
Measuring The Quality Of Pennsylvania's Commercial HMOs

CALENDAR YEAR 2000

TECHNICAL REPORT

THE PENNSYLVANIA HEALTH CARE COST CONTAINMENT COUNCIL

April 2002

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FOREWORD

The Pennsylvania Health Care Cost Containment Council (PHC4) wishes to thank all those who offered recommendations for the preparation of this study and who reviewed the many drafts of the final text. The Council offers special thanks to its Technical Advisory Group, a standing PHC4 committee charged with overseeing all technical and methodological aspects of the Council's research. The Council's Payor Advisory Group provided special guidance on matters related to the payor data included in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, including data provided by the National Committee on Quality Assurance®. We appreciate the interest that these groups have shown in this study and are grateful for their advice.

The Council also wishes to thank the Managed Care Association of Pennsylvania and the Insurance Federation of Pennsylvania for their assistance and support throughout this process.

A thank you is likewise extended to the Council's Data Systems Committee who reviewed all aspects of this report and the Education Committee for review of the report layout and text. We are also indebted to Dr. Thomas Smitherman and the clinical advisors at hospitals who took the time to personally advise Council staff regarding case selection and assisted with coding issues. Dr. Mary Simmonds advised staff on the technicalities of breast cancer treatment. Advice was also provided by Dr. William West for hysterectomy, Dr. Mark Piasio for the neck and back procedures, and Dr. Peter Lund for prostatectomy.

The Council wishes to acknowledge the efforts of hospital and HMO staff that checked and rechecked the data included in this study.

As we strive toward the goal of quality, cost-effective health care, as directed by managed care networks, we truly appreciate the efforts that these individuals and groups committed to this project.

Copies of the *Measuring the Quality of Pennsylvania's Commercial HMOs* report and this document, the *Technical Report*, can be obtained by contacting the Council, or can be accessed electronically via the Council's Web site.

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TECHNICAL REPORT
MEASURING THE QUALITY OF PENNSYLVANIA'S COMMERCIAL HMOs
CALENDAR YEAR 2000

OVERVIEW

This technical supplement accompanies the Calendar Year 2000 version of the *Measuring the Quality of Pennsylvania's Commercial HMOs* report. Included in this *Technical Report* are detailed descriptions of the data and their sources, explanations for the adjustments to the data, and presentation of the methodology used for risk adjustment of the utilization and clinical outcomes data.

The *Measuring the Quality of Pennsylvania's Commercial HMOs* report provides information related to the quality of health care services received by members of commercial Health Maintenance Organizations (HMOs) and related Point of Service (POS) plans licensed by the Department of Health to do business in Pennsylvania. The report brings together information from several sources that are of interest to purchasers, consumers, payors, and providers. This collection of information and data allows all interested readers to make comparisons among HMOs based upon a comprehensive set of data. Sources of information include

- Pennsylvania's hospitals and ambulatory surgery centers,
- the National Committee for Quality Assurance,
- the Pennsylvania Department of Health,
- the Pennsylvania Insurance Department,
- and the commercial HMOs in Pennsylvania.

Most of the content of the *Technical Report* describes calculations that serve as the basis for the utilization and clinical outcome measures found in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report. Also included are detailed explanations for data collection and verification procedures, selection of clinical conditions and outcomes for study, and other comparative measures. Descriptions of financial indicators, ratings of HMOs by members, and plan profile information are further explained.

Utilization and outcome measures are provided for fourteen specific clinical conditions/treatments included in the public report. This *Technical Report* details the methodology for the age/sex adjustment of hospitalization rates, and the risk adjustment for length of stay, in-hospital complications, percent rehospitalized, and in-hospital mortality.

It is important to note that the research methodology yielding utilization and outcome ratings is complex and differs for all clinical conditions. Methodology development was based upon state-of-the-art research practice. This development included a review of the current medical outcome literature, discussions with practicing medical professionals, and careful examination and approval by the Council's Technical Advisory Group. Each clinical condition was selected because:

- it is of high importance to purchasers and consumers,
- it is generally a high-volume, high-risk, or high cost condition/procedure,
- and its management by HMOs and their providers can reasonably be expected.

DATABASES

The databases (depicted below) used to analyze each of the fourteen clinical conditions—Pediatric Ear, Nose and Throat Infections; Adult Ear, Nose and Throat Infections; High Blood Pressure (Hypertension); Gastrointestinal Infections; Kidney/Urinary Tract Infections; Chronic Obstructive Pulmonary Disease; Pediatric Asthma; Adult Asthma; Diabetes; Heart Attack (Acute Myocardial Infarction; AMI); Hysterectomy; Breast Cancer Procedures; Neck and Back Procedures; and Prostatectomy—were derived from discharge data submitted to PHC4 by Pennsylvania health care facilities.

The statewide database was comprised of cases who(se):

- age is under 65 years (except for diabetes in which the age interval is 18 years to 75 years),
- met the clinical inclusion criteria for each condition investigated (see Appendix A: *Description of Study Population*),
- and were discharged from a Pennsylvania *acute care* hospital (or received care in an inpatient or ambulatory surgical setting for breast cancer procedures) between January 1, 2000 and December 31, 2000.

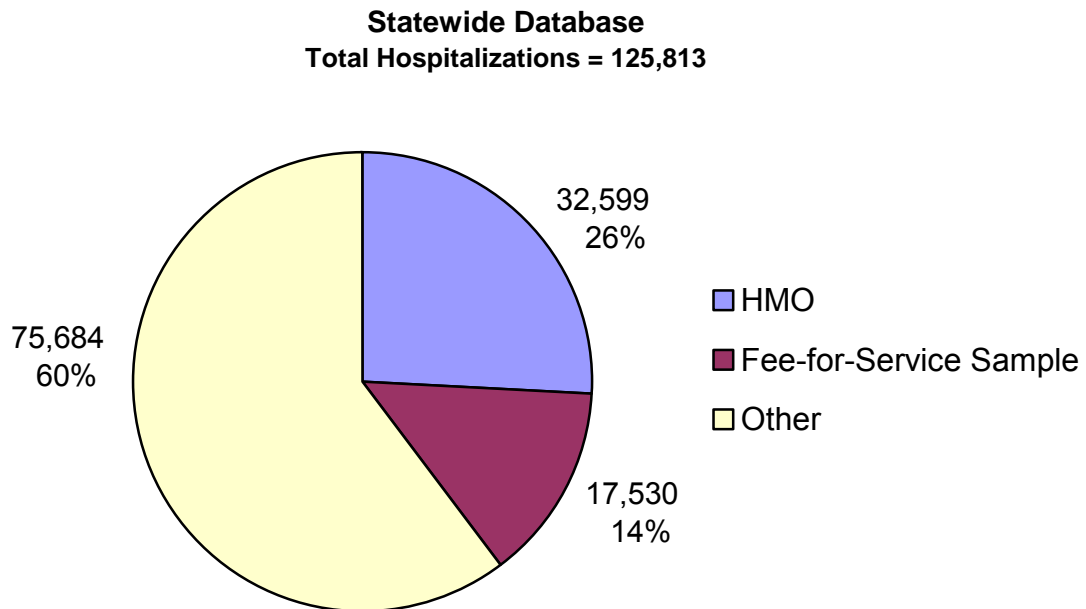
The HMO database was derived from the statewide database and included:

- aggregate hospitalizations for members of all commercial HMOs licensed by the Pennsylvania Department of Health.

The “Fee-for-Service” sample was derived from the statewide database and included:

- aggregate hospitalizations for members of commercial, traditional “fee-for-service” plans (this group included only those patients who were clearly identified in a hospital record as a member of one of the 67 largest fee-for-service plans in Pennsylvania). Hospitalization rates per member are not reported for this group because detailed enrollment data by plan were not available.

The hospitalizations that constituted the “Other” group in the statewide database included hospitalizations where the payor was Medicare, Medicaid, or self-pay, as well as those records where the payor could not be identified.



Only inpatient acute care hospitalizations (with the exception of breast cancer procedures) were analyzed for this report. Study populations for each of the fourteen clinical conditions were constructed by identifying cases in the statewide database that met the definition criteria for each particular condition evaluated. Utilization and outcome measures were then defined. Analysis of the results consisted of comparisons between individual HMO organizations and either the statewide database or the HMO database depending upon the condition under study. Listed in the Table 1 are the comparative databases that determined expected percents for each appropriate PHC4 measure (where actual percents were compared to expected percents), and were used to risk adjust for each PHC4 measure that involved risk adjustment. For example, the statewide database neck and back procedures included those cases meeting the definition criteria for neck and back procedures and were under age 65 but over age 17. This statewide database was then used as the comparative standard when determining the risk-adjusted length of stay for each HMO plan for neck and back procedures.

Results are presented in the public report in a manner that allows the reader to visually compare the results for individual HMO plans and the HMO state total/average (and to a fee-for-service sample, if the comparative reference was the statewide database).

Table 1. Comparative References

Reported Measure	Database Used
<i>Hospitalization/Procedure Rate</i>	
▪ Pediatric Ear, Nose and Throat Infections	HMO Hospitalizations (members 28 days - 17 years)
▪ Adult Ear, Nose and Throat Infections	HMO Hospitalizations (members 18 - 64 years)
▪ High Blood Pressure	
▪ Gastrointestinal Infections	HMO Hospitalizations (members 28 days - 64 years)
▪ Kidney/Urinary Tract Infections	
▪ Chronic Obstructive Pulmonary Disease	HMO Hospitalizations (members 18 - 64 years)
▪ Pediatric Asthma	HMO Hospitalizations (members 28 days - 17 years)
▪ Adult Asthma	HMO Hospitalizations (members 18 - 64 years)
▪ Diabetes	HMO Hospitalizations (members 18 - 75 years with diabetes)
▪ Heart Attack	HMO Hospitalizations (members 18 - 64 years)
▪ Hysterectomy	
▪ Breast Cancer Procedures	
▪ Neck and Back Procedures	
▪ Prostatectomy	
<i>Length of Stay</i>	
▪ Chronic Obstructive Pulmonary Disease	HMO Hospitalizations (members 18 - 64 years)
▪ Pediatric Asthma	HMO Hospitalizations (members 28 days - 17 years)
▪ Adult Asthma	HMO Hospitalizations (members 18 - 64 years)
▪ Diabetes	HMO Hospitalizations (members 18 - 75 years with diabetes)
▪ Heart Attack*	Statewide Hospitalizations (members 18 - 64 years)
▪ Hysterectomy	
▪ Breast Cancer procedures	
▪ Neck and Back procedures	
▪ Prostatectomy	
<i>Percent Rehospitalized – 180 days</i>	
• Chronic Obstructive Pulmonary Disease	HMO Hospitalizations (age 18 - 64 years)
• Asthma (adult only)	
▪ Diabetes	HMO Hospitalizations (members 18 - 75 years with diabetes)
<i>In-Hospital Complications</i>	
▪ Hysterectomy	Statewide Hospitalizations (members 18 - 64 years)
▪ Breast Cancer Procedures	
▪ Neck and Back procedures	
▪ Prostatectomy	
<i>In-Hospital Mortality – 30 days</i>	
• Heart Attack	Statewide Hospitalizations (age 18 - 64 years)

* The Average Number of Days Hospitalized, rather than the Length of Stay, is reported for Heart Attack.

DATA COLLECTION AND VERIFICATION

The data utilized in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report were obtained from several sources including: (1) discharge data submitted to PHC4 by Pennsylvania health care facilities, (2) the National Committee for Quality Assurance (NCQA) through the purchase of *Quality Compass*® (see the “Staying Healthy” section of the *Measuring the Quality of Pennsylvania's Commercial HMOs* report), (3) the Pennsylvania Department of Health, and (4) the Pennsylvania Insurance Department. Pennsylvania hospitals verified data used to generate utilization measures and clinical outcomes, and HMO plans verified payor information listed in the hospital-submitted records. A more detailed explanation of the data and data sources follows.

PHC4 and Hospital-Submitted Data: HMO Verification of Payor

Data specific to the fourteen clinical conditions were submitted to PHC4 by licensed Pennsylvania health care facilities. Refer to Appendix A: *Description of Study Population* for a listing of the diagnosis and procedure codes that defined each clinical condition in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report.

The process used by PHC4 to identify specific HMO payors for hospitalizations relied upon the National Association of Insurance Commissioners (NAIC) code in the discharge record. The NAIC code is used by the hospital to identify the primary payor of a patient's care and provides a coded name for the specific HMO. All records that clearly identified an HMO plan as the principal payor by the NAIC code were directly assigned to that respective HMO for verification. In addition, a record was sent to an HMO plan if any part of a discharge record pointed to that particular HMO plan as the payor. This was necessary to assure inclusion of all appropriate records.

Exact identification of primary payor was more difficult for those HMO plans that market several products under one generic product or company name. The most common difficulty was separation of commercial (usually employer-paid benefits) from government-contracted members (primarily Medical Assistance and sometimes Medicare) within the same insurance company.

The verification process presented three options to HMO plans: 1) verify and return a record for inclusion in the analyses, 2) reject and flag those records for which the plan was not the primary payor, or 3) add records that PHC4 did not include in the initial data file. Additions were possible if: 1) the record was based upon correct ICD.9.CM codes, 2) PHC4 was able to match the added record to a hospital discharge record, and 3) no other HMO plan in the statewide database claimed the same record.

Rejection of records by HMOs occurred for two reasons: 1) the patient was not a member of the HMO, and 2) the HMO was not the primary payor.

Every HMO and related POS plan that received a file for verification from PHC4 reviewed, verified and returned the data.

NCQA

The National Committee for Quality Assurance (NCQA) is a private, not-for-profit organization dedicated to assessing and reporting on the quality of managed care plans. According to the NCQA Web site (www.ncqa.org), “NCQA's mission is to provide information that enables purchasers and consumers of managed health care to distinguish among plans based on quality, thereby allowing them to make more informed health care purchasing decisions.”

NCQA collects data via the Health Plan Employer Data and Information Set and consumer surveys that assess health plan performance and member satisfaction with their HMO. These data, available collectively in NCQA's *Quality Compass* (the central repository of data collected nationally from the NCQA accreditation surveys), are then available for purchase. Select outcome measures from NCQA's *Quality Compass* (2000 calendar year) are included in this report.

HEDIS Measures

The Health Plan Employer Data and Information Set® (HEDIS) is a health plan performance tool developed by NCQA and is a component of the NCQA accreditation process. The "HMO State Average" for each measure (derived from the *Quality Compass* database weighted by HMO enrollment) is calculated by PHC4. The *HEDIS Technical Specifications Manual* provides a detailed description of the calculations used to determine the numerator and denominator for these measures. The HEDIS "Effectiveness of Care" and "Use of Services" measures displayed in this report include:

Comprehensive Diabetes Care is a composite measure used to examine the frequency and results of certain tests for HMO members with diabetes. The measure evaluates HMO performance on six aspects of diabetes care using a single sample of members age 18 to 75 years old who have diabetes. The six components of the comprehensive diabetes care measure are expressed as a percent of members with diabetes who had each of the following:

- *Poorly Controlled Hemoglobin A1c Levels for Members with Diabetes:* Poor HbA1c control (i.e., the most recent HbA1c test level within the calendar year 2000 that was greater than 9.5 percent. If no test was performed, then it is counted as poor HbA1c control).
- *Hemoglobin A1c Blood Tests for Members with Diabetes:* Hemoglobin A1c (HbA1c) tested (i.e., at least one HbA1c test conducted during the calendar year 2000).
- *Eye Exam Performed for Members with Diabetes:* Eye exam performed (i.e., an eye screening for diabetic retinal disease conducted during the calendar year 2000 or, in certain circumstances, the calendar year 1999).
- *Monitoring Kidney Disease for Members with Diabetes:* Kidney disease monitored (i.e., a microalbuminuria screening performed during the calendar year 2000, or previous evidence of kidney disease such as a positive microalbuminuria screening or medical treatment for kidney disease).
- *Cholesterol Screening for Members with Diabetes:* LDL-C screening performed (i.e., a low-density lipoprotein cholesterol test conducted during the calendar year 1999 or 2000).
- *"Bad" Cholesterol Controlled for Members with Diabetes:* LDL-C controlled (i.e., the most recent low-density lipoprotein cholesterol test level performed during the calendar year 1999 or 2000 that was less than 130 mg/dL. If there was no valid LDL-C value within the last two measurement years, it is counted as exceeding the threshold).

As a set, these six aspects of care provide a comprehensive picture of the clinical management of patients with diabetes. The specifications for this measure are consistent with recommendations of the Diabetes Quality Improvement Project.

Childhood Immunizations is reported as the percent of enrolled children who turned two years old during the calendar year 2000, who were continuously enrolled for 12 months immediately preceding their second birthday, and who were identified as having four

DTP/DtaP, three IPV/OPV, one MMR, two H influenza type b, three hepatitis B and one chicken pox vaccine.

