographic region. These regional readmissions are attributed to the hospital in which the patient was first treated (index admission).

Second, the time frame within which a readmission is defined should be related to the specific purpose for which the resultant indicator will be used. In general, it is assumed that the closer the readmission is to the initial admission, the more likely that the two hospitalizations are related to each other and are suggestive of potential quality problems. However, in other disease-specific investigations, a longer time frame would be more appropriate. For example, to evaluate patient outcomes associated with a total knee replacement, a much longer time frame

would be required to account for the full array of potential complications and consequences of the procedure. In this study, readmissions within one month and within one year of the initial discharge were examined and compared. All patients with at least one readmission within a year of the first discharge were identified in order to provide an assessment of the magnitude of unexpected readmissions in a longer time period.

Third, the major task of refining gross readmission rates is to select patients whose readmissions are related to the treatment provided during the first admission, but whose readmissions are not expected as part of the course of the illness or its appropriate treatment. That is, two admissions that are independent events should not be counted as a readmission for purposes of developing a quality indicator. A patient who is admitted first for a delivery and then for an extremity fracture received in an auto accident is such a patient with two unrelated admissions. Similarly, a comparative hospital readmission rate used as a quality indicator should exclude certain related readmissions that are expected, given the course of the patient's illness. For example, a cancer patient's readmission within 30 days of a previous discharge because the disease has spread (metastasis) or for a radiotherapy or chemotherapy evaluation is an expected readmission.

To make the distinction between expected and unexpected readmissions and to categorize patients based on the appropriateness of their readmission, Patient Management Categories (PMCs) were used (Young et al, 1985). PMCs are a clinically specific patient classification that incorporates severity and complexity distinctions among patient types. Because of their clinical specificity, PMCs provided the clinical framework to facilitate the identification and isolation of certain types of complications and related conditions suggestive of the need for subsequent medical record review of the care provided.

The first step in this process was to identify particular illness and treatment categories that have a high probability of repeat admissions primarily due to the nature of the disease or course of treatment. For example, according to physicians, multiple admissions are common in the management of patients with cancer. Patients who were characterized as having cancer in their first admission during the study period were identified, and a separate readmission rate was calculated for them using a denominator of cancer patients at risk for cancer related readmissions, rather than all patients.

In addition to patients with diagnosed malignancies, other patient types were identified for separate analysis. Some of these patient types have frequent readmissions that are associated with the compromised condition of the patient or complexity of the patient's treatment plan (e.g., organ transplant patients). Other patient types represent less complicated conditions (e.g., normal deliveries preceded by an admission for false labor or complications of pregnancy). Such readmissions are not necessarily reflective of problems in the care provided in the index admission; rather, they may highlight the variation in admission patterns in the region or the need for patient education. Because unique or specific quality problems may exist in these subpopulations, each of these groups should be isolated for separate analysis. They should not, however, contribute to a comparative readmission rate that is intended to isolate potential quality problems.

Thus, a readmission in this study is defined as a patient readmitted within one month (and, alternately, within one year) of an initial hospitalization to any general, acute care hospital within a defined geographic region. Categories of patients for whom a hospital readmission is expected (such as false labor/delivery, oncology, and organ transplants) are identified using PMCs and reported separately. Since patients with these conditions, as well as patients

readmitted for elective procedures, patients with clinically unrelated readmissions, and patients with certain diseases classified as chronic, occur differentially across hospitals, they are excluded from each hospital's comparative readmission rate. Not only are readmissions expected in these clinical areas, but the services and hospital programs to accommodate such patients are not available at all hospitals. If these patients were included in comparative hospital-level readmission rates, the service mix of hospitals would differentially affect the results.

After patients with expected or unrelated readmissions were excluded from the comparative hospital readmission indicator, PMCs were again used to identify the following specific types of unexpected readmissions—potential nosocomial infections, complications of previous care, symptom/related diagnoses, and potential ambulatory readmission. These patient types form the basis of the comparative hospital readmission rate used in this study to identify patients for more focused review.