Advising Smokers to Quit is reported as the percent of commercial HMO members age 18 years and older as of December 31, 2000 who were continuously enrolled during 2000, were either current smokers or recent quitters, were seen by a plan provider during the reporting year, and received advice to quit smoking during 2000 from a plan practitioner.

Timely Initiation of Prenatal Care is reported as the percent of women who delivered a live birth between November 6th of the calendar year 1999 and November 5th of the calendar year 2000, who were continuously enrolled at least 43 days prior to delivery, and who received a prenatal care visit in the first trimester or within 42 days of enrolling in the HMO.

Screening for Breast Cancer is reported as the percent of women age 52 through 69 years old, who were continuously enrolled during the calendar years 1999 and 2000 and had a mammogram during either of those two years.

Screening for Cervical Cancer is reported as the percent of commercially enrolled women age 21 through 64 years, who were continuously enrolled during the calendar years 1998, 1999 and 2000, and who received one or more Pap tests during one of those three years.

Cholesterol Management after Acute Cardiovascular Events consists of two measures (referred to as *Cholesterol Screening after Acute Cardiovascular Events* and “Bad” *Cholesterol Controlled after Acute Cardiovascular Events* in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report). The first measure reports the percent of members age 18 through 75 as of December 31, 2000 who were discharged alive during the prior year for AMI, CABG or PTCA (angioplasty) and had evidence of receiving an LDL-C screening during the measurement year. The second measure reports the percent of those members that received this screening who had an LDL-C level of less than 130mg/dL.

Appropriate Medications for Members with Asthma evaluates whether members with persistent asthma are being prescribed medications acceptable as primary therapy for long-term control of asthma. Members with “persistent” asthma are approximated based on services received during the prior year and medication utilization, rather than by a clinical measure of severity. The consistent use of the following medications result in a member being added to the numerator: Inhaled Corticosteroids, Cromolyn Sodium and Nedocromil, Leukotrine Modifiers, and Methylxanthines. Use of long-acting, inhaled beta-2 agonists are not included in the numerator.

Controlling High Blood Pressure is an intermediate outcome measure that assesses whether blood pressure was controlled among adult members with diagnosed hypertension. This measure can only be calculated by using the hybrid method (for further explanation of the hybrid methodology, see the *HEDIS Technical Specifications Volume 2*). For the Controlling High Blood Pressure measure, the hybrid method uses membership data and ambulatory claims/encounter data to identify members ages 46 to 85 years old with a diagnosis of hypertension and a medical record review to confirm the hypertension diagnosis and to assess blood pressure control during the membership year.

Beta Blocker Treatments After a Heart Attack is reported as the percent of commercial HMO members age 35 years and older who were hospitalized and discharged alive from January 1, 2000 through December 31, 2000 with a diagnosis of acute myocardial infarction (AMI) and who received a prescription for beta blockers upon discharge. NCQA provides a list of contraindications to allow plans to adjust the number of commercial members who qualify for treatment.

The source for the HEDIS data contained in this publication is Quality Compass® and is used with the permission of the National Committee for Quality Assurance (NCQA). Any analysis, interpretation, or conclusion based on these data is solely that of PHC4, and NCQA specifically disclaims responsibility for any such analysis, interpretation, or conclusion. Quality Compass is a registered trademark of NCQA.

HEDIS Rotation Strategy

Beginning with HEDIS 1999, NCQA implemented a measures rotation strategy. The purpose of the strategy is to reduce data collection burdens for the HMOs while still providing relevant and accurate data to consumers. The strategy allows HMOs to skip, for one year, the task of collecting data for certain HEDIS measures, and permits the plans to use the results from the previous year instead. Measures included in the rotation schedule must have been in the measurement set for two years and have stable data collection specifications. For this report, two HEDIS measures were part of the HEDIS rotation strategy in CY 2000:

- Beta Blocker Treatments After a Heart Attack
- Childhood Immunizations

A summary of all rotation measures included in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report follows:

Table 2. Repeat of CY1999 Outcome Measures in the CY2000 Report by HMO
As Allowed by the HEDIS Rotation Schedule for Specific HEDIS Measures

Plan Name	Beta Blocker Treatments After a Heart Attack	Childhood Immunizations
Aetna U.S. Healthcare	✓	
CIGNA		✓
First Priority Health	✓	✓
Geisinger	✓	
HealthAmerica		✓
HealthAssurance		✓
HealthGuard	✓	✓
Highmark/KHP West	✓	✓
KHPE	✓	

CAHPS Measures

Another important component of the NCQA accreditation process is the Consumer Assessment of Health Plans Study® (CAHPS) survey instrument. Commercial HMOs hire vendors from an NCQA-approved list to administer this member satisfaction survey.

The *Measuring the Quality of Pennsylvania's Commercial HMOs* report includes calendar year 2000 CAHPS scores for 12 Pennsylvania plans (13 lines of business).

Pennsylvania Department of Health

Each HMO licensed by the Pennsylvania Department of Health files an *Annual Report* each April that summarizes enrollment, provider network and financial data from the previous calendar year (as of December 31st). Information from these *Annual Reports* may be found on the Council's Web site in the "Plan Profile" section.

Pennsylvania Insurance Department

Each HMO is required to file a detailed annual financial statement with the Pennsylvania Insurance Department (PID). PHC4, at the request of the HMOs included in this report, calculated the financial indicators shown on the Council's Web site using these data.

CLINICAL CONDITIONS AND MEASURES
PHC4 Utilization and Outcome Measures, and HEDIS Effectiveness of Care Measures

The measures described in this report are tailored to each clinical condition. Listed below are the measures reported for each of the clinical conditions included in the calendar year 2000 report.

Table 3. Clinical Conditions and Measures

Condition	Data Source	Measure
Ear, Nose and Throat Infections	PHC4	<ul style="list-style-type: none"> • Pediatric and Adult reported separately: <ul style="list-style-type: none"> ○ Hospitalization Rate per 10,000 Members (age & sex adjusted) ○ Statistical Rating for Hospitalization Rate
High Blood Pressure	PHC4	<ul style="list-style-type: none"> • Hospitalization Rate per 10,000 Members (age & sex adjusted) • Statistical Rating for Hospitalization Rate
	HEDIS	<ul style="list-style-type: none"> • Controlling High Blood Pressure
Gastrointestinal Infections	PHC4	<ul style="list-style-type: none"> • Hospitalization Rate per 10,000 Members (age & sex adjusted) • Statistical Rating for Hospitalization Rate
Kidney/Urinary Tract Infections	PHC4	<ul style="list-style-type: none"> • Hospitalization Rate per 10,000 Members (age & sex adjusted) • Statistical Rating for Hospitalization Rate
Chronic Obstructive Pulmonary Disease	PHC4	<ul style="list-style-type: none"> • Hospital Admissions • Hospitalization Rate per 10,000 Members (age & sex adjusted) • Statistical Rating for Hospitalization Rate • Length of Stay, Risk-Adjusted • Percent Rehospitalized (risk-adjusted)
Asthma	PHC4	<ul style="list-style-type: none"> • Pediatric and Adult reported separately: <ul style="list-style-type: none"> ○ Hospital Admissions ○ Hospitalization Rate per 10,000 Members (age & sex adjusted) ○ Statistical Rating for Hospitalization Rate ○ Length of Stay, Risk-Adjusted • Adult only: <ul style="list-style-type: none"> ○ Percent Rehospitalized (risk-adjusted)
	HEDIS	<ul style="list-style-type: none"> • Appropriate Medications for Members (pediatric and adult) with Asthma (percent)

Table 3. Clinical Conditions and Measures continued

Condition	Data Source	Measure
Diabetes	PHC4	<ul style="list-style-type: none"> • Number of Members with Diabetes • Hospital Admissions • Hospitalization Rate per 10,000 Members with Diabetes (age & sex adjusted) • Statistical Rating for Hospitalization Rate • Length of Stay, Risk-Adjusted • Percent of Admissions for Short-term Complications of Diabetes • Percent Rehospitalized (risk-adjusted)
	HEDIS	<ul style="list-style-type: none"> • Poorly Controlled Hemoglobin A1c Levels (percent) • Hemoglobin A1c Blood Tests (percent) • Eye Exam Performed (percent) • Monitoring Kidney Disease (percent) • Cholesterol Screening (percent) • “Bad” Cholesterol Controlled (percent)
Heart Attack (AMI)	PHC4	<ul style="list-style-type: none"> • Hospital Admissions • Hospitalization Rate per 10,000 Members (age & sex adjusted) • Average Number of Days Hospitalized (risk-adjusted) • Expected In-Hospital Mortality (30 day; risk-adjusted) • Actual In-Hospital Mortality (30 day; risk-adjusted) • Statistical Rating for 30 day In-Hospital Mortality • Percent Receiving Diagnostic Catheterization Procedure • Percent Receiving PTCA/Stent Procedure • Percent Receiving Coronary Artery Bypass Graft (CABG) Procedure
	HEDIS	<ul style="list-style-type: none"> • Cholesterol Management after Acute Cardiovascular Events—2 measures: referred to as “Cholesterol Screening after Acute Cardiovascular Events” and “Bad Cholesterol Controlled after Acute Cardiovascular Events” (percents) • Beta Blocker Treatments After a Heart Attack (percent)
Mental Health ¹	HEDIS	<ul style="list-style-type: none"> • Percent of Members Receiving any Mental Health Service • Inpatient Admission Rate • Average Length of Stay • Follow-up After Hospitalization—7 day • Follow-up After Hospitalization—30 day
Other Measures	HEDIS	<ul style="list-style-type: none"> • Childhood Immunizations • Advising Smokers to Quit • Timely Initiation of Prenatal Care

¹Displayed on Web Only

Table 3. Clinical Conditions and Measures continued

Condition	Data Source	Measure
Hysterectomy	PHC4	<ul style="list-style-type: none"> • Total Hysterectomy Hospital Admissions • Procedure Rate per 10,000 Female Members (age adjusted) • Statistical Rating for Procedure Rate • Reported separately for Abdominal and Vaginal procedures: <ul style="list-style-type: none"> ○ Number of Hospital Admissions ○ Procedure Rate per 10,000 Female Members (age adjusted) ○ Statistical Rating for Procedure Rate ○ Length of Stay, Risk-Adjusted ○ Expected In-Hospital Complications (percent) ○ Actual In-Hospital Complications (percent) ○ Statistical Rating for In-Hospital Complications
	HEDIS	<ul style="list-style-type: none"> • Screening for Cervical Cancer (percent)
Breast Cancer Procedures	PHC4	<ul style="list-style-type: none"> • Total Breast Cancer Procedures • Procedure Rate per 10,000 Female Members (age adjusted) • Reported separately for Lumpectomy and Mastectomy: <ul style="list-style-type: none"> ○ Number of Procedures ○ Percent Performed Inpatient ○ Length of Stay, Risk-Adjusted (inpatient only) ○ Expected In-Hospital Complications (percent; inpatient only) ○ Actual In-Hospital Complications (percent; inpatient only) ○ Statistical Rating for In-Hospital Complications • Percent of Mastectomies with Reconstruction During the Same Admission (inpatient only)
	HEDIS	<ul style="list-style-type: none"> • Screening for Breast Cancer (percent)
Neck and Back Procedures	PHC4	<ul style="list-style-type: none"> • Total Neck and Back Procedures • Procedure Rate per 10,000 Members (age & sex adjusted) • Reported separately for With Fusion and Without Fusion: <ul style="list-style-type: none"> ○ Number of Procedures ○ Length of Stay, Risk-Adjusted ○ Expected In-Hospital Complications (percent) ○ Actual In-Hospital Complications (percent) ○ Statistical Rating for In-Hospital Complications
Prostatectomy	PHC4	<ul style="list-style-type: none"> • Total Prostatectomy Procedures • Procedure Rate per 10,000 Male Members (age adjusted) • Length of Stay, Risk-Adjusted • Expected In-Hospital Complications (percent) • Actual In-Hospital Complications (percent) • Statistical Rating for In-Hospital Complications

DESCRIPTION OF EPISODE OF CARE AND “WHAT” IS ANALYZED

An episode of care is a string of contiguous acute care inpatient hospitalizations linked by date. The total medical event or episode may be composed of a single acute care hospitalization or several such hospitalizations (i.e., transfers) coupled by date. For a multiple-hospitalization episode, the discharge date of the preceding hospitalization (in a string of contiguous hospitalizations) must be the same as the admission date of the subsequent hospitalization (independent of discharge status coding). The “index hospitalization” is the first hospitalization in the year being analyzed that meets the study population inclusion criteria. For some patients an episode of care may be composed of only a single hospitalization. Single hospitalizations are especially frequent for the preventable hospitalizations (conditions listed under the *Preventing Hospitalization through Primary Care* section of the *Measuring the Quality of Pennsylvania's Commercial HMOs* report).

Clinical information used to evaluate particular measures may be taken from *all* or only *a portion* of the hospitalizations within a multiple-hospitalization episode, depending on the measure and clinical condition being investigated. Accordingly, all hospitalizations (in a multiple-hospitalization episode) or all episodes were not necessarily used for each measure. For example, for diabetes, the main component of analysis involved the index hospitalization only (per member). Therefore, for hospitalization rate, length of stay, and percent rehospitalized analyses (measures analyzed for diabetes), the index hospitalization was the main unit of analysis. In the case of diabetes, while the main unit of analysis was the index hospitalization, the last acute care hospitalization in the diabetes episode was used as the reference in order to determine accurately a rehospitalization beginning within six months. It was necessary to use the discharge date of the last hospitalization in the episode as the reference; using only the index hospitalization as the reference would not have portrayed an accurate assessment of the percent rehospitalized across all patients hospitalized for diabetes.

Table 4A summarizes the main components used in the PHC4-calculated analyses for each clinical condition in the calendar year 2000 *Measuring the Quality of Pennsylvania's Commercial HMOs* report. The components used are different for each measure within a clinical condition grouping because the clinical management and delivery of health care varies for each condition. Table 4B lists the hospitalizations from which clinical information was extracted for each applicable measure. Refer to subsequent sections of this report that pertain to each clinical condition for detailed descriptions of the particular records excluded for each relevant measure.

Table 4A. “What” is analyzed: A Comparison among Clinical Conditions

<i>Ear, Nose and Throat Infections; High Blood Pressure; Gastrointestinal Infections; Kidney/Urinary Tract Infections</i>	<i>Asthma; COPD; Diabetes; Hysterectomy; Prostatectomy</i>	<i>Breast Cancer Procedures</i>	<i>Neck and Back Procedures</i>	<i>Heart Attack (AMI)</i>
Index hospitalization	Index hospitalization	Single encounters for breast cancer procedures ^{1, 2}	Single hospitalizations ²	All hospitalizations that were part of an episode that began no more than 30 days from the admit date of the heart attack index hospitalization.

¹ Encounter refers to a single patient visit, not number of procedures; for example, if a patient had both a lumpectomy and a mastectomy in the same medical visit, only the more invasive procedure was counted as a single patient encounter.

² Over the course of the study period, a single patient may have more than one non-contiguous hospitalization for said condition. If so, all of the single hospitalizations are analyzed.

Table 4B. Hospitalizations¹ Used for PHC4 Measures

PHC4 MEASURE	Ear, Nose and Throat infections ² ; High Blood Pressure; Gastrointestinal Infections; Kidney/Urinary Tract Infections	COPD	Asthma ²	Diabetes	Breast Cancer Procedures	Hysterectomy; Neck and Back Procedures; Prostatectomy	Heart Attack (AMI)
• Procedure/Hospitalization Rate per 10,000 Members	Index hospitalization only (one per member) ³	Index hospitalization only (one per member) ³	Index hospitalization only (one per member) ³	Index hospitalization only (one per member) ³	Single Encounters ^{4, 5}	Single hospitalizations ⁵ (Neck and Back) Index hospitalization ³ (Hyst. and Prost.)	Index hospitalization only (one per member) ³
• In-Hospital Complications	N/A	N/A	N/A	N/A See footnote ⁶	Single hospitalizations (inpatient only) ⁵	Single hospitalizations ⁵ (Neck and Back) Index hospitalization ³ (Hyst. and Prost.)	N/A
• Length of Stay / Average # of Days Hospitalized	N/A	Index hospitalization only (one per member) ³	Index hospitalization only (one per member) ³	Index hospitalization only (one per member) ³	Single hospitalizations (inpatient only) ⁵	Single hospitalizations ⁵ (Neck and Back) Index hospitalization ³ (Hyst. and Prost.)	All hospitalizations ⁷ beginning no more than 30 days from the admission date of the AMI index hospitalization.
• Percent Rehospitalized–180 days	N/A	Any respiratory-related hospitalization beginning no more than 180 days after the discharge date of the last acute care hospitalization ⁸ linked to the index hospitalization	Adult only: Any respiratory-related hospitalization beginning no more than 180 days after the discharge date of the last acute care hospitalization ⁸ linked to the index hospitalization	Any diabetes-related hospitalization beginning no more than 180 days after the discharge date of the last acute care hospitalization ⁸ linked to the index hospitalization	N/A	N/A	N/A
• In-Hospital Mortality–30 day	N/A	N/A	N/A	N/A	N/A	N/A	Any hospitalization ⁷ ending in death where the death occurred no more than 30 days from the admit date of the index AMI hospitalization.
• Percent Receiving Cardiac Catheterization	N/A	N/A	N/A	N/A	N/A	N/A	Any hospitalization ⁷ in which a catheterization procedure was performed no more than 30 days from (or 3 days prior to) the date of admission of the index hospitalization.
• Percent Receiving PTCA/Stent	N/A	N/A	N/A	N/A	N/A	N/A	Any hospitalization ⁷ in which a procedure was performed no more than 30 days from the date of admission of the index hospitalization.
• Percent Receiving CABG							

¹ Includes those hospitalizations from which clinical information that is needed for the associated measure is extracted.