Nosocomial infections are defined as infections that originate in the hospital. Readmissions to the hospital within seven days of the initial discharge for the common types of nosocomial infections (specifically, septicemia, pneumonia, and urinary tract infection) were identified using PMCs. If such infections are related to the previous hospitalization, they are likely to occur within this restricted time frame. Readmissions for a wound infection within 31 days following an operation were also included in the definition of potential nosocomial infections. Note that this approach underestimates the incidence of all such infections, since some nosocomial infections can be treated on an ambulatory basis.

Complications of previous care are conditions that can be linked with treatment provided in a previous admission. Examples of such complications include wound dehiscence,

intraperitoneal hemorrhage, postoperative hematoma, and anastomotic leak associated with a previous operative repair. All were identified using clinically specific PMCs.

PMCs were also used to identify multiple admissions that represent either treatment for the same acute condition (e.g., a patient diagnosed and treated for bacterial pneumonia who is readmitted within 31 days for the same problem) or treatment of a condition in the second admission that was only a symptom of unknown etiology in the initial admission. An example of the latter patient type is a patient who is admitted with severe abdominal pain, discharged without a definitive diagnosis, and then readmitted a second time with a condition such as colorectal neoplasm, diverticular disease, or another gastrointestinal disorder. This case type is a readmission that should be reviewed to discover whether the disease process could have been identified in the first admission. The PMCs provide the framework for identification of all of these potential quality problems.

The unexpected readmissions discussed thus far deal primarily with clinical outcomes that should be reviewed to assure that quality care was provided. Also included in the comparative hospital readmission rate, however, are readmissions that may be inappropriate because of the process and level of care provided. For example, patients who are readmitted for a condition that can be managed in an ambulatory setting and who remain hospitalized in the second admission for two days or longer are potentially being exposed to undue risk, and thus, they are included in the readmissions that should be reviewed.

The goal is to use the refined readmission rate constructed in this study as a screening device to identify the medical records of patients for further review by physicians. The readmission rates reported provide a focus for such an investigation of quality rather than

definitive results. Independent physician peer review should be used to provide the final judgment of quality care.

Data

Accurately identifying patients who are readmitted during a particular time frame requires careful attention to defining the population at risk and to database construction. Each patient must have an equal chance of being readmitted and each patient must be counted only once in the population, regardless of the number of times that the patient is readmitted. As noted above, in some studies, investigators have counted the number of readmissions instead of the number of readmitted patients. The preferred method, however, and the method used in this study, is to link all of a patient's readmissions and count patients. A readmission rate is then calculated as the number of patients readmitted divided by the total number of patients admitted during that time period.

Two databases were used in this study to calculate readmission rates. The first database consisted of Blue Cross of Western Pennsylvania (BCWP) claimants (employees and their dependents) from approximately 20 major corporate members of the Pittsburgh Business Group on Health (PBGH). All of these PBGH claimants (N = 16,566) had been discharged from 1 of 22 Pittsburgh area acute care hospitals during calendar year 1987. For an analysis of readmissions within 31 days, this 1987 PBGH claims database was truncated at the beginning and end of the year to permit equal opportunity of readmission. That is, patients who had their index admission in December 1986 and were not readmitted in January 1987 were excluded since they would inappropriately inflate the number of patients at risk for readmission. Similarly, patients with an index admission in December 1987 who were not readmitted in

January 1988 were excluded because they would inappropriately deflate the number of patients at risk for readmission. For these reasons, the population at risk was reduced to 14,122 patients.

As mentioned previously, an analysis of readmissions occurring within one year of the initial discharge was also conducted. For this purpose, the database was expanded to include all of 1988 PBGH claims in order to ensure that patients discharged in December 1987 had the same chance of being readmitted (through December 1988) as those patients whose first discharge was in January 1987 and for whom any readmission through January 1988 would be counted. Since 1986 data were not available, patients who had index admissions in 1986 and readmissions in 1987 could not be identified for exclusion.

To determine whether the total Blue Cross of Western Pennsylvania claims experience with respect to readmissions paralleled that of the PBGH subset, a separate analysis was conducted using a second database of all Blue Cross patients discharged in 1987 from any of the 88 western Pennsylvania acute care hospitals (N = 147,041). The same methods were used to ensure that patients had an equal opportunity of readmission within 31 days and within one year of the index admission. The resultant databases included 124,833 patients and 142,193 patients at risk for readmission, respectively.

Other adjustments were also made to ensure equal risk of inclusion in the databases. For example, those patients admitted only once during the time period and who died during that hospitalization were excluded from the population at risk because they had no chance of being readmitted. Transfers between hospitals and between units in the same hospital were treated as one hospitalization rather than a readmission. Note that patients who died outside the hospital were not identifiable in this study in order to exclude them from patients at risk for readmission. Also, individuals who changed their Blue Cross coverage status during the period studied

(including those who changed from Blue Cross to Medicare) were not excluded from the database even though they would not be at risk for readmission. Inclusion of these patients may have caused some underestimate of readmissions.

RESULTS

In this section, the results of defining expected versus unexpected readmissions using both PBGH and Blue Cross databases are described. Rates of readmission within 31 days and for the longer time period of one year are then derived using these case mix adjustments to compare with results using gross readmission rates. Finally, the impact of including regional readmissions is assessed.

Types of Readmissions

For PBGH patients and for all Blue Cross patients who were readmitted within 31 days, Figure 1 shows the distribution of expected versus unexpected readmissions. As shown, of all PBGH patients readmitted within one month of discharge, 17.4 percent (182 of 1,044) were unexpected readmissions. These are the readmissions defined by PMCs, representing potential nosocomial infections, complications of previous care, ambulatory, and symptom/related diagnoses, that should be reviewed as part of the hospital's quality assessment program. The remaining 82.6 percent of PBGH readmissions were repeat admissions for cancer treatment (14.2 percent), organ transplantation (0.7 percent), labor and delivery (9.1 percent), scheduled procedures (7.8 percent), and unrelated acute conditions or chronic conditions for which multiple admissions are expected (50.8 percent). This latter group is comprised of two general types of patients: 1) patients who have two or more hospitalizations during the specified time period that appear to be clinically unrelated (e.g., a patient who is admitted for a gallbladder operation and

then readmitted for an injury); and 2) patients whose multiple admissions are clinically related but whose disease suggests periodic episodes of illness requiring hospitalization for control and/or maintenance (e.g., brittle diabetes, chronic obstructive pulmonary disease, or severe asthma).

Also shown in Figure 1 is the percentage distribution of these same types of readmissions in the Blue Cross population. As indicated, a similar proportion (16.3 percent) of all Blue Cross readmissions within one month of discharge were defined as unexpected. In fact, the percentage of readmissions in each subdivision identified (within expected and unexpected categories) is similar in both populations.

The types and percentage of readmissions that occur within 31 days are not substantially different when the time period for readmissions is extended to one year. Unexpected readmissions within one year represent 14 percent (403 of 2,883) of all readmissions over an entire year in the PBGH database. For the Blue Cross database, unexpected readmissions within one year represent 13.7 percent of all readmissions (3,195 or 23,347). These percentages are slightly lower than the proportion of unexpected readmissions within 31 days (17.4 percent and 16.3 percent, respectively) primarily because of the increased number and percentage of clinically unrelated and chronic patients who are readmitted during the longer time frame. For certain clinical areas like prosthetic device complications, readmission rates may be of special interest in a more extended time frame. In general, however, shorter time frames (30, 60, 90 days) yield greater payoff in terms of unexpected, potentially preventable readmissions.