² Separate analyses were performed for pediatric and adult cases.

³ Records with missing/invalid SSNs cannot be linked to a single member, and therefore were counted as separate members for the hospitalization rate. If records had matching valid social security numbers but had inconsistent birth dates or sex identifiers that could not be resolved, each record was counted as a single index hospitalization.

⁴ Encounter refers to a single patient visit, not number of procedures; i.e., if a patient had both a lumpectomy and a mastectomy in the same medical visit, only the more invasive procedure was counted as a single patient encounter.

⁵ Over the course of the study period, a single patient may have more than one hospitalization for said condition. If so, all of the single hospitalizations were analyzed.

⁶ In-hospital complications were not calculated for diabetes; however, Short-term complications are reported (see Diabetes in the *Treatment Measures Calculated by PHC4* section of this *Technical Report* for clarification).

⁷ May be an index or a non-index hospitalization. An Index hospitalization must have a principal diagnosis of AMI. A non-index hospitalization need not have a principal diagnosis for AMI, but must be classified as MDC5.

⁸ Non-index hospitalization that may or may not have a principal diagnosis related to condition analyzed.

N/A: Not Applicable

PROCEDURES USED FOR LINKING HOSPITALIZATIONS

Identification of a patient's hospitalization history was crucial for 1) distinguishing unique members and 2) the percent rehospitalized for adult members with asthma, diabetes or chronic obstructive pulmonary disease. However, all hospitalizations and episodes in the study period were identified for each patient when possible. Hospitalizations within an episode with a principal diagnosis that was different from the index hospitalization were still considered in creating a patient's hospitalization history. Thus, additional acute care hospitalizations (for an individual patient) occurring after the index hospitalization were retained in the dataset as potential rehospitalization cases.

The patient identifier was fundamental to identifying each hospitalization and episode(s) for any individual patient. The patient's social security number (SSN) was used as the basic identifier; only valid SSNs were potentially usable.

In addition, for an SSN to be retained, the same sex-birth date combination must have been reported for all hospitalizations with that SSN. If there were conflicting sex-birth date combinations, these multiple combinations were reconciled based on the methodology used by PHC4 to link appropriate acute care hospitalizations (refer to Appendix B: *Methods for Resolving Inconsistent Patient Identifier Information*).

EXCLUSION CRITERIA

For each measure exclusions were necessary for accurate analysis. Exclusions differed for each clinical condition and are explained in detail in the following table.

Table 5. Exclusions by Condition

PREVENTING HOSPITALIZATION THROUGH PRIMARY CARE		
<i>Pediatric Ear, Nose & Throat Infections</i>	<i>Adult Ear, Nose & Throat Infections</i>	<i>High Blood Pressure</i>
Hospitalization Rate <ul style="list-style-type: none"> • Duplicates • Neonates (age < 28 days) • Metastatic cancer • Cancer of ear, nose or throat • Lung cancer • HIV infection • Extensive OR procedures unrelated to principal diagnosis • Mechanical ventilator • Tracheostomy • Cleft lip and palate repair • Non-extensive OR procedures unrelated to principal diagnosis • Tracheitis • Non-index hospitalizations 	Hospitalization Rate <ul style="list-style-type: none"> • Duplicates • Metastatic cancer • Cancer of ear, nose or throat • Lung cancer • HIV infection • Extensive OR procedures unrelated to principal diagnosis • Mechanical ventilator • Tracheostomy • Cleft lip and palate repair • Non-extensive OR procedures unrelated to principal diagnosis • Tracheitis • Non-index hospitalizations 	Hospitalization Rate <ul style="list-style-type: none"> • Duplicates • Age < 18 years • Metastatic cancer • HIV infection • Renal dialysis • Open-heart surgery • Extensive OR procedures unrelated to principal diagnosis • Coronary bypass/stenting • Mechanical ventilator • Non-index hospitalizations
PREVENTING HOSPITALIZATION THROUGH PRIMARY CARE		
<i>Gastrointestinal Infections</i>	<i>Kidney/Urinary Tract Infections</i>	
Hospitalization Rate <ul style="list-style-type: none"> • Duplicates • Neonates (age < 28 days) • GI cancer • Metastatic cancer • HIV infection • Extensive OR procedures unrelated to principal diagnosis • Major large and small bowel procedures • Other digestive system OR procedures with complications • Non-index hospitalizations 	Hospitalization Rate <ul style="list-style-type: none"> • Duplicates • Neonates (age < 28 days) • Metastatic cancer • Kidney/urinary tract cancer • HIV infection • Chronic renal failure • Renal dialysis • Extensive OR procedures unrelated to principal diagnosis • Kidney, ureter and major bladder procedures • Non-index hospitalizations 	

Table 5. Exclusions by Condition continued

MANAGING ON-GOING ILLNESSES			
COPD	Pediatric Asthma	Adult Asthma	Diabetes
<p>Hospitalization Rate</p> <ul style="list-style-type: none"> • Duplicates • Age < 18 years • All diagnosis related groups except DRG 088 (COPD) • Metastatic cancer • Lung cancer • HIV infection • Mechanical ventilator • Non-index hospitalizations <p>Length of Stay</p> <ul style="list-style-type: none"> • Hospitalization Rate exclusions <i>plus</i>: • Death in hospital • Missing <i>Atlas Outcomes</i>® PLOS <p>Percent Rehospitalized—180 days</p> <ul style="list-style-type: none"> • Length of Stay exclusions <i>plus</i>: • Invalid SSN • Invalid dates/sex • Inconsistent SSN, sex, DOB 	<p>Hospitalization Rate</p> <ul style="list-style-type: none"> • Duplicates • Problematic records • Tracheostomy • Lung cancer • Metastatic cancer other than lung • Non-index hospitalizations <p>Length of Stay</p> <ul style="list-style-type: none"> • Hospitalization Rate exclusions <i>plus</i>: • Death in hospital • Missing <i>Atlas Outcomes</i>® PLOS • Outliers <p>Appropriate Medications—HEDIS Measure</p> <ul style="list-style-type: none"> • As defined by NCQA 	<p>Hospitalization Rate</p> <ul style="list-style-type: none"> • Duplicates • Problematic records • Tracheostomy • Lung cancer • Metastatic cancer other than lung • Non-index hospitalizations <p>Length of Stay</p> <ul style="list-style-type: none"> • Hospitalization Rate exclusions <i>plus</i>: • Death in hospital • Missing <i>Atlas Outcomes</i>® PLOS • Outliers <p>Percent Rehospitalized—180 days</p> <ul style="list-style-type: none"> • Length of Stay exclusions <i>plus</i>: • Invalid SSN • Invalid dates/sex • Inconsistent SSN, sex, DOB <p>Appropriate Medications—HEDIS Measure</p> <ul style="list-style-type: none"> • As defined by NCQA 	<p>Hospitalization Rate</p> <ul style="list-style-type: none"> • Duplicate/problematic records • Major organ transplants • Metastatic cancer cases • HIV infection • Other clinically complex cases based upon procedures performed during the same admission • Non-index hospitalizations <p>Length of Stay</p> <ul style="list-style-type: none"> • Hospitalization Rate exclusions <i>plus</i>: • Death in hospital • Missing <i>Atlas Outcomes</i>® PLOS • Outliers <p>Percent Rehospitalized—180 days</p> <ul style="list-style-type: none"> • Length of Stay exclusions <i>plus</i>: • Death in hospital • Invalid SSN • Inconsistent SSN, sex, DOB <p>Diabetes HEDIS Measures</p> <ul style="list-style-type: none"> • As defined by NCQA

List of Abbreviations: *Atlas Outcomes*® ASG: *Atlas Outcomes*® Admission Severity Group; *Atlas Outcomes*® PLOS: *Atlas Outcomes*® Predicted Length of Stay; DOB: Date of Birth; LOS: Length of Stay; NCQA: National Committee for Quality Assurance; SSN: Social Security Number.

Table 5. Exclusions by Condition continued

HEART ATTACK (AMI)	MENTAL HEALTH ¹
<p>Hospitalization Rate</p> <ul style="list-style-type: none"> • Duplicates • Age < 18 years • Problematic records • Index heart attack hospitalizations that were contiguous with heart attack hospitalizations that occurred prior to the study period • Hospitalizations that occurred beyond 30 days from the initial index hospitalization • Non-index heart attack hospitalizations that were embedded into 30-day episode • Metastatic cancer • Transplants: heart; heart and lung <p>In-Hospital Mortality—30 days</p> <ul style="list-style-type: none"> • Hospitalization Rate exclusions <i>plus</i> • Missing <i>Atlas Outcomes</i>@ ASG index hospitalization • Invalid SSN • Inconsistent SSN/sex/DOB <p>Average Number of Days Hospitalized</p> <ul style="list-style-type: none"> • In-Hospital Mortality exclusions <i>plus</i>: • Death in hospital within 30 days • Death in hospital after 30 days but within an episode • Outliers • Missing or invalid Length of Stay <p>Percent Receiving Cardiac Catherization—30 days</p> <ul style="list-style-type: none"> • Hospitalization Rate exclusions <p>Percent Receiving PTCA/Stent —30 days</p> <ul style="list-style-type: none"> • Hospitalization Rate exclusions <p>Percent Receiving CABG—30 days</p> <ul style="list-style-type: none"> • Hospitalization Rate exclusions <p>Beta Blocker Treatments After a Heart Attack—HEDIS Measure</p> <ul style="list-style-type: none"> • As defined by NCQA <p>Cholesterol Management After Acute Cardiovascular Events— 2 HEDIS Measures</p> <ul style="list-style-type: none"> • As defined by NCQA 	<p>HEDIS Measures:</p> <p>Percent of Members Receiving any Mental Health Service</p> <ul style="list-style-type: none"> • As defined by NCQA <p>Inpatient Admission Rate</p> <ul style="list-style-type: none"> • As defined by NCQA <p>Average Length of Stay</p> <ul style="list-style-type: none"> • As defined by NCQA <p>Follow-up after Hospitalization—7 day</p> <ul style="list-style-type: none"> • As defined by NCQA <p>Follow-up after Hospitalization—30 day</p> <ul style="list-style-type: none"> • As defined by NCQA

¹Displayed on Web only.

List of Abbreviations: *Atlas Outcomes*@ ASG: *Atlas Outcomes*@ Admission Severity Group; *Atlas Outcomes*@ PLOS: *Atlas Outcomes*@ Predicted Length of Stay; DOB: Date of Birth; NCQA: National Committee for Quality Assurance; SSN: Social Security Number.

Table 5. Exclusions by Condition continued

SURGICAL PROCEDURES			
Hysterectomy	Breast Cancer Procedures	Neck and Back Procedures	Prostatectomy
<p>Procedure Rate</p> <ul style="list-style-type: none"> • Age < 18 years • Any cancer other than history of cancer • Hemorrhage on admission • Not in MDC 13 • Duplicate/problematic records <p>In-Hospital Complications</p> <ul style="list-style-type: none"> • Hospitalization Rate exclusions <i>plus:</i> • Missing <i>Atlas Outcomes®</i> PLOS <p>Length of Stay</p> <ul style="list-style-type: none"> • In-Hospital Complications exclusions <i>plus:</i> • Death in hospital • Outlier / invalid or missing Length of Stay <p>Screening for Cervical Cancer – HEDIS Measure</p> <ul style="list-style-type: none"> • As defined by NCQA 	<p>Procedure Rate (Inpatient and Ambulatory)</p> <ul style="list-style-type: none"> • Age < 18 years • Breast cancer not principal diagnosis • Invalid dates • Duplicate/problematic records <p>In-Hospital Complications</p> <ul style="list-style-type: none"> • Procedure Rate exclusions <i>plus:</i> • Ambulatory procedures • Missing <i>Atlas Outcomes®</i> PLOS <p>Length of Stay (Inpatient only)</p> <ul style="list-style-type: none"> • In-Hospital Complications exclusions <i>plus:</i> • Death in hospital <p>Screening for Breast Cancer – HEDIS Measure</p> <ul style="list-style-type: none"> • As defined by NCQA 	<p>Procedure Rate</p> <ul style="list-style-type: none"> • Age < 18 years • Spinal refusion procedure • Pathological spinal fractures • Spinal nerve root injury • Paraplegia • Unspecified paralysis • Spinal fracture • HIV infection • Quadriplegia • Hemiplegia • Infantile cerebral palsy • Date/sex problems • Duplicates <p>In-Hospital Complications</p> <ul style="list-style-type: none"> • Procedure Rate exclusions <i>plus:</i> • Missing <i>Atlas Outcomes®</i> PLOS <p>Length of Stay</p> <ul style="list-style-type: none"> • In-Hospital Complications exclusions <i>plus:</i> • Death in hospital • Outliers 	<p>Procedure Rate</p> <ul style="list-style-type: none"> • Age < 18 years • Non-acute care hospitalizations • HIV infection • Non-radical prostatectomy • DRGs other than 334 or 335 • Duplicates <p>In-Hospital Complications</p> <ul style="list-style-type: none"> • Procedure Rate exclusions <i>plus:</i> • Missing <i>Atlas Outcomes®</i> PLOS <p>Length of Stay</p> <ul style="list-style-type: none"> • In-Hospital Complications exclusions <i>plus:</i> • Death in hospital • Outliers

List of Abbreviations: *Atlas Outcomes®* PLOS: *Atlas Outcomes®* Predicted Length of Stay; LOS: Length of Stay; NCQA: National Committee for Quality Assurance.

RISK ADJUSTMENT

Age and Sex Adjustment Approach

Age and sex adjustment methods took into account statistically that one HMO may have more older members than another HMO or a different mix of members by gender. PHC4's system "expected" more health problems in the HMO with an older population and made appropriate adjustments. Gender is often an important risk factor, and the system also accounted for differences among HMOs in this category. The hospitalization rate data were adjusted using age and sex cohorts derived from the total membership population of each HMO. These cohorts were constructed with the assistance and review of each HMO.

To standardize hospitalization/encounter data across plans and across age categories, only records for those patients age 64 or younger as of December 31, 2000 were included in this analysis. HMO members were excluded from an analysis if they turned 65 at any point during 2000, even if the individual was age 64 at the time of their hospitalization. HMOs, as part of the verification of the CY2000 data verification process, were instructed to follow this same age criterion when adding records to the file of verified data.

Adjustment Approach for Other Risk Factors

Based on a complex mathematical formula that assessed the degree of illness or risk for patients, PHC4 calculated expected, or predicted, percents. HMO plans that have sicker members were given "credit" in the system; patients that were more seriously ill were expected to have a greater probability of death, to have longer lengths of stay, to be readmitted, or to have complications. These events are "expected." This system was used to measure outcomes taking into account patient illness or risk factors.

Atlas Outcomes® Admission Severity/PLOS Approach for Risk Adjustment

In a contractual agreement with MediQual® Systems, Inc. in Marlborough, Massachusetts, acute care hospitals are required to use MediQual's *Atlas Outcomes*® Severity of Illness System to classify each patient's condition from date of admission through the first two days of the hospital stay (or a maximum of 30 hours, based on when the patient was admitted to the hospital). This system represents a summarization of patient risk/severity, characterized as the probability of death or the predicted length of stay (PLOS), and is based on objective data found in the medical record. Ultimately, this system was used here to risk adjust outcomes to allow for fair comparisons among HMO plans.

The *Atlas Outcomes*® system is based on the examination of numerous Key Clinical Findings (KCFs) such as lab tests, EKG readings, vital signs, the patient's medical history, imaging results, pathology, age, sex, and operative/endoscopy findings. Hospital personnel abstract these KCFs during specified timeframes in the hospitalization. Some pre-admission data are also captured (e.g., cardiac catheterization findings) as are some history findings. The KCF results are entered into algorithms that calculate the overall probability of death or the PLOS. The *Atlas Outcomes*® system utilizes 70 different disease-specific scoring algorithms to obtain the admission severity.