Case Mix Adjusted Readmission Rates

Table 1 summarizes the rates of readmission for PBGH and Blue Cross patients within one month and one year of a previous discharge for selected subsets of patients. It should be

noted that the denominator of the calculation of all the rates shown in Table 1 is specifically tailored to the population at risk. That is, only transplant patients are at risk for transplant readmissions; only cancer patients are at risk for cancer readmissions. Obstetric patients who deliver are included in the denominator of more than one calculation because they are at risk for the expected false labor/delivery sequence as well as for post-delivery, unexpected complications.

Table 1

Case Mix Adjusted Readmission Rates
(Per 100 Patients)

	PBGH Readmission Rate		BLUE CROSS Readmission Rate	
	31 day	365 day	31 day	365 day
All Patients (without case mix adjustment)	7.4	17.4	6.6	15.9
Oncology	25.3	49.9	25.4	48.8
Labor & Delivery	5.3	8.3	5.0	8.9
Organ Transplant	35.0	52.0	21.8	44.5
Unexpected Readmissions (case mix adjusted)	1.3	2.5	1.1	2.2

The rates of unexpected readmissions shown in Table 1 of 1.3 per 100 patients (within 31 days) and 2.5 per 100 patients (within one year) for PBGH are adjusted for the case mix differences described in this paper. That is, they include only the clinical patient groups defined as potential nosocomial infections, complications of previous care, symptom and related acute diagnoses, and potential ambulatory readmissions. The Blue Cross rates of 1.1 per 100 patients

(within 31 days) and 2.2 per 100 patients (within one year) are case mix adjusted in the same way. The latter results are not different from those in the PBGH population.

These case mix adjusted readmission rates are dramatically different from the gross readmission rates (without case mix adjustment) shown in Table 1 for the same time periods (7.4 per 100 patients and 17.4 per 100 patients for PBGH in 31 and 365 days, respectively; and 6.6 per 100 patients and 15.9 per 100 patients for Blue Cross in 31 and 365 days, respectively). The high readmission rates associated with oncology and transplant patients and the high volume associated with labor and delivery patients (all of whom are included in the gross readmission rates) distort the gross readmission rates and make interpretation of such unadjusted rates virtually impossible.

Of all oncology patients admitted to Pittsburgh area hospitals in 1987, about one fourth of them were readmitted within 31 days of the previous discharge, and nearly half were readmitted within one year. Although not displayed, there is a great deal of variability in the number of patients admitted to each hospital for cancer diagnosis and treatment; thus, hospital-specific readmission rates are also variable. It is not clear, however, whether this variability is due to the size of each hospital's oncology service or to the mix of cancer patients at each institution and their clinical requirements for palliative versus curative therapy. Since inappropriate readmissions may be occurring in this group as well, further study is warranted to determine whether a screening tool can be devised to identify quality problems in this restricted subpopulation.

Although those patients who received an organ transplant in 1987 represented a small proportion of all readmissions (0.7 percent for each population in Figure 1), they had high rates of readmission for complications and/or rejection. Organ transplant readmission rates are, for an

unknown reason, higher for PBGH patients than they are for Blue Cross patients (35.0 versus 21.8 per 100 within 31 days and 52.0 versus 44.5 per 100 within one year, respectively).

Although the overall rates of readmission for labor and delivery are relatively low in both populations (i.e., approximately 5.0 readmissions per 100 within 31 days and 8.0 per 100 within one year), wide variability exists among hospital specific readmission rates as it does for other clinically specific patient types. Regardless of whether this variability is due to the volume or mix of patients, it is important to adjust for these clinical factors before hospitals are compared using readmission rates that are suggestive of quality problems.

Hospital Specific Readmission Rates

In this study, much effort has been directed at the identification and isolation of unexpected or preventable readmissions so that a more reasonable comparative analysis of hospital readmission rates could be performed. When this is accomplished, hospital specific readmission rates are reduced dramatically. Using both databases, the range of hospital specific rates of unexpected readmissions was from 10 to 5.8 percent while the gross readmission rates (without case mix adjustments) ranged from 0 to 20.8 percent. Using the larger database of all Blue Cross claims at 88 hospitals, 94.3 percent of all hospitals had less than 2.0 percent unexpected readmissions, and all hospitals had rates below 3.0 percent. Hospital specific rates are probably more stable in the larger population.