The two systems developed by MediQual Systems, Inc. to rate patient risk that PHC4 used in this study are described below and include the Admission Severity Group (ASG) score, which is a probability of death measure, and the PLOS:

ASG: Admission Severity Group

The algorithm-derived probability of death for any one patient is categorized into one of five groups, or Admission Severity Group (ASG), ranked 0 to 4, which correspond to levels of patient risk. These ASG scores range from minimally sick (ASG 0) to maximum probability of death (ASG 4). The ASG scores were assigned by *Atlas Outcomes*® as shown in Table 6A.

Table 6A. Atlas Outcomes® ASG Scores

ASG	Description	Probability of Death
0	No risk of clinical instability	0.000 – 0.001
1	Minimum risk of clinical instability	0.002 – 0.011
2	Moderate risk of clinical instability	0.012 – 0.057
3	Severe risk of clinical instability	0.058 – 0.499
4	Maximum risk of clinical instability	0.500 – 1.000

Source: *Atlas Outcomes*® version 3.3, CY2000 MediQual Systems, Inc.

PLOS: Predicted Length of Stay

The PLOS is a continuous variable, meaning it has values that range on a continuum. In order to use PLOS as a risk adjustment variable, the PLOS must be categorized. Four population percentiles were used to categorize the PLOS into five categories. The percentiles used were approximately the 2.5th, 16th, 84th, and 97.5th percentiles of the population's distribution curve.

Determination of Risk Adjustment Factors by PHC4

For each clinical condition in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, a list of potential risk factors was identified. Each of the factors actually used for risk adjusting was determined for each outcome measure using the (forward) stepwise selection process. For those outcome measures generated from binary response factors (percent rehospitalized, in-hospital complications and in-hospital mortality), logistic regression was used. The length of stay outcome measure was created from a continuous factor and thus, a linear regression technique was used.

The first step in the stepwise process was to identify the risk factor that explained more of the variability among the specific response factor (i.e., length of stay, percent rehospitalized, in-hospital complications, or in-hospital mortality) values than did any other individual risk factor. In the second step, the risk factor that, when coupled with the first factor, explained more response factor variability than any of the other remaining factors in the list when coupled with first factor. The third risk factor determined was that factor from the list that, when considered with the first two factors, explained the most additional response factor variability. A stepwise selection method is a dynamic process since a factor selected at one step may be removed at a later step if it is no longer statistically significant given the other factors that have been selected by that later step.

Categorization of Risk Factors

As mentioned above, the PHC4 methodology typically used three (sometimes two) categorical risk factors. The strongest factor (i.e., the first risk factor determined in the selection process) can have at most five categories, while both the second and third factors can have a maximum of three categories each. Categories for any risk factor with more than the maximum number were combined to the extent necessary to make that risk factor compatible with the PHC4 methodology.

Table 6B (also see Table 6D) displays the order in which the most significant risk adjustors were ranked for each clinical condition and appropriate outcome measure. The risk adjustor variable that explained the most variability was ranked #1, while the second and third variables were ranked #2 and #3, respectively. Appendix D: *Risk Factors* lists the candidate variables as risk adjustors for each of the clinical conditions and includes hospitalization information (e.g., average length of stay, complications percent, etc.) for each of the variables used as risk adjustors. Each of the final risk adjustors was consequently subcategorized when necessary for the risk adjustment process. Table 6B lists the categories used for each of the risk adjustor variables for each clinical condition and applicable outcome measure. A minimum of 20 hospitalizations per risk adjustor category was required for the statistical methods that were utilized. Risk adjustor categories containing less than 20 hospitalizations were combined.

Table 6B. Ranking of Significant Risk Adjustors by Condition

Chronic Pulmonary Obstructive Disease	
•	<i>Length of Stay</i>
	#1 <i>Atlas Outcomes®</i> PLOS
	1: 0 – 3.073 days
	2: 3.074 – 3.643 days
	3: 3.644 – 5.125 days
	4: 5.126 – 6.012 days
	5: 6.013+ days
	#2 Patient Sex
	1: Male
	2: Female
•	<i>Percent Rehospitalized</i>
	#1 <i>Atlas Outcomes®</i> ASG
	1: 0, 1
	2: 2, 3
	#2 Age
	1: 18 – 52 years
	2: 53 – 59 years
	3: 60 – 64 years
	#3 Race
	1: Black/Other
	2: White

Table 6B. Ranking of Significant Risk Adjustors by Condition continued

Asthma	
•	<ul style="list-style-type: none"> <i>Pediatric Length of Stay</i> <ul style="list-style-type: none"> #1 <i>Atlas Outcomes®</i> PLOS <ul style="list-style-type: none"> 1: 0 – 1.679 days 2: 1.680 – 1.831 days 3: 1.832 – 2.279 days 4: 2.280 – 2.523 days 5: 2.524+ days #2 Age <ul style="list-style-type: none"> 1: 0 – 1 years 2: 2 – 11 years 3: 12 – 17years <i>Adult Length of Stay</i> <ul style="list-style-type: none"> #1 <i>Atlas Outcomes®</i> PLOS <ul style="list-style-type: none"> 1: 0 – 2.235 days 2: 2.236 – 2.642 days 3: 2.643 – 3.742 days 4: 3.743 – 4.552 days 5: 4.553+ days #2 Status Asthmaticus with Acute Exacerbation <ul style="list-style-type: none"> 1: Group 1 (Principal diagnosis: 493.01, 493.02, 493.11, 493.12, 493.21, 493.22, 493.92) 2: Group 2 (Principal diagnosis: 493.00, 493.10, 493.20, 493.90) #3 Sex <ul style="list-style-type: none"> 1: Male 2: Female <i>Percent Rehospitalized (Adult Only)</i> <ul style="list-style-type: none"> #1 Race <ul style="list-style-type: none"> 1: Black 2: White 3: Other #2 <i>Atlas Outcomes®</i> PLOS <ul style="list-style-type: none"> 1: 0 – 2.653 days 2: 2.654 – 3.741 days 3: 3.742+ days #3 Sex <ul style="list-style-type: none"> 1: Male 2: Female
Diabetes	
•	<ul style="list-style-type: none"> <i>Length of Stay</i> <ul style="list-style-type: none"> #1 <i>Atlas Outcomes®</i> PLOS <ul style="list-style-type: none"> 1: 0 – 2.922 days 2: 2.923 – 6.206 days 3: 6.207+ days #2 Surgical/Non-surgical Diagnosis Related Group (DRG) <ul style="list-style-type: none"> 1: Surgical DRG 2: Non-surgical DRG #3 Non-traumatic Lower Extremity Amputation <ul style="list-style-type: none"> 1: No 2: Yes

Table 6B. Ranking of Significant Risk Adjustors by Condition continued

Diabetes continued	
•	<i>Percent Rehospitalized</i>
#1	<i>Atlas Outcomes® PLOS</i>
1:	0 – 2.926 days
2:	2.927 – 6.231 days
3:	6.232+ days
#2	<i>Diabetes Complication Level</i>
1:	Uncomplicated
2:	Short-term Complications
3:	Long-term Complications
#3	<i>Age</i>
1:	18 – 35 years
2:	36 – 55 years
3:	56 – 75 years

Heart Attack (AMI)	
•	<i>Average Number of Days Hospitalized</i>
#1	<i>Heart failure</i>
1:	No
2:	Yes
#2	<i>Atlas Outcomes® PLOS</i>
1:	0 – 3.843 days
2:	3.844 – 6.011 days
3:	6.012+ days
#3	<i>Chronic Renal Failure</i>
1:	No
2:	Yes
•	<i>In-Hospital Mortality</i>
#1	<i>Atlas Outcomes® ASG - 5 categories: ASG 0 – 4 (see Table 6A for ASG categories)</i>
#2	<i>AMI Type</i>
1:	Q-wave
2:	Non Q-wave
#3	<i>Chronic Renal Failure</i>
1:	No
2:	Yes

Table 6B. Ranking of Significant Risk Adjustors by Condition continued

Hysterectomy	
•	<i>Length of Stay</i>
	#1 Procedure Group
	1: Abdominal/Radical Vaginal Hysterectomy
	2: Vaginal/Other Hysterectomy
	#2 Atlas Outcomes® PLOS
	1: 0 – 2.236 days
	2: 2.237 days – 2.787 days
	3: 2.788+ days
	#3 Principal Diagnosis Group
	1: Fibroids/Hyperplasia/Endometriosis
	2: Uterine Prolapse
	3: Bleeding Abnormalities and Other Principal Diagnoses for Bleeding Abnormalities
•	<i>In-Hospital Complications</i>
	#1 Procedure Group
	1: Abdominal/Radical Vaginal Hysterectomy
	2: Vaginal/Other Hysterectomy
	#2 Race
	1: Black
	2: White
	3: Other
	#3 Atlas Outcomes® PLOS
	1: 0 – 2.236 days
	2: 2.237 – 2.789 days
	3: 2.790+ days

Breast Cancer Procedures	
•	<i>Length of Stay</i>
	#1 Procedure Group
	1: Reconstruction (Concurrent with Both Mastectomy and Lumpectomy)
	2: Mastectomy without Concurrent Reconstruction
	3: Lumpectomy without Concurrent Reconstruction
	#2 Atlas Outcomes® PLOS
	1: 0 – 1.567 days
	2: 1.568 – 1.994 days
	3: 1.995+ days
	#3 Race
	1: Black/Other
	2: White
•	<i>In-Hospital Complications</i>
	#1 Concurrent Reconstruction
	1: No
	2: Yes
	#2 Atlas Outcomes® PLOS
	1: 0 – 1.567 days
	2: 1.568 – 1.994 days
	3: 1.995+ days
	#3 Diagnostic Stage of Breast Cancer
	1: Metastatic
	2: Malignant neoplasm
	3: In Situ

Table 6B. Ranking of Significant Risk Adjustors by Condition continued

Neck/Back Procedures	
•	<i>Length of Stay</i>
	#1 Fusion Location
	1: No Fusion
	2: Cervical/Atlas Axis/Fusion Not Otherwise Specified
	3: Dorsal/Dorsolumbar
	4: Lumbar/Lumbosacral
	#2 <i>Atlas Outcomes®</i> PLOS
	1: 0 – 1.555 days
	2: 1.556 – 2.593 days
	3: 2.594+ days
	#3 Race
	1: Black
	2: White
	3: Other
•	<i>In-Hospital Complications</i>
	#1 Fusion Location
	1: No Fusion
	2: Cervical/Atlas Axis/Fusion Not Otherwise Specified
	3: Dorsal/Dorsolumbar
	4: Lumbar/Lumbosacral
	#2 <i>Atlas Outcomes®</i> PLOS
	1: 0 – 1.555 days
	2: 1.556 – 2.594 days
	3: 2.595+ days
	#3 Principal Diagnosis Group
	1: Disc Displacement
	2: Disc Degeneration or Narrowing of Spinal Canal
	3: Other Disc Disorders/Back Pain

Table 6B. Ranking of Significant Risk Adjustors by Condition continued

Prostatectomy	
•	<i>Length of Stay</i>
	#1 <i>Atlas Outcomes® PLOS</i>
	1: 0 – 2.196 days
	2: 2.197 – 2.556 days
	3: 2.557 – 3.169 days
	4: 3.170 – 3.571 days
	5: 3.572+ days
	#2 Race
	1: Black
	2: White
	3: Other
	#3 Age
	1: 18 – 56 years
	2: 57 – 60 years
	3: 61 – 64 years
•	<i>In-Hospital Complications</i>
	#1 Race
	1: Black
	2: White
	3: Other
	#2 <i>Atlas Outcomes® PLOS</i>
	1: 0 – 2.556 days
	2: 2.557 – 3.169 days
	3: 3.170+ days

Indirect Standardization

In order to statistically evaluate the associated outcome for each HMO plan, the statewide database was used as the comparative reference for in-hospital complications and in-hospital mortality, and the HMO database was used as the comparative reference for the percent rehospitalized analysis. However, directly comparing the statewide (or HMO aggregate) percent to an HMO plan's crude percent can be misleading. For example, when statistical modeling was used to evaluate the neck and back procedures, in-hospital complications varied by the fusion location, *Atlas Outcomes*® PLOS and principal diagnosis group. The statewide distribution of these three risk factors may be very different than the distribution of these same factors within a particular HMO plan. Indirect standardization is a technique that was used to adjust for these differences and allow for discrepancies in the risk factor structure between the state and each HMO plan.

Indirect standardization was also used to calculate the age and sex adjusted hospitalization rates for each HMO plan. Enrollment data, reported in age and sex categories, were collected from HMO plans only. Because enrollment data were not available (that is, were not collected) from the insurance groups that comprise the “fee-for-service” sample, these hospitalization rates cannot be reported. Indirect standardization, using the risk factors of age and sex, was used to compare the hospitalization rates for each HMO plan against the hospitalization rate for the HMO aggregate for each clinical condition.

Risk Index Adjustment for Length of Stay Analyses

The risk-adjusted length of stay (LOS) values are reported by each HMO and fee-for-service sample where appropriate. Length of stay values may vary within a clinical condition due to variance in risk adjustor variables used. Therefore, in order to report a comparable risk-adjusted length of stay for each appropriate clinical condition within each HMO, a technique comparable to calculating a case mixed index was employed. The following steps were used:

- 1) Relative weights for each risk adjustor variable combination within each clinical condition were determined using LOS averages aggregated from the statewide (or HMO, depending on the clinical condition) comparative reference database. After all exclusions were satisfied and outliers removed, the relative weight for each risk adjustor combination within each clinical condition was calculated using the formula:

$$\text{Relative Weight} = \frac{\text{Average LOS for a cell (i.e., a particular combination of risk adjustors)}}{\text{Average LOS for the clinical condition}}$$

- 2) Each HMO's risk index for each clinical condition was calculated:

$$\text{An HMO's risk index for a particular clinical condition} = \frac{\sum(n_i \times RW_i)}{\sum n_i}$$

where, for each of the risk adjustor combinations (cell) within the clinical condition,
 RW_i = the statewide (or HMO aggregate) relative weight for the i^{th} combination (cell)
 n_i = the number of hospitalizations for the HMO of the i^{th} combination
 $\sum n_i$ = the total number of hospitalizations for the HMO plan for a clinical condition

- 3) For each HMO, the risk-adjusted length of stay was then calculated for each of the clinical conditions:

$$\text{Risk-Adjusted Length of Stay} = \frac{\text{Average LOS for a Clinical Condition}}{\text{Risk Index for a Clinical Condition}}$$

where the average LOS for an HMO's clinical condition was derived by adding up all the LOSs for the hospitalizations remaining in the analysis for that HMO's clinical condition and dividing by the number of hospitalizations.

Tests of Significance

Binomial Distribution

Significance tests were performed for the measures listed in Table 6C.

Table 6C. Binomial Distribution by Condition

Measure	Clinical Conditions
Hospitalization Rate (Members hospitalized for a given clinical condition per HMO population.)	Ear, Nose and Throat Infections; High Blood Pressure; Gastrointestinal Infections; Kidney/Urinary Tract Infections; Chronic Obstructive Pulmonary Disease; Asthma; Diabetes; Heart Attack
Procedure Rate (Members hospitalized for a hysterectomy.)	Hysterectomy
In-Hospital Complications (Complication vs. No Complication)	Hysterectomy, Breast Cancer Procedures, Neck and Back Procedures, Prostatectomy
In-Hospital Mortality (Death vs. No Death)	Heart Attack

Although the measures for any single HMO plan may be comparable to the statewide norm (or HMO aggregate), random variation plays a role in such comparisons. Statistical evaluation was used to determine whether the difference between the observed and the expected (or average) value was *too large* to be attributed solely to chance.

The type of distribution chosen was based on the nature of the measures in question, and required certain assumptions:

Binomial Distribution

- Each observation included in the study had one of two observable events (e.g., in-hospital complication vs. no in-hospital complication). In other words, the response was dichotomous.
- The probability of complication for each observation studied within a clinical condition group (as adjusted by the risk factors for that clinical condition) was equal to the percent provided by the statewide comparative reference database.
- The result for any one observation in the analyses had no impact on the result of another observation. In other words, the observations were independent.

A probability distribution was created for each measure within each HMO plan based on the expected value (risk-adjusted and derived using the statewide or HMO reference database,

depending on the clinical condition). Using the probability distribution, a p-value was calculated for each observed value. This p-value is the probability, or likelihood, that the observed value could have occurred by chance. If it was very unlikely ($p < 0.05$; see “Inferential Error” section below) that the observed value could have occurred only by chance, then it was concluded that the observed value was “significantly different” from the expected value (see “Statistical Rating” section below).

Inferential Error

A type of inferential error that can be made in statistics is called a Type I error or “false positive.” The probability of committing a Type I error is equal to the level of significance established by the researcher. For the current analysis, the level of significance was set to 0.05. In the context of the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, a Type I error occurred when the difference between the observed in-hospital complications percent and the expected in-hospital complications percent was declared statistically significant, when in fact, the difference was due to chance. That is, for a particular clinical condition, the HMO plan was declared to be statistically higher or lower than expected, when in reality the HMO plan's level of performance was comparable to the statewide norm. Since the level of significance was set to 0.05, there was a 5% (or 1 in 20) chance of committing this type of error.

Measures Using the Binomial Test

The binomial distribution is used to determine the p-value used to test for significant differences between observed and expected values. The p-value is calculated as shown below.

p-value Calculation: Binomial Distribution

Calculating the p-value for the binomial test is defined by a formula that sums discrete probabilities based upon the binomial distribution. The binomial formula (see below) is used, in part, to derive the p-value. The probability that a binomial random variable takes on a specific value is defined by the following equation (i.e., the binomial formula):

$$P(X=a) = [(N!)/(a!(N-a)!)] p^a(1-p)^{N-a}$$

where (for in-hospital complications analysis),

$P(X=a)$ is the probability that the binomial random variable (X) takes on a specific value (a) (That is, $a = 1$ complication, $a = 2$ complications, etc.)

X is the binomial random variable. X is a discrete random variable that can range from 0 through N ($0 \leq X \leq N$).

N is the number of observations for a particular HMO plan's clinical condition.

p is the overall expected probability of patient in-hospital complications for a particular HMO plan's clinical condition.

The p-value for a specific result is determined to be the sum of all probabilities associated with that result and all other results that are more extreme. The p-value associated with the observed number of in-hospital complications was calculated for each HMO plan and clinical condition.

Actual versus Expected Values

Using neck and back in-hospital complications as an example, fusion location, *Atlas Outcomes*® PLOS, and principal diagnosis group were used as risk adjustors in this analysis. The *expected* statewide in-hospital complications percent was calculated for each of the final combinations of risk adjustor factors (i.e., fusion location/*Atlas Outcomes*® PLOS/principal diagnosis group). Expected percents were computed for each risk adjustor combination by dividing the total number of complications in that combination by the total number of patients in that combination.

Using, again, in-hospital complications as an example, the *actual* or observed in-hospital complications percent was based on the number of complications for each HMO within each clinical condition. The number of in-hospital complications expected for each HMO within each clinical condition was calculated using the statewide expected (or average) in-hospital complications percents for each of the risk adjustor category combinations for a particular clinical condition.

Since there were various combinations of risk adjustor variables for each measure and clinical condition, the variable i , shown in the calculation for the expected number of in-hospital complications, covered a range of possible combinations, depending upon the clinical condition being studied. For a particular clinical condition, the maximum of the variable i was given by the number of final combinations of the risk adjustor factors. The i^{th} combination is a generic term used to signify each of the final combinations of these risk adjustor categories.

The expected number of in-hospital complications for each clinical condition within each HMO was calculated as follows:

$$\text{Expected number of in-hospital complications} = \sum(p_i \times n_i)$$

where, for each of the final combinations of the risk adjustors within the clinical condition,

p_i = the statewide in-hospital complications percent for the i^{th} combination
 n_i = the number of hospitalizations for the HMO of the i^{th} combination

The expected in-hospital complications percent for each clinical condition within each HMO was calculated as follows:

$$\text{Expected percent} = \sum(p_i \times n_i) / \sum n_i$$

Similar calculations were made for hospitalization rate, percent rehospitalized and in-hospital mortality analyses using the HMO aggregate and statewide values, as appropriate, for each clinical condition.

Statistical Rating

A statistical rating was assigned to each HMO if the difference between what was observed and what was expected in a particular clinical condition was statistically significant. The p-value, calculated in terms of a “two-tailed” test was compared to the level of significance. For example, in the calculation of in-hospital complications percent for each HMO,

- If the calculated p-value was greater than 0.05, then the conclusion was made that the difference between what was expected and what was observed was *not* statistically significant. It *cannot be concluded* that the in-hospital complications percent for that

- particular clinical condition in that particular HMO was different from the comparative reference.
- If the calculated p-value was less than or equal to 0.05, then the conclusion was made that the difference between what was expected and what was observed was statistically significant.
 - If the observed in-hospital complications percent was less than expected, which was based on the statewide in-hospital complications percent, the HMO was assigned the symbol “○” (as shown in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report) to indicate the in-hospital complications percent was significantly less than expected for a particular clinical condition.
 - If the observed in-hospital complications percent was higher than expected, which was based on the statewide in-hospital complications percent, the HMO was assigned the symbol “●” (as shown in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report) to indicate the in-hospital complications percent was significantly greater than expected for a particular clinical condition.

In the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, statistical ratings are shown for HMO plans that have sufficient records. When the number of records for analysis was less than 10, a statistical rating was not reported and the symbol “NR” appears in the report.

Table 6D summarizes the measures, the tests of significance, and the corresponding risk adjustor variables for each of the clinical conditions studied in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report.

Table 6D. Risk Adjustment Approach by Condition

PREVENTING HOSPITALIZATION THROUGH PRIMARY CARE¹		
<i>Pediatric Ear, Nose & Throat Infections</i>	<i>Adult Ear, Nose & Throat Infections</i>	<i>High Blood Pressure</i>
Hospitalization Rate <ul style="list-style-type: none"> • Approach: Indirect standardization • Age cohort² and sex adjusted • Significance test: Binomial • Confidence level: 95% 	Hospitalization Rate <ul style="list-style-type: none"> • Approach: Indirect standardization • Age cohort³ and sex adjusted • Significance test: Binomial • Confidence level: 95% 	Hospitalization Rate <ul style="list-style-type: none"> • Approach: Indirect standardization • Age cohort³ and sex adjusted • Significance test: Binomial • Confidence level: 95%

PREVENTING HOSPITALIZATION THROUGH PRIMARY CARE¹	
<i>Gastrointestinal Infections</i>	<i>Kidney/Urinary Tract Infections</i>
Hospitalization Rate <ul style="list-style-type: none"> • Approach: Indirect standardization • Age cohort⁴ and sex adjusted • Significance test: Binomial • Confidence level: 95% 	Hospitalization Rate <ul style="list-style-type: none"> • Approach: Indirect standardization • Age cohort⁴ and sex adjusted • Significance test: Binomial • Confidence level: 95%

¹ Age and sex adjustment was used in the calculation of the hospitalization rate. The age groups used in the numerator (an inpatient hospitalization) match the age groups used in the denominator (age and sex enrollment cohorts).

² Age cohorts for pediatric members were: 28 days – 4 yr; 5 yr – 17 yr.

³ Age cohorts for adult members were: 18 yr – 44 yr; 45 yr – 64 yr.

⁴ Age cohorts were 28 days – 4 yr; 5 yr – 17 yr; 18 yr – 44 yr; 45 yr – 64 yr.

Table 6D. Risk Adjustment Approach by Condition continued

MANAGING ON-GOING ILLNESSES¹			
<i>Chronic Obstructive Pulmonary Disease</i>	<i>Pediatric Asthma</i>	<i>Adult Asthma</i>	<i>Diabetes</i>
<p>Hospitalization Rate</p> <ul style="list-style-type: none"> • Approach: Indirect standardization • Age cohort² and sex adjusted • Significance test: Binomial • Confidence level: 95% <p>Length of Stay</p> <ul style="list-style-type: none"> • Approach: Risk index adjustment • Risk adjustors (ranked): #1 PLOS³ #2 Sex <p>Percent Rehospitalized—180 days</p> <ul style="list-style-type: none"> • Approach: Indirect standardization • Risk adjustors (ranked): #1 ASG⁴ #2 Age cohort⁵ #3 Race 	<p>Hospitalization Rate</p> <ul style="list-style-type: none"> • Approach: Indirect standardization • Age cohort⁶ and sex adjusted • Significance test: Binomial • Confidence level: 95% <p>Length of Stay</p> <ul style="list-style-type: none"> • Approach: Risk index adjustment • Risk adjustors (ranked): #1 PLOS³ #2 Age cohort⁷ 	<p>Hospitalization Rate</p> <ul style="list-style-type: none"> • Approach: Indirect standardization • Age cohort² and sex adjusted • Significance test: Binomial • Confidence level: 95% <p>Length of Stay</p> <ul style="list-style-type: none"> • Approach: Risk index adjustment • Risk adjustors (ranked): #1 PLOS³ #2 Status Asthmaticus with acute exacerbation #3 Sex <p>Percent Rehospitalized—180 days</p> <ul style="list-style-type: none"> • Approach: Indirect standardization • Risk adjustors (ranked): #1 Race #2 PLOS³ #3 Sex 	<p>Hospitalization Rate</p> <ul style="list-style-type: none"> • Approach: Indirect standardization • Age cohort⁸ and sex adjusted • Significance test: Binomial • Confidence level: 95% <p>Length of Stay</p> <ul style="list-style-type: none"> • Approach: Risk index adjustment • Risk adjustors (ranked): #1 PLOS³ #2 Surgical/Non-surgical DRG #3 Non-traumatic Lower Extremity Amputation <p>Percent Rehospitalized—180 days</p> <ul style="list-style-type: none"> • Approach: Indirect standardization • Risk adjustors (ranked): #1 PLOS³ #2 Diabetes complication level #3 Age cohort⁹

¹ The “step-wise” statistical method was used to determine the best risk adjustor factors for percent rehospitalized. A modification of this approach was used for LOS analyses.

² Age cohorts for adult members are defined as: 18 yr – 44yr; 45yr – 64yr.

³ *Atlas Outcomes*® Predicted Length of Stay.

⁴ *Atlas Outcomes*® Admission Severity Group.

⁵ Age cohorts: 18 yr – 52yr; 53yr – 59yr; 60yr – 64 yr.

⁶ Age cohorts as defined by PA Department of Health and modified by PHC4: 28 days – 4yr; 5 yr – 17 yr.

⁷ Age cohorts: 28 days - 1 yr; 2 yr - 11 yr; 12 yr - 17 yr.

⁸ Age cohorts for members with diabetes defined as: 18 yr – 25yr; 26yr – 35yr; 36yr – 45 yr; 46 yr – 55 yr; 56 yr – 65 yr; 66 yr – 75 yr.

⁹ Age cohorts: 18 yr – 35 yr; 36 yr – 55 yr; 56 yr – 75 yr.

Table 6D. Risk Adjustment Approach by Condition continued

HEART ATTACK (AMI) ¹	
<p>Hospitalization Rate</p> <ul style="list-style-type: none"> • Approach: Indirect standardization • Age cohort² and sex adjusted <p>Average Number of Days Hospitalized</p> <ul style="list-style-type: none"> • Approach: Risk index adjustment • Risk adjustors (ranked): <ul style="list-style-type: none"> #1 Heart Failure #2 <i>Atlas Outcomes</i>® PLOS³ #3 Chronic Renal Failure • Significance test: none <p>In-Hospital Mortality</p> <ul style="list-style-type: none"> • Approach: Indirect standardization • Risk adjustors (ranked): <ul style="list-style-type: none"> #1 <i>Atlas Outcomes</i>® ASG⁴ #2 AMI type⁵ #3 Chronic Renal Failure • Significance test: Binomial • Confidence level: 95% 	<p>Percent Receiving Cardiac Catheterization—30 days</p> <ul style="list-style-type: none"> • No risk adjustors used <p>Percent Receiving PTCA/Stent—30 days</p> <ul style="list-style-type: none"> • No risk adjustors used <p>Percent Receiving CABG—30 days</p> <ul style="list-style-type: none"> • No risk adjustors used

¹ The “step-wise” statistical method was used to determine the best risk adjustor factors for in-hospital mortality. A modification of this approach was used for the average number of days hospitalized analysis.

² Age cohorts: 18 yr; 19yr; 20yr – 44yr; 45 yr – 64 yr.

³ *Atlas Outcomes*® Predicted Length of Stay.

⁴ *Atlas Outcomes*® Admission Severity Group

⁵ Q-wave vs. non Q-wave.

Table 6D. Risk Adjustment Approach by Condition continued

SURGICAL PROCEDURES¹			
<i>Hysterectomy</i>	<i>Breast Cancer Procedures</i>	<i>Neck and Back Procedures</i>	<i>Prostatectomy</i>
<p>Procedure Rate</p> <ul style="list-style-type: none"> • Approach: Indirect standardization • Age cohort² adjusted • Significance test: Binomial • Confidence level: 95% <p>Length of Stay</p> <ul style="list-style-type: none"> • Approach: Risk index adjustment • Risk adjustors (ranked): <ul style="list-style-type: none"> #1 Procedure group #2 PLOS³ #3 Principal diagnosis group <p>In-Hospital Complications</p> <ul style="list-style-type: none"> • Approach: Indirect standardization • Risk adjustors (ranked): <ul style="list-style-type: none"> #1 Procedure group #2 Race #3 PLOS³ • Significance test: Binomial • Confidence level: 95% 	<p>Procedure Rate</p> <ul style="list-style-type: none"> • Approach: Indirect standardization • Age cohort² adjusted <p>Length of Stay (Inpatient only)</p> <ul style="list-style-type: none"> • Approach: Risk index adjustment • Risk adjustors (ranked): <ul style="list-style-type: none"> #1 Procedure group⁴ #2 PLOS³ #3 Race <p>In-Hospital Complications (Inpatient only)</p> <ul style="list-style-type: none"> • Approach: Indirect standardization • Risk adjustors (ranked): <ul style="list-style-type: none"> #1 Concurrent reconstruction #2 PLOS³ #3 Breast cancer type⁵ • Significance test: Binomial • Confidence level: 95% 	<p>Procedure Rate</p> <ul style="list-style-type: none"> • Approach: Indirect standardization • Age cohort⁶ and sex adjusted <p>Length of Stay</p> <ul style="list-style-type: none"> • Approach: Risk index adjustment • Risk adjustors (ranked): <ul style="list-style-type: none"> #1 Fusion location⁷ #2 PLOS³ #3 Race <p>In-Hospital Complications</p> <ul style="list-style-type: none"> • Approach: Indirect standardization • Risk adjustors (ranked): <ul style="list-style-type: none"> #1 Fusion location⁷ #2 PLOS³ #3 Diagnosis type⁸ • Significance test: Binomial • Confidence level: 95% 	<p>Procedure Rate</p> <ul style="list-style-type: none"> • Approach: Indirect standardization • Age cohort² adjusted <p>Length of Stay</p> <ul style="list-style-type: none"> • Approach: Risk index adjustment • Risk adjustors (ranked): <ul style="list-style-type: none"> #1 PLOS³ #2 Race #3 Age⁹ <p>In-Hospital Complications</p> <ul style="list-style-type: none"> • Approach: Indirect standardization • Risk adjustors (ranked): <ul style="list-style-type: none"> #1 Race #2 PLOS³ • Significance test: Binomial • Confidence level: 95%

¹ The “step-wise” statistical method was used to determine the best risk adjustor factors for in-hospital complications. A modification of this approach was used for LOS analyses.

² Age cohorts: 18 yr – 44 yr; 45 yr – 64 yr.

³ *Atlas Outcomes*@ Predicted Length of Stay.

⁴ Reconstruction (both mastectomy and lumpectomy), mastectomy (no reconstruction), lumpectomy (no reconstruction).

⁵ In situ, malignant neoplasm, metastatic.

⁶ Age cohort: 18 yr, 19 yr, 20 – 44 yr, 45 yr – 64 yr.

⁷ Cervical/atlas axis/fusion not otherwise specified, lumbar/lumbosacral, dorsal/dorsolumbar, no fusion.

⁸ Disc displacement, disc degeneration and narrowing of spinal canal, other disorders/back pain.

⁹ Age cohorts: 18 yr – 56 yr; 57 yr – 60 yr, 61 yr – 64 yr.

DESCRIPTION OF MISSING INPATIENT DATA

The utilization and outcome data presented in this report were derived from the PHC4 database. Table 7A lists the number and percent of acute care facilities that submitted incomplete data. Table 7B lists specific acute care facilities that did not submit data. It should be noted that all analyses of data presented in these tables (7A, 7B) below was based on *all* inpatient discharges - before exclusions and before payor verification of the data.

Table 7A. Records Submitted by Facilities by Quarter

Time Period	N, Total Facilities ¹	N, Facilities Not Reporting ²	% Facilities Not Reporting
Quarter 1, 2000	195	2	1.0
Quarter 2, 2000	193	1	0.5
Quarter 3, 2000	191	0	0.0
Quarter 4, 2000	190	0	0.0

¹ The total number of facilities is shown as changing over time due to circumstances in which a facility changed status (e.g., changed from acute care status) or underwent a merger.

² Three facilities did not report data (see Table 7B below).