In addition to the low level of unexpected readmissions in any particular hospital, the hospitals with the highest gross readmission rates are not the same hospitals that have the highest rate of unexpected readmissions. In fact, of the ten hospitals with gross readmission rates between 10.0 and 20.8 percent, after case mix adjustment, only half of these hospitals had relatively high rates of unexpected readmissions (greater than 2.4 percent). Thus, it is clear that

using unadjusted readmission rates to compare hospitals with respect to this one dimension of quality yields inaccurate and misleading results. In order to have a useful indicator of quality at the hospital level, it is important to refine and use a rate of only unexpected and preventable readmissions.

One direct application of the methodology to identify unexpected readmissions developed here is in an individual hospital quality assessment program or a similar program sponsored by a payer. Used as a screen, this case mix adjustment to readmissions can be used effectively to minimize review efforts and focus on cases that are more likely to yield quality improvements. For example, using this methodology, the overall rate of unexpected readmissions of 1.3 percent of PBGH patients represents 182 readmissions. This is a much better targeted group of patients to review tan the original 1,044 patients identified using the gross readmission rate of 7.4 percent. Similarly, the rate of unexpected readmissions for Blue Cross patients of 1.1 per 100 patients represents 1,131 readmissions in contrast to the 8,187 patients that would have been identified for review using the gross readmission rate of 6.6 percent of patients readmitted within 31 days.

The majority of the patients defined as unexpected readmissions in these databases were readmitted with an acute diagnosis similar to the diagnosis of their first hospitalization. The other groups of unexpected readmissions were widely dispersed with no apparent pattern within or across hospitals. It is not expected that all of these readmissions that have been highlighted for review by this screening mechanism will reflect quality of care problems. It is important to emphasize that even readmissions identified through this process may, after further detailed review, be found to be clinically appropriate. Conversely, readmissions found to be inappropriate and preventable may be the result of other external factors such as patient

noncompliance. It is an assumption of this study, however, that these influences are random and are not systematically inflating the rate of any one hospital or any type of hospital.

Regional Readmissions

Using only the PBGH database, a detailed examination of regional readmissions (i.e., readmission to a different hospital from the index hospital admission) was undertaken to determine whether regional readmissions are a significant factor in examining readmissions. Since this study was performed using a subscriber claims database, it was possible to link all of an individual's hospitalization claims, regardless of the number of hospitals to which the patient was admitted. In the PBGH database, 22.3 percent of all readmissions within 31 days (233 of 1,044) were to a different hospital in the region as is shown in Figure 2. An analysis of these patients' records indicated that the most frequent type of regional readmission was a readmission for an unrelated diagnosis. Figure 2 also shows that only 33 of the 233 regional readmissions (14.2 percent) were defined as unexpected readmissions. These 33 readmissions to a different facility represented 18.1 percent of all unexpected readmissions (33 of 182).

A similar pattern exists when readmissions within one year are examined. For this extended interval, regional readmissions represented 26.6 percent of total readmissions, but only 16.4 percent of the unexpected readmissions. Part of this difference is accounted for by expected readmissions to a second hospital for medical technology (e.g., lithotripsy) or services not available at the originating hospital (e.g., cardiac catheterization).

The impact of these numbers can be shown most clearly when regional readmissions are not included in the calculation of unexpected readmission rates. If regional readmission data were not available (as is the case in many published studies), the comparative hospital readmission rate would be 1.1 per 100 PBGH patients (as opposed to 1.3 per 100) within 31 days

and 2/1 per 100 PBGH patients (as opposed to 2.5 per 100) within 365 days. An even greater impact would occur if gross readmission rates were used without the case mix adjustments made in this study.

DISCUSSION AND POLICY IMPLICATIONS

Although the issue of quality in health care has many dimensions, it is obvious that no single measure or set of measures will adequately reflect quality of care for such a complex process as health care delivery. But, in order to effect quality improvement, employers, payers, and providers of health care must begin to select indicators of quality that can be used effectively to measure the processes and outcomes of care both consistently and continuously. Case mix adjustment is a necessary step in the search for indicators of quality of care, especially at the hospital level where these indicators seem desirable for comparative purposes. It is important to recognize, however, that these indicators represent a cross-sectional view of quality at a point in time and must therefore be continuously monitored and reported at set intervals.

The methodology developed in this study provides a clinical framework to systematically analyze readmissions by differentiating clinical conditions enough so that unexpected and potentially preventable readmissions can be identified. The maj9or finding is that, when expected readmissions are excluded, the overall hospital readmission rate is very low (about one patient per 100 using large databases). More importantly, patterns of inappropriate or preventable readmissions were not found within hospitals. The study challenges the assumption that readmissions generally reflect quality problems and that patterns of potentially avoidable readmissions are common and obvious targets for action.

Part of the benefit of this information is derived from a review by each hospital of its own data. Therefore, prior to release of the PBGH portion of the study, hospital specific results were

provided to each of the 44 hospitals included in the analysis. Although entirely voluntary, both verbal and written comments received from the hospitals pertaining to their unexpected readmissions provided valuable insights regarding the effectiveness of this screening device in identifying readmissions as a quality indicator. The following considerations are noteworthy:

- The detailed medical record review revealed coding and medical record documentation problems;
- Independent physician peer review is essential in judgments of quality; and
- Unexpected readmission rates should not be interpreted in terms of statistical significance.

Some coding and medical record documentation problems were identified during the medical record review. Since documentation and coding are integral to the quality of care process, they should be monitored for accuracy and completeness. The systematic process of identifying and reviewing unexpected readmissions will assist in this process. Improved data quality will eliminate false positives in identifying quality problems and aid in the identification of false negatives that are excluded from the review process.

Although the issue of independent physician review is frequently a sensitive one, independent case selection seemed much more acceptable. In fact, physicians commented that having a tool that can be modified over time to assist in independently selecting cases for review seemed to permit more open discussion among the hospital's physicians.

Finally, people have come to rely on statistical significance testing as a substitute for their own judgment about practical meaningfulness. Statistical significance testing is not helpful, however, in the current evaluation of unexpected readmissions. The number and rate of unexpected readmissions identified in this study are reflective of actual practice patterns in the respective populations of PBGH and Blue Cross. Although the absolute values of these adjusted

readmission rates were small and their variability across hospitals was relatively low, they are important enough to warrant review and further monitoring over time for stability. The final test of real significance is whether problems are identified in the process of care that can be prevented in the future.

This study was designed to develop a readmission indicator of quality of care. The readmission rates presented here are intended as a screening device for potential quality problems, not a definitive measure of quality. Because the screening device applies the same rules to all cases consistently, it identifies a subset of all readmissions for review that are comparable across hospitals and can be used to identify potential quality problems. Used as a screen, this case mix adjusted readmission rate will minimize review efforts by focusing on those cases that are more likely to lead to areas for quality improvement.

This study shows the importance of identifying and refining indicators to use as quality assessment tools. It also shows some important ways of reefing indicators to obtain more comparable and accurate indices across hospitals. This study represents one of the few attempts to develop case mix adjusted hospital level quality indicators that are specific enough to be the basis of policy decisions and action. Yet it is important to note that the case mix adjusted indicators presented in this study (as refined as they are) are only one piece of a comprehensive puzzle on quality care. This piece must be integrated with other information to form a more complete picture of hospital performance not only at a point in time, but as part of an ongoing program to monitor quality and costs.