Table 7B. Facilities that Submitted Incomplete Data During Study Period

Facility Name	N ¹ , Quarter 1, 2000	N ¹ , Quarter 2, 2000	N ¹ , Quarter 3, 2000	N ¹ , Quarter 4, 2000	Total N ¹
• JFK Memorial	488	0	N/A ²	N/A ²	488
• Kensington	0	N/A ³	N/A ³	N/A ³	0
• Montrose General	0	214	151	201	566

¹ Refers to the number of records submitted.

² Only outpatient services were offered during this quarter.

³ Facility no longer a General Acute Care (GAC) hospital.

N/A: Not Applicable.

TREATMENT MEASURES CALCULATED BY PHC4

PREVENTING HOSPITALIZATION THROUGH PRIMARY CARE

The hospitalization rates for the five categories of preventable hospitalizations (pediatric ear, nose and throat infections; adult ear, nose and throat infections; high blood pressure; gastrointestinal infections; and kidney/urinary tract infections) were based upon the number of individual members that were hospitalized for a given condition. These admissions are referred to as “index hospitalizations.” Non-index hospitalizations are those records that are linked to an index hospitalization for a single member. Non-index cases were excluded so that a single member was counted in the hospitalization rate analysis rather than individual hospitalizations. Therefore, if a person was hospitalized several times during the study period, only the first or index hospitalization was counted. Hence, the number of members hospitalized was the basis of the hospitalization rate, not the number of hospitalizations.

Pediatric Ear, Nose and Throat Infections

Inclusion Criteria

Cases were included in the data analysis for pediatric ear, nose, and throat infections if they included diagnosis/treatment codes for ear, nose and throat infections as defined by one of the ICD.9.CM codes for this condition listed in Appendix A: *Description of Study Population*. One of these codes must have served as the principal diagnosis for a hospitalization for inclusion in this analysis. Pediatric members included in this analysis were 0 to 17 years old. A total of 616 admissions, after exclusions, matched these criteria.

Data Analyzed

For pediatric ear, nose and throat infections, only a single hospitalization per member was included in the analysis. Only index hospitalizations were used to determine hospitalization rates.

Hospitalization Rate and Exclusion Criteria

Hospitalization Rate (age and sex adjusted). The hospitalization rate shown for each HMO used the total number of pediatric index hospitalizations per 10,000 pediatric members.

Of the 654 hospitalizations for pediatric ear, nose and throat infections submitted to PHC4 for inclusion in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, no records were identified as duplicates. As a result, of the 654 HMO records identified for study, 616 were included in the analysis after exclusion of 38 records. Hospitalizations that were excluded from the hospitalization rate analysis for pediatric ear, nose and throat infections are listed in Table 8A. The HMO database was used as the comparative reference.

Table 8A. Exclusions from “Hospitalization Rate” Analysis for Pediatric Ear, Nose and Throat Infections

	HMO	
	Total Hospitalizations <i>N</i>	% of Total
<i>Total hospitalizations before exclusions</i>	654	100.0
<i>Exclusions:</i>		
❖ Neonates (age < 28 days)	15	2.3
❖ Clinical exclusions [†]	19	2.9
❖ Non-index hospitalizations	4	0.6
<i>Total exclusions</i>	38	5.8
<i>Total members remaining in analysis</i>	616	94.2

[†] Includes cases involving metastatic cancer; cancer of ear, nose or throat; lung cancer; HIV infection; extensive OR procedures unrelated to principal diagnosis; mechanical ventilator; tracheostomy; cleft lip and palate repair; non-extensive OR procedures unrelated to principal diagnosis; and tracheitis.

Adult Ear, Nose and Throat Infections

Inclusion Criteria

Cases were included in the data analysis for adult ear, nose and throat infections if they included diagnosis/treatment codes for the ear, nose and throat infections as defined by one of the ICD.9.CM codes for this condition listed in Appendix A: *Description of Study Population*. One of these codes must have served as the principal diagnosis for a hospitalization for inclusion in this analysis. Adult members included in this analysis were aged 18 years old to 64 years old. A total of 522 admissions, after exclusions, matched these criteria.

Data Analyzed

For adult ear, nose and throat infections, only a single hospitalization per member was included in the analysis. Only index hospitalizations were used to determine hospitalization rates.

Hospitalization Rate and Exclusion Criteria

Hospitalization Rate (age and sex adjusted). The hospitalization rate shown for each HMO used the total number of adult index hospitalizations per 10,000 adult members.

Of the 551 hospitalizations for adult ear, nose and throat infections submitted to PHC4 for inclusion in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, two records were identified as duplicates. As a result, of the 549 HMO records identified for study, 522 records were included in the analysis after exclusion of 27 records. Hospitalizations that were excluded from the hospitalization rate analysis for adult ear, nose and throat infections are listed in Table 8B. The HMO database was used as the comparative reference.

Table 8B. Exclusions from “Hospitalization Rate” Analysis for Adult Ear, Nose and Throat Infections

	HMO	
	Total Hospitalizations	
	<i>N</i>	<i>% of Total</i>
Total hospitalizations before exclusions	549	100.0
<i>Exclusions:</i>		
❖ Clinical exclusions [†]	15	2.7
❖ Non-index hospitalizations	12	2.2
<i>Total exclusions</i>	<i>27</i>	<i>4.9</i>
<i>Total members remaining in analysis</i>	<i>522</i>	<i>95.1</i>

[†] Includes cases involving metastatic cancer, cancer of ear, nose or throat, lung cancer, HIV infection, extensive OR procedures unrelated to principal diagnosis, mechanical ventilator, tracheostomy, cleft lip and palate repair, non-extensive OR procedures unrelated to principal diagnosis, and tracheitis.

High Blood Pressure (Hypertension)

Inclusion Criteria

Only adult (age 18 – 64 years) HMO members were included in this analysis. Cases were included in the data analysis for high blood pressure if they included diagnosis/treatment codes for high blood pressure as defined by one of the ICD.9.CM codes listed in *Appendix A: Description of Study Population*. One of these codes must have served as the principal diagnosis for a hospitalization for inclusion in this analysis. A total of 466 admissions, after exclusions, matched these criteria.

Data Analyzed

For high blood pressure treatment, only a single hospitalization per member was included in the analysis. Only index hospitalizations were used to determine hospitalization rates.

Hospitalization Rate and Exclusion Criteria

Hospitalization Rate (age and sex adjusted). The hospitalization rate shown for each HMO used the total number of index hospitalizations per 10,000 adult members.

Of the 513 hospitalizations for hypertension submitted to PHC4 for inclusion in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, one record was identified as duplicate. As a result, of the 512 HMO records identified for study, 466 were included in the analysis after exclusion of 46 records. Hospitalizations that were excluded from the hospitalization rate analysis for high blood pressure treatment are listed in Table 8C. The HMO database was used as the comparative reference.

Table 8C. Exclusions from “Hospitalization Rate” Analysis for High Blood Pressure

	HMO	
	Total Hospitalizations	
	<i>N</i>	<i>% of Total</i>
<i>Total hospitalizations before exclusions</i>	512	100.0
<i>Exclusions:</i>		
❖ Age < 18 years	8	1.6
❖ Clinical exclusions [†]	12	2.3
❖ Non-index hospitalizations	26	5.1
<i>Total exclusions</i>	46	9.0
<i>Total members remaining in analysis</i>	466	91.0

[†] Includes cases involving metastatic cancer, HIV infection, renal dialysis, open-heart surgery, extensive OR procedures unrelated to principal diagnosis, coronary bypass/stenting, and mechanical ventilator use.

Gastrointestinal Infections

Inclusion Criteria

Cases were included in the data analysis for gastrointestinal infections if they included diagnosis/treatment codes for gastrointestinal infections as defined by one of the ICD.9.CM codes listed in Appendix A: *Description of Study Population*. One of these codes must have served as the principal diagnosis for a hospitalization for inclusion in this analysis. HMO members included in this analysis were aged 0 to 64 years. A total of 1,062 admissions, after exclusions, matched these criteria.

Data Analyzed

For gastrointestinal infections, only a single hospitalization per member was included in the analysis. Only index hospitalizations were used to determine hospitalization rates.

Hospitalization Rate and Exclusion Criteria

Hospitalization Rate (age and sex adjusted). The hospitalization rate shown for each HMO used the total number of index hospitalizations per 10,000 members.

Of the 1,110 hospitalizations for gastrointestinal infections submitted to PHC4 for inclusion in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, no records were identified as duplicates. As a result, of the 1,110 HMO records identified for study, 1,062 were included in the analysis after exclusion of 48 records. Hospitalizations that were excluded from the hospitalization rate analysis for gastrointestinal infections are listed in Table 8D. The HMO database was used as the comparative reference.

Table 8D. Exclusions from “Hospitalization Rate” Analysis for Gastrointestinal Infections

	HMO	
	Total Hospitalizations	
	<i>N</i>	<i>% of Total</i>
<i>Total hospitalizations before exclusions</i>	1,110	100.0
<i>Exclusions:</i>		
❖ Neonates (age < 28 days)	4	0.4
❖ Clinical exclusions [†]	31	2.8
❖ Non-index hospitalizations	13	1.2
<i>Total exclusions</i>	48	4.3
<i>Total members remaining in analysis</i>	1,062	95.7

[†] Includes cases involving GI cancer, metastatic cancer, HIV infection, extensive OR procedures unrelated to principal diagnosis, major large and small bowel procedures, and other digestive system OR procedures with complications.

Kidney/Urinary Tract Infections

Inclusion Criteria

Cases were included in the data analysis for kidney/urinary tract infections if they included diagnosis/treatment codes for kidney/urinary tract infections as defined by one of the ICD.9.CM codes listed in Appendix A: *Description of Study Population*. One of these codes must have served as the principal diagnosis for a hospitalization for inclusion in this analysis. HMO members included in this analysis were aged 0 to 64 years. A total of 1,412 records, after exclusions, matched these criteria.

Data Analyzed

For kidney/urinary tract infections, only a single hospitalization per member was included in the analysis. Only index hospitalizations were used to determine hospitalization rates.

Hospitalization Rate and Exclusion Criteria

Hospitalization Rate (age and sex adjusted). The hospitalization rate shown for each HMO used the total number of index hospitalizations per 10,000 members.

Of the 1,552 hospitalizations for kidney/urinary tract infections submitted to PHC4 for inclusion in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, five records were identified as duplicates. As a result, of the 1,547 HMO records identified for study, 1,412 records were included in the analysis after exclusion of 135 records. Hospitalizations that were excluded from the hospitalization rate analysis for kidney/urinary tract infections are listed in Table 8E. The HMO database was used as the comparative reference.

Table 8E. Exclusions from “Hospitalization Rate” Analysis for Kidney/Urinary Tract Infections

	HMO	
	Total Hospitalizations	
	<i>N</i>	<i>% of Total</i>
<i>Total hospitalizations before exclusions</i>	1,547	100.0
<i>Exclusions:</i>		
❖ Neonates (age < 28 days)	10	0.6
❖ Clinical exclusions [†]	81	5.2
❖ Non-index hospitalizations	44	2.8
<i>Total exclusions</i>	135	8.7
<i>Total members remaining in analysis</i>	1,412	91.3

[†] Includes cases involving metastatic cancer, kidney/urinary tract cancer, HIV infection, chronic renal failure, renal dialysis, extensive OR procedures unrelated to principal diagnosis, and kidney, ureter and major bladder procedures.

MANAGEMENT OF ON-GOING ILLNESSES

Chronic Obstructive Pulmonary Disease (COPD)

Inclusion Criteria

Only adult (age 18 – 64 years) HMO members were included in this analysis. Cases were included in the data analysis for COPD if they included diagnosis/treatment codes for this condition as defined by one of the ICD.9.CM codes listed in Appendix A: *Description of Study Population*. One of these codes must have served as the principal diagnosis for a hospitalization to be included in this analysis. A total of 1,193 admissions, after exclusions, matched these criteria.

Data Analyzed

For COPD only a single hospitalization was included in the analysis. Index hospitalizations only were used to determine hospitalization rates.

Outcome/Utilization Measures and Exclusion Criteria

Hospitalization Rate (age and sex adjusted). The hospitalization rate is shown for each HMO using the total number of index hospitalizations per 10,000 adult members.

Of the 1,512 hospitalizations for COPD submitted to PHC4 for inclusion in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, two records were identified as duplicates. As a result, of the 1,510 HMO records identified for study, 1,193 were included in the analysis after exclusion of 317 records. Hospitalizations that were excluded from the hospitalization rate analysis for COPD are listed in Table 9A. The HMO database was used as the comparative reference.

Table 9A: Exclusions from “Hospitalization Rate” Analysis for COPD

	HMO	
	Total Hospitalizations	
	<i>N</i>	<i>% of Total</i>
<i>Total hospitalizations before exclusions</i>	1,510	100.0
<i>Exclusions:</i>		
❖ Age < 18 years	6	0.4
❖ Clinical exclusions [†]	109	7.2
❖ Non-index hospitalizations	202	13.4
<i>Total exclusions</i>	317	21.0
<i>Total members remaining in analysis</i>	1,193	79.0

[†] Includes all diagnosis groups except COPD (DRG 088) and cases involving metastatic cancer, lung cancer, HIV infection, and mechanical ventilator use.

Length of Stay, Risk-Adjusted. The inpatient length of stay measure is a valuable indicator of the time spent under a provider's care. It was calculated from the COPD index hospitalization only, beginning with the date of admission and ending with the date of discharge of the index hospitalization (length of stay is calculated as discharge date minus admit date). Hospitalizations that were excluded from the risk-adjusted length of stay analysis for COPD are listed in Table 9B. The HMO database was used as the comparative reference.

Table 9B. Exclusions from “Length of Stay” (LOS) Analysis for COPD

	HMO		
	Total Members		Avg. LOS
	<i>N</i>	<i>% of Total</i>	
<i>Total hospitalizations before exclusions</i>	1,510	100.0	4.6
<i>Exclusions:</i>			
❖ Hospitalization Rate exclusions	317	21.0	6.8
❖ Death in hospital [†]	2	0.1	4.5
❖ Missing Atlas Outcomes [®] PLOS	20	1.3	4.3
<i>Total exclusions</i>	339	22.4	6.6
<i>Total members remaining in analysis</i>	1,171	77.6	4.0

[†] Refers to a death occurring in a COPD index hospitalization.

Percent Rehospitalized (risk-adjusted). For percent rehospitalized, the first return hospitalization for respiratory-related acute care (MDC 4) within 180 days of discharge from an acute care facility in Pennsylvania was used. For multiple-hospitalization episodes, the discharge date of the last hospitalization (which may not be COPD-related) in the COPD episode was used as the start point for counting the 180 days. If a member was rehospitalized multiple times, he or she was still counted as one member who was rehospitalized. The numerator was the number of members rehospitalized with a respiratory-related principal diagnosis. The denominator was the total number of members hospitalized for COPD, after exclusions. Exclusion criteria for percent rehospitalized are listed in Table 9C. The HMO database was used as the comparative reference.

Table 9C. Exclusions from “Percent Rehospitalized” Analysis for COPD

	HMO	
	Total Hospitalizations	
	<i>N</i>	<i>% of Total</i>
<i>Total hospitalizations before exclusions</i>	1,510	100.0
<i>Exclusions:</i>		
❖ Length of Stay exclusions	339	22.4
❖ Invalid SSN	10	0.7
❖ Invalid admit/discharge/DOB/sex	2	0.1
❖ Inconsistent SSN/sex/DOB	4	0.3
<i>Total Exclusions</i>	355	23.5
<i>Total members remaining in analysis</i>	1,155	76.5

Pediatric and Adult Asthma

Inclusion Criteria

Pediatric (age 0 – 17 years) and adult (age 18 – 64 years) cases were analyzed separately. Cases were included in the data analysis if they included diagnoses/treatment codes for the clinical condition of asthma, as defined by one of the following ICD.9.CM codes as the principal diagnosis: 493.00, 493.01, 493.02, 493.10, 493.11, 493.12, 493.20, 493.21, 493.22, 493.90, 493.91, 493.92 (for description of codes see Appendix A: *Description of Study Population*).

Data Analyzed

The main data component analyzed used the index hospitalization only. Table 9D lists the hospitalizations that were excluded at the outset because they were identified as duplicate or they contained errors (e.g., nonsensical dates). Due to these errors, linkage of contiguous hospitalizations into an episode of care could not be accomplished.

Table 9D lists cases that were excluded prior to any asthma analyses. Only the first index hospitalization was used to determine hospitalization rate. Subsequent hospitalizations, although important for other outcome measures, were not accounted for in the hospitalization rate analyses, since these analyses act to tally the number of patients.

Table 9D. Records Excluded Prior to Any Asthma Analyses

	HMO	
	Total Hospitalizations	
	<i>N</i>	<i>% of Total</i>
<i>Total hospitalizations before exclusions</i>	3,629	100.0
<i>Exclusions</i>		
❖ Duplicates	3	< 0.1
❖ Problematic records [†]	0	0.0
❖ Non-index hospitalizations	377	10.4
<i>Total Exclusions</i>	380	10.5
<i>Total members remaining in analysis</i>	3,249	89.5

[†] Hospitalizations lacking clear identifying characteristics (e.g., records with invalid notation for sex or nonsensical dates; case in which a patient was recorded as having died before his/her last hospitalization).