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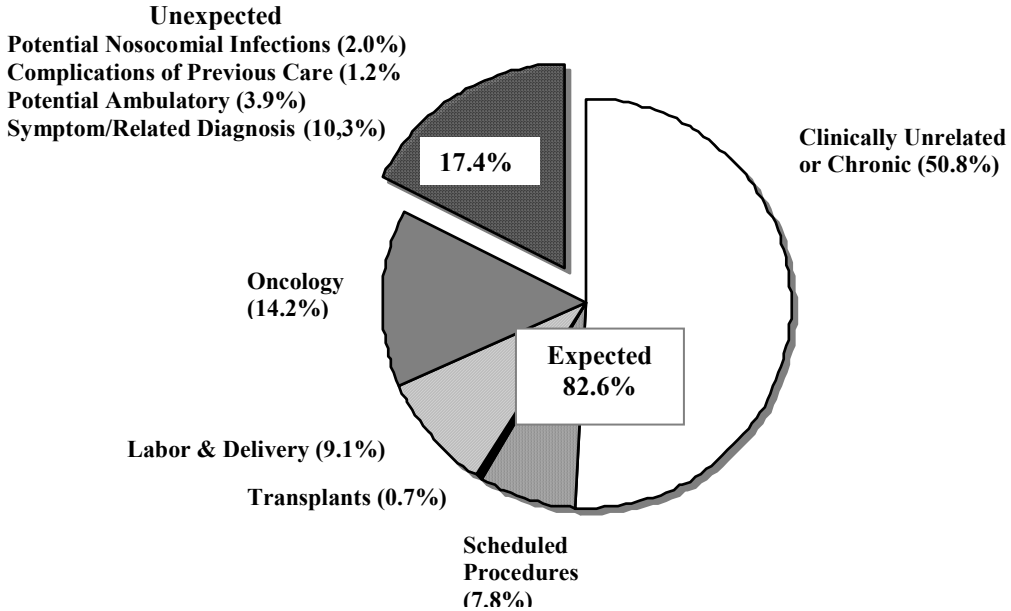
Figure 1

Readmissions Within 31 Days By Clinical Group

PBGH Readmissions
N = 1,044



All Blue Cross Readmissions
N = 8,187

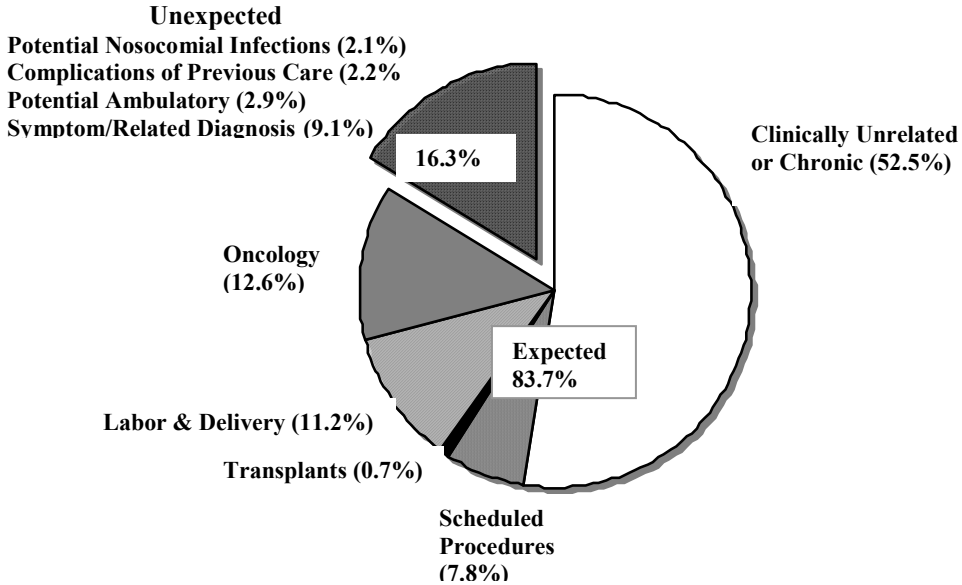


Figure 2
Regional Readmissions Within 31 Days
BGH Claims Data, 1987
N = 1,044