Outcome/Utilization Measures and Exclusion Criteria

Hospitalization Rate (age and sex adjusted). This measure is reported separately for pediatric and adult patients. The hospitalization rate is shown for each HMO using the total number of asthma index hospitalizations per 10,000 pediatric/adult members.

Calculation of the actual asthma hospitalization rate for an individual HMO plan incorporated the total number of index hospitalizations by the plan in the numerator and the total number of enrollees for the plan in the denominator. HMO comparison rates for each age/sex combination (cell) were determined by aggregating all HMO data to create two comparative databases, one for pediatric rates and one for adult rates. The aggregated HMO pediatric and adult rates served, respectively, as comparisons for each of the HMO plan's pediatric and adult hospitalization rates. Members that were excluded from the hospitalization rate analysis for asthma are listed in Table 9E.

Table 9E. Exclusions from “Hospitalization Rate” Analyses for Asthma

	Adult—HMO Total Hospitalizations		Pediatric—HMO Total Hospitalizations	
	<i>N</i>	% of Total	<i>N</i>	% of Total
<i>Total members before exclusions</i>	1,795	100.0	1,454	100.0
<i>Exclusions:</i>				
❖ Neonates (age < 28 days)	N/A	N/A	0	0.0
❖ Hospitalizations that were clinically complex:				
Tracheostomy ¹ procedure performed	2	0.1	0	0.0
Lung cancer ²	1	< 0.1	0	0.0
Metastatic cancers from other body systems ³	2	0.1	0	0.0
<i>Total Exclusions</i>	5	0.3	0	0.0
<i>Total members remaining in analysis</i>	1,790	99.7	1,454	100.0

¹ ICD.9.CM procedure codes 31.1, 31.21, and 31.29.

² Lung cancers involving primary site, secondary site (metastatic), uncertain behaviors, in situ cancers, or cancer of non-specific site; ICD.9.CM codes 162.2-162.9, 197.0, 231.2, 235.7, and 239.1.

³ ICD.9.CM codes 196.0-199.1.

Length of Stay, Risk-Adjusted analyses were conducted separately for adult and pediatric patients. The inpatient length of stay outcome measure is a valuable indicator of the time spent under a provider's care. It was calculated from the asthma index hospitalization only, beginning with the date of admission and ending with the date of discharge of the index hospitalization (length of stay is calculated as discharge date minus admit date). Hospitalizations that were excluded from the risk-adjusted length of stay analysis for asthma are listed in Table 9F. The HMO database was used as the comparative reference.

Table 9F. Exclusions from “Length of Stay” (LOS) Analyses for Asthma

	Adult—HMO Total Hospitalizations			Pediatric—HMO Total Hospitalizations		
	<i>N</i>	% of Total	<i>Avg.</i> <i>LOS</i>	<i>N</i>	% of Total	<i>Avg.</i> <i>LOS</i>
<i>Total members before exclusions</i>	1,795	100.0	3.3	1,454	100.0	2.0
<i>Exclusions:</i>						
❖ Hospitalization Rate exclusions	5	0.3	13.2	0	0.0	—
❖ Death in hospital	1	<0.1	29.0	0	0.0	—
❖ Hospitalizations with missing <i>Atlas Outcomes</i> ®/PLOS scores	27	1.5	3.0	9	0.6	2.1
❖ Outlier ¹ /invalid ² or missing LOS	8	0.4	20.1	3	0.2	11.7
<i>Total Exclusions</i>	41	2.3	8.2	12	0.8	4.5
<i>Total members remaining in analysis</i>	1,754	97.7	3.1	1,442	99.2	2.0

¹ Those LOS values that are greater than 15 days for adult, 10 days for pediatric.

² LOS value < 0.

Percent Rehospitalized (risk-adjusted) was calculated for adult asthma only. Because pediatric cases frequently lack SSN identification, potential rehospitalizations cannot be linked

to previous hospitalizations. Thus, the percent rehospitalized analysis was not reported for pediatric asthma cases.

For percent rehospitalized, the first return hospitalization for respiratory-related acute care (MDC 4) within 180 days of discharge from an acute care facility in Pennsylvania was used. For multiple-hospitalization episodes, the discharge date of the last hospitalization (which may not be asthma-related) in the asthma episode was used as the start point for counting the 180 days. If a member was rehospitalized multiple times, he or she was still counted as one member who was rehospitalized. The numerator was the number of members rehospitalized with a respiratory-related principal diagnosis. The denominator was the total number of members hospitalized for asthma, after exclusions. Exclusion criteria for percent rehospitalized are listed in Table 9G. The HMO database was used as the comparative reference.

Table 9G. Exclusions from “Percent Rehospitalized” Analysis for Adult Asthma

	HMO	
	Total Hospitalizations	
	<i>N</i>	<i>% of Total</i>
<i>Total hospitalizations before exclusions</i>	1,795	100.0
<i>Exclusions:</i>		
❖ Length of Stay exclusions	41	2.3
❖ Invalid SSN	33	1.8
❖ Invalid dates/sex	0	0.0
❖ Inconsistent SSN/sex/DOB	9	0.5
<i>Total Exclusions</i>	83	4.6
<i>Total members remaining in analysis</i>	1,712	95.4

Diabetes

Inclusion Criteria

Hospitalization records were included in this analysis only if: the member was identified as having diabetes, according to HEDIS NCQA guidelines; the member was between the ages of 18 and 75 years (inclusive) on December 31, 2000; the member met continuous enrollment requirements set by NCQA; and the hospitalization had a principal diagnosis of diabetes (ICD.9.CM codes are listed in Appendix A: *Description of Study Population*). Plans were asked to delete records that did not meet these criteria. If a member was hospitalized multiple times during 2000, only the first hospitalization that met inclusion criteria, the index hospitalization, was used for analysis. Also note that the age interval for this analysis is different from the other clinical treatments/conditions included in the report.

Outcome/Utilization Measures and Exclusion Criteria

Hospitalization Rate (age and sex adjusted). The hospitalization rate is shown for each HMO using the total number of adult diabetic members hospitalized per 10,000 diabetic members.

Starting with all diabetic hospitalizations in 2000, for all plans, any duplicate or problematic records were removed first. Then, clinical exclusions were removed. Finally, to account for members that were hospitalized repeatedly, only the first hospitalization by a member was included in the analysis. Rehospitalizations for the same member are excluded, and listed as

"non-index hospitalizations" in Table 9H. The HMO database was used as the comparative reference.

Table 9H. Exclusions from "Hospitalization Rate" Analysis for Diabetes

	HMO	
	Total Hospitalizations	
	<i>N</i>	<i>% of Total</i>
<i>Total hospitalizations before exclusions</i>	1,731	100.0
<i>Exclusions:</i>		
❖ Duplicate/problematic records	4	0.2
❖ Clinical exclusions [†]	51	2.9
❖ Non-index hospitalizations	268	15.5
<i>Total exclusions</i>	323	18.7
<i>Total members remaining in analysis</i>	1,408	81.3

Note that those members age < 18 years or > 75 years were excluded through the data verification efforts with the health plans (in order to be consistent with the HEDIS definition).

[†] Includes cases involving major organ transplants, metastatic cancer, HIV infection and other "clinically complex" cases that have been defined by DRG:

- 004 - Spinal procedures
- 106 - Coronary bypass with PTCA
- 107 - Coronary bypass with cardiac catheterization
- 110 - Major cardiovascular procedures with complications and comorbidities
- 116 - Other permanent cardiac pacemaker implant or PTCA with coronary artery stent implant
- 288 - OR procedures for obesity
- 304 - Kidney, ureter and major bladder procedures for nonneoplasms with complications and comorbidities
- 305 - Kidney, ureter and major bladder procedures for nonneoplasms without complications and comorbidities
- 310 - Transurethral procedures with complications and comorbidities
- 468 - Extensive OR procedure unrelated to principal diagnosis
- 476 - Prostatic OR procedure unrelated to principal diagnosis.

Following exclusions, the hospitalization rate was adjusted for age and sex using the formulas listed in the *Data Analysis* section of this *Technical Report*.

Length of Stay, Risk-Adjusted. The inpatient length of stay outcome measure is a valuable indicator of the time spent under a provider's care. It was calculated from the diabetes index hospitalization, beginning with the date of admission and ending with the date of discharge of the hospitalization. Hospitalizations that were excluded from the risk-adjusted length of stay analysis for diabetes are listed in the Table 9I. The HMO database was used as the comparative reference.

Table 9I. Exclusions from “Length of Stay” (LOS) Analysis for Diabetes

	HMO		
	N	Total Members	
		% of Total	Avg. LOS
<i>Total members hospitalized before exclusions</i>	1,408	100.0	4.3
<i>Exclusions:</i>			
❖ Death in hospital [†]	1	0.1	3.0
❖ Missing <i>Atlas Outcomes</i> [®] PLOS	29	2.1	5.6
❖ Outliers (LOS > 30 days)	4	0.3	39.3
<i>Total exclusions</i>	34	2.4	9.4
<i>Total members remaining in analysis</i>	1,374	97.6	4.2

[†] Refers to a death occurring in a diabetes index hospitalization.

Percent of Admissions for Short-term Complications of Diabetes For all diabetes hospitalizations included in the hospitalization rate analysis, PHC4 also calculated the percent that were hospitalized due to short-term complications of diabetes. These hospitalizations may be an immediate reflection of how well members are managing their diabetes. Short-term complications of diabetes are acute, life-threatening events related to blood sugar control. The following codes were used to identify short-term complications: 250.2, 250.03, 250.10–250.13, 250.20–250.23, 250.30–250.33 (for a description of these codes see Appendix A: *Description of Study Population*).

Percent Rehospitalized (risk-adjusted). For percent rehospitalized, the first return hospitalization for diabetes-related acute care within 180 days of discharge from an acute care facility in Pennsylvania was used. For multiple-hospitalization episodes, the discharge date of the last hospitalization (which may not be diabetes-related) in the diabetes episode was used as the start point for counting the 180 days. If a member was rehospitalized multiple times, he or she was still counted as one member who was rehospitalized. The numerator was the number of members rehospitalized with a diabetes-related principal diagnosis. The denominator was the total number of members with diabetes that were hospitalized for diabetes, after exclusions. Exclusion criteria for percent rehospitalized are listed in Table 9J. The HMO database was used as the comparative reference.

Table 9J. Exclusions from “Percent Rehospitalized” Analysis for Diabetes

	HMO	
	Total Members	
	N	% of Total
<i>Total members hospitalized before exclusions</i>	1,408	100.0
<i>Exclusions:</i>		
❖ Length of Stay exclusions	34	2.4
❖ Death in hospital [†]	1	0.1
❖ Invalid SSN	14	1.0
❖ Inconsistent SSN/sex/DOB	7	0.5
<i>Total exclusions</i>	56	4.0
<i>Total members remaining in analysis</i>	1,352	96.0

[†] Refers to a death occurring in a non-diabetes hospitalization within the episode.

HEART ATTACK (AMI)

Inclusion Criteria

Only adults (age 18 – 64 years) were included in this analysis. Cases that were assigned a principal diagnosis (in the index hospitalization) of one of the ICD.9.CM codes for heart attack, (i.e., 410.x1, where x = 0 – 9 delineates the location of the infarction within the heart, and the fifth digit of “1” delineates the initial episode of care for that heart attack; see Appendix A: *Description of Study Population*) were included in the analyses.

Note that of the 14,775 AMI hospitalizations submitted to PHC4 for potential inclusion in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, 22 records were identified as duplicates. As a result, 14,753 AMI hospitalizations (statewide; prior to the removal of excluded records) were investigated in this report.

Data Analyzed

The care received by a patient following a heart attack is comprehensive and typically involves several additional/intricately-related hospitalizations. Therefore, for this report, the main data component analyzed consists of acute care MDC 5 (Major Diagnostic Category 5: Diseases and Disorders of the Circulatory System*) hospitalizations that began within 30 days of the admit date of the index heart attack hospitalization or were linked by date to a hospitalization beginning within 30 days of the admit date of the index heart attack hospitalization. This unique methodology was meant to provide for a complete depiction of an individual patient's hospitalization experience for a single heart attack. Thus, the analyses for heart attack utilization and outcome measures included data for single patients only. For any one patient, only hospitalizations associated with the first heart attack hospitalization were included in the analyses. That is, if a patient encounters two or more heart attack hospitalizations within the one-year study period, only the hospitalizations associated with the first index hospitalization were analyzed in this study. Those AMI hospitalizations occurring after the 30-day period that were not contiguous with any other hospitalization beginning within the 30-day period were excluded (see Table 10A). In addition, Table 10A notes (as exclusions) the number of index heart attack hospitalizations that were contiguous with heart attack hospitalizations occurring prior to the study period.

Table 10A illustrates that the total number of hospitalizations for AMI is different from the number of index hospitalizations studied, since, for a single AMI patient, several related hospitalizations occurring within 30 days of the index heart attack hospitalization were studied as a unit in the analyses. Table 10A also notes the number of non-index hospitalizations that were embedded into a single unit (to represent individual patients). Clinical information from each individual hospitalization (index and non-index) was utilized for the following analyses: average number of days hospitalized, in-hospital mortality, and cardiac procedure percents (i.e., percent receiving catheterization, percent receiving CABG, percent receiving PTCA/stent). For the in-hospital mortality and the cardiac procedure percent analyses, the death or the procedure, respectively, must have occurred within 30 days of the admission date of the index heart attack hospitalization in order to be included in the analysis. For the average number of days hospitalized analysis, all hospitalizations that began no more than 30 days from the admit date of the index AMI hospitalization were used to determine the total days hospitalized.

*Major Diagnostic Categories, used by the DRG system, are a broad classification of diagnoses typically grouped by body system.

Table 10A. Exclusions from “Hospitalization Rate” Analysis for Heart Attack

	HMO	
	Total Hospitalizations	
	<i>N</i>	<i>% of Total</i>
<i>Total members before exclusions</i>	4,082	100.0
<i>Exclusions:</i>		
❖ Age < 18 years	3	<0.1
❖ Problematic records ¹	0	0.0
❖ Index heart attack hospitalizations that are contiguous with AMI hospitalizations occurring prior to the study period	2	<0.1
❖ Hospitalizations occurring beyond 30 days from the initial index hospitalization ²	66	1.6
❖ Non-index AMI hospitalizations that were embedded into 30-day episode	703	17.2
❖ Hospitalizations that were clinically complex:		
Transplants ³	0	0.0
Metastatic cancer ⁴	9	0.2
<i>Total exclusions</i>	783	19.2
<i>Total members remaining in analysis</i>	3,299	80.8

¹ These include cases in which a single patient was recorded as having died more than once.

² AMI hospitalizations that occurred after the 30-day period *and* were not contiguous with any other hospitalization beginning within the 30-day period.

³ Heart transplants (ICD.9.CM procedure code 37.5) and heart/lung transplants (ICD.9.CM procedure code 33.6) that occurred in an AMI hospitalization.

⁴ Metastatic cancer, ICD.9.CM codes 196.0-199 was listed in AMI hospitalization.

Outcome/Utilization Measures and Exclusion Criteria

Hospitalization Rate (age and sex adjusted). The hospitalization rate is shown for each HMO using the total number of adult members hospitalized per 10,000 members. HMO members included in this analysis were aged 18 years to 64 years of age at the end of calendar year 2000. This measure was determined for each HMO using the total number of patients in the heart attack analysis. Therefore, all hospitalizations associated with an individual patient were collectively referred to as a single data unit for hospitalization rate analysis.

The actual hospitalization rate for an individual HMO plan for heart attack incorporated the total number of AMI patients by the plan in the numerator and the total number of adult enrollees for the plan in the denominator. HMO rates for each age/sex combination (cell) were determined from all HMO heart attack adult patients under the age of 65 combined; the HMO database served as a comparison for each of the HMO plans. Hospitalizations that were excluded from the hospitalization rate analysis for heart attack are listed in Table 10A.

In-Hospital Mortality (risk-adjusted). The care received by a patient following a heart attack is comprehensive and typically involves several additional/intricately-related hospitalizations. Therefore, any acute care MDC 5 hospitalization ending in death (regardless of principal diagnosis), where the death (discharge status “20” listed in the record) occurred no more than 30 days from the admit date of the index heart attack hospitalization, was included in the in-hospital mortality analysis. The actual mortality percent for AMI was calculated by dividing the

total number of deaths (occurring within 30 days of the admit date of the index hospitalization) for AMI patients in the study for each HMO plan by the total number of heart attack patients per plan. The exclusions to the analysis of in-hospital mortality for heart attack are listed below in Table 10B. The statewide database was used to calculate each HMO plan's expected in-hospital mortality percent.

Table 10B. Exclusions from “In-Hospital Mortality” Analysis for Heart Attack

	Statewide Total Hospitalizations	
	<i>N</i>	% of Total
<i>Total hospitalizations after “hospitalization rate” analysis exclusions</i>	11,922	100.0
<i>Exclusions:</i>		
❖ Hospitalizations with a missing <i>Atlas Outcomes</i> ® ASG score in index hospitalization	193	1.6
❖ Invalid SSN [†]	204	1.7
❖ Inconsistent SSN/sex/DOB [†]	137	1.1
<i>Total Exclusions</i>	534	4.5
<i>Total hospitalizations remaining in analysis</i>	11,388	95.5

[†] Patients were excluded since it was indeterminable (due to invalid SSN, dates, gender, etc.) whether these patients were hospitalized at another time following the index AMI hospitalization and therefore could not be linked.

Average Number of Days Hospitalized (risk-adjusted). Rather than reporting length of stay, the average number of days hospitalized for individual heart attack patients is reported as an indicator of the time spent in the hospital(s) for heart attack treatment. The average number of days hospitalized for heart attack patients consists of the total time spent in the hospital or the sum of individual hospitalizations that began no more than 30 days of the admit date of the index heart attack hospitalization. The exclusions to the average number of days hospitalized analysis for heart attack are listed in Table 10C. The statewide database was used as the comparative reference.

Table 10C. Exclusions from “Average Number of Days Hospitalized” Analysis for Heart Attack

	Statewide Total Hospitalizations	
	<i>N</i>	% of Total
<i>Total hospitalizations before exclusions</i>	11,922	100.0
<i>Exclusions:</i>		
❖ In-Hospital Mortality exclusions	534	4.5
❖ Death in hospital within 30 days ¹	420	3.5
❖ Death in hospital after 30 days but within an episode ²	24	0.2
❖ Outliers ³ /missing or invalid ⁴ length of stay	60	0.5
<i>Total Exclusions</i>	1,038	8.7
<i>Total hospitalizations remaining in analysis</i>	10,884	91.3

¹ Refers to a death that occurs within 30 days of the admission date of the index hospitalization.

² Refers to a death that occurs beyond 30 days of the admission date of the index hospitalization.

³ Hospitalizations in which days hospitalized > 38.

Other Cardiac Procedures Associated with Any Single Heart Attack Patient

Percent Receiving Cardiac Catheterization. The diagnostic cardiac catheterization procedure (ICD.9.CM codes 37.22 or 37.23) must have been performed (in any hospitalization, regardless of principal diagnosis) within 30 days of (or 3 days prior to) the index hospitalization admission date for a heart attack. Calculation of the catheterization percent incorporated the frequency of catheterization procedures (occurring for a single heart attack patient), by plan in the numerator and the number of heart attack patients for each plan in the denominator. Note, when a procedure code for a diagnostic catheterization was not present in a heart attack record, it was assumed that the procedure was performed in conjunction with or prior to PTCA/stent procedures and CABG surgeries, since all cases require a diagnostic catheterization in order to undergo therapeutic intervention/coronary revascularization.

Percent Receiving PTCA/Stent. The codes associated with PTCA (percutaneous transluminal coronary angioplasty) include 36.01, 36.02, and 36.05. The code assigned to a stent procedure is 36.06. To be included in the analyses, these procedures must have been performed within 30 days of the index hospital admission for a heart attack. Calculation of this percent incorporated the frequency of the procedures (occurring in any individual patient) for individual HMO plans in the numerator and the number of heart attack patients per plan in the denominator.

Percent Receiving Coronary Artery Bypass Graft (CABG). The codes associated with bypass surgery percent include 36.10–36.17, 36.19. One or more of these procedure codes must have been present (in any hospitalization) within the heart attack episode. The CABG procedure must have been performed within 30 days of the index hospitalization admission date for a heart attack. Calculation of the bypass surgery percent incorporated the frequency of CABG procedures occurring within 30 days of the index hospital admission for individual AMI patients by plan in the numerator and the number of heart attack patients by plan in the denominator.

SURGICAL PROCEDURES

Hysterectomy

Inclusion Criteria

Hysterectomy procedures can be divided among abdominal and vaginal surgical approaches. In the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, the data are reported for abdominal, vaginal and total hysterectomies. However, the risk adjustment methodology was based on collective data for abdominal and vaginal approaches. As a result the exclusion tables shown below include data for abdominal and vaginal hysterectomies combined. The study population included hospitalizations that were assigned a principal or secondary procedure code of hysterectomy (see Appendix A: *Description of Study Population*). Only adult (age 18 – 64 years) females were included in this analysis. Exclusions from the hysterectomy population are detailed in the following sections. Cases were removed from analyses for several reasons including hysterectomies performed due to cancer (ICD.9.CM diagnosis codes 179, 180.0-180.9, 181, 182.0-182.8, 183.0-183.9, 184.0-184.9, 198.6, 198.82, 233.1-233.3, 236.0-236.3, 239.5), trauma of the female reproductive system (ICD.9.CM diagnosis codes 867.4-867.9, 868.00, 868.03, 868.04, 868.09, 868.10, 868.13, 868.14, 868.19, 869.0, 869.1, 879.6-879.9, 906.0, 908.2, 939.1, 947.4), or other emergent occurrences such as pregnancy related complications (i.e., cases that were not in MDC 13 were excluded).

In summary, hysterectomies were excluded from analysis when a diagnosis code for female reproductive malignancy or pelvic/lower abdominal trauma appeared in any diagnosis position or the cases were not in MDC 13 (Diseases and Disorders of the Female Reproductive System). Thus, only non-traumatic and non-female reproductive malignant hysterectomies were analyzed.

Data Analyzed

For the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, only a subset of hysterectomy procedures was included in the study. Hysterectomies due to trauma or cancer (of the female reproductive system) were two of several clinical reasons for exclusion from these analyses. Additional clinical exclusions to analyses follow (see Table 11A).

For hysterectomy outcome analyses, the main data component consists of a single acute care hospitalization (i.e., an index hospitalization) in which a hysterectomy is performed. From a clinical standpoint, hysterectomy procedures are expected to involve only single hospitalizations. That is, hysterectomy episodes should include a single hospital admission and should not involve multiple hospitalizations/transfers. Therefore, for this report, hysterectomy episodes consisting of two or more hysterectomy hospitalizations (for a single patient) are considered erroneous hospitalizations and are excluded from the analyses at the outset (see “problematic records” in Table 11A below).

Table 11A. Records Excluded Prior to Any Hysterectomy Analyses

	HMO		Statewide	
	Total Hospitalizations <i>N</i>	% of Total	Total Hospitalizations <i>N</i>	% of Total
<i>Total hospitalizations before exclusions</i>	7,961	100.0	21,100	100.0
<i>Exclusions:</i>				
❖ Duplicate/problematic records [†]	16	0.2	39	0.2
<i>Total hospitalizations remaining in analysis</i>	7,945	99.8	21,061	99.8

[†] For example, case in which a patient is recorded as having more than one hysterectomy hospitalization.

Outcome/Utilization Measures and Exclusion Criteria

Procedure Rate (age adjusted). The procedure rate is shown for each HMO and was based upon the number of hysterectomy procedures divided by the total number of adult female HMO members in calendar year 2000. This rate was reported per 10,000 members.

HMO rates for each age category (cell) were determined from all data combined (that is, HMO adult members, aggregated). This rate served as a comparison for each of the HMO plans. Procedures excluded from the procedure rate analysis for hysterectomy are listed in Table 11B.

Table 11B. Exclusions from “Procedure Rate” Analysis for Hysterectomy

	HMO	
	Total Hospitalizations	
	<i>N</i>	<i>% of Total</i>
<i>Total hospitalizations before exclusions</i>	7,945	100.0
<i>Exclusions:</i>		
❖ Age < 18 yr	0	0.0
❖ Hospitalizations that were clinically complex:		
Any cancer (other than history of cancer) ¹	58	0.7
Hemorrhage on admission ²	1	< 0.1
❖ Not in MDC 13	109	1.4
<i>Total Exclusions</i>	168	2.1
<i>Total hospitalizations remaining in analysis</i>	7,777	97.9

¹ Subsequent to data verification, these hospitalizations were deemed necessary exclusions due to cancer status of all other body sites.

² Hemorrhage (as principal diagnosis) complicating a procedure; ICD.9.CM code 998.11.

In-Hospital Complications (risk-adjusted). This measure is reported separately for abdominal and vaginal adult hysterectomies and was calculated for each HMO. In-hospital complications are any one of a particular set of ICD.9.CM codes in any procedure or secondary diagnosis position in a discharge record associated with the hysterectomy hospitalization. Calculation of the actual in-hospital complications percent for an individual HMO plan incorporated the total number of hysterectomy cases with at least one complication by each plan in the numerator and the total number of hysterectomy hospitalizations for the plan in the denominator. Refer to Appendix C: *Definition of In-Hospital Complications for Surgical Procedures* for a detailed description of the in-hospital complications associated with hysterectomy procedures. The exclusions to the in-hospital complications analysis for hysterectomy are outlined in Table 11C. Statewide percents were used to risk adjust each HMO plan's in-hospital complications percent.

Table 11C. Exclusions from “In-Hospital Complications” Analysis for Hysterectomy

	Statewide Total Hospitalizations	
	<i>N</i>	<i>% of Total</i>
<i>Total hospitalizations before exclusions</i>	21,061	100.0
<i>Exclusions:</i>		
❖ Procedure Rate exclusions	539	2.6
❖ Hospitalizations with a missing <i>Atlas Outcomes</i> ® PLOS	240	1.1
<i>Total Exclusions</i>	779	3.7
<i>Total hospitalizations remaining in analysis</i>	20,282	96.3

Length of Stay, Risk-Adjusted. The inpatient length of stay for hysterectomy is the period of hospitalization beginning with the date of admission of the hospitalization in which the hysterectomy procedure was performed and ending with the date of discharge of the same hospitalization (length of stay is calculated as discharge date minus admit date). The exclusions to the risk-adjusted length of stay analysis for hysterectomy are outlined in Table 11D. The statewide database was used as the comparative reference.

Table 11D. Exclusions from “Length of Stay” (LOS) Analysis for Hysterectomy

	Statewide Total Hospitalizations		
	<i>N</i>	<i>% of Total</i>	<i>Avg. LOS.</i>
<i>Total hospitalizations before exclusions</i>	21,061	100.0	2.7
<i>Exclusions:</i>			
❖ In-Hospital Complications exclusions	779	3.7	4.9
❖ Death in hospital	2	< 0.1	14.5
❖ Outlier ¹ /invalid ² or missing LOS	91	0.4	12.6
<i>Total Exclusions</i>	872	4.1	5.7
<i>Total hospitalizations remaining in analysis</i>	20,189	95.9	2.6

¹ LOS > 11 days in abdominal hysterectomy hospitalizations or LOS > 5 days in vaginal hysterectomy hospitalizations.

² LOS value < 0.

Breast Cancer Procedures

Inclusion Criteria

The analyses of breast cancer utilization and outcome measures were based upon the total number of *procedures* (8,761 statewide and 2,988 for HMO members, who had a lumpectomy and/or mastectomy and a diagnosis of breast cancer in either the principal or secondary diagnosis fields) reported in calendar year 2000. Initial selection included procedures for only adult (age 18 – 64 years) females. Cases were included in the data analysis for breast cancer procedures if they had a principal diagnosis of breast cancer and had a procedure code present in the record for this condition as defined by one of the ICD.9.CM or CPT codes listed in Appendix A: *Description of Study Population*. A total of 2,927 (HMO) and 8,504 (statewide) admissions, after exclusions, matched these criteria.

Data Analyzed

For breast cancer, procedure rates were based upon the *total number* of breast cancer procedures not the number of patients receiving a breast cancer procedure. Procedures were performed during an inpatient hospitalization or in an ambulatory care setting.

Outcome/Utilization Measures and Exclusion Criteria

Procedure Rate (age adjusted). The procedure rate is shown for each HMO using the total number of procedures (lumpectomies and mastectomies) per 10,000 adult female members. When two or more procedures were performed at the same time (e.g., lumpectomy and mastectomy) only the most invasive procedure (mastectomy) was included in the analysis. That is, within an encounter, multiple procedures were tallied only once for the purpose of calculating the procedure rate.

Calculation of the actual breast cancer procedure rate for an individual HMO plan incorporated the total number of breast cancer encounters, both inpatient and ambulatory care, for adult females by HMO in the numerator and the total number of HMO adult female plan members in the denominator. HMO rates for each age category (cell) were determined from all data combined (that is, HMO breast cancer procedures for adult female members, aggregated). This rate served as a comparison for each of the HMO plans.

Table 11E. Exclusions from “Procedure Rate” Analysis for Breast Cancer Procedures – Inpatient and Ambulatory

	HMO	
	Total Procedures	
	<i>N</i>	<i>% of Total</i>
<i>Total procedures[†] before exclusions</i>	2,998	100.0
<i>Exclusions:</i>		
❖ Age < 18 years	0	0.0
❖ BRCA diagnosis not principal	64	2.1
❖ Invalid dates	3	0.1
❖ Duplicate/problematic records	4	0.1
<i>Total exclusions</i>	71	2.4
<i>Total procedures remaining in analysis</i>	2,927	97.6

[†] Refers to patient encounters; for example, if a patient had both a lumpectomy and a mastectomy in the same medical encounter, only the more invasive procedure was counted as a single encounter. Inpatient and ambulatory cases were included.

In-Hospital Complications (risk-adjusted). This measure was calculated for inpatient procedures only and is reported separately for lumpectomy and mastectomy procedures and was calculated for each HMO. In-hospital complications are any one of a particular set of ICD.9.CM codes in any procedure or secondary diagnosis position in a discharge record associated with the breast cancer hospitalization. Calculation of the actual in-hospital complications percent for an individual HMO incorporated the total number of cases that had at least one complication for a breast cancer procedure by each HMO in the numerator and the total number of procedures for the plan in the denominator. Refer to Appendix C: *Definition of In-Hospital Complications for Surgical Procedures* for a detailed description of the in-hospital complications associated with breast cancer procedures. The exclusions to the in-

hospital complications analysis are found in Table 11F. Statewide percents were used to risk adjust each HMO plan's in-hospital complications percent.

Table 11F. Exclusions from “In-Hospital Complications” Analysis for Breast Cancer Procedures – Inpatient Only

	Statewide Total Procedures	
	N	% of Total
Total procedures ¹ before exclusions	8,767	100.0
<i>Exclusions:</i>		
❖ Procedure Rate exclusions	263	3.0
❖ Ambulatory procedures ²	5,181	59.1
❖ Missing Atlas Outcomes® PLOS	62	0.7
Total exclusions	5,506	62.8
Total hospitalizations remaining in analysis	3,261	37.2

¹ Includes inpatient and ambulatory cases.

² 5,181 statewide records related to ambulatory care were not analyzed in the in-hospital complications percent since this is derived from inpatient cases only.

Length of Stay, Risk-Adjusted analyses are reported separately for lumpectomy and mastectomy procedures. Only inpatient hospitalizations were included in the length of stay outcome measure. The inpatient length of stay outcome measure is a valuable indicator of the time spent under a provider's care. It was calculated from a single hospitalization only, beginning with the date of admission and ending with the date of discharge hospitalization (length of stay is calculated as discharge date minus admit date). Hospitalizations that were excluded from the risk-adjusted length of stay analysis for inpatient breast cancer procedures are listed in Table 11G. The statewide database was used as the comparative reference.

Table 11G. Exclusions from “Length of Stay” (LOS) Analysis for Breast Cancer Procedures – Inpatient Only

	Statewide Total Procedures		
	N	% of Total	Avg. LOS
Total procedures ¹ before exclusions	8,767	100.0	2.1 (N ² = 3,410)
<i>Exclusions:</i>			
❖ In-Hospital Complications exclusions	5,506	62.8	3.9 (N ² = 149)
❖ Death in hospital	1	< 0.1	15.0 (N ² = 1)
Total exclusions	5,507	62.8	3.9 (N ² = 150)
Total hospitalizations remaining in analysis	3,260	37.2	2.1

¹ Includes inpatient and ambulatory cases.

² Based on inpatient cases only.

Neck and Back Procedures

Inclusion Criteria

The analyses of neck and back procedure utilization and outcome measures were based upon the total number of procedures reported in calendar year 2000 for adults (age 18 – 64 years). Cases were included in the data analysis for neck and back procedures if they included procedure or

diagnosis/treatment codes for the condition as defined by one of the ICD.9.CM codes listed in Appendix A: *Description of Study Population*. One of these codes must have served as the principal diagnosis for a hospitalization for inclusion in this analysis. A total of 5,193 HMO admissions, after exclusions, matched these criteria.

Data Analyzed

For neck and back procedures, rates were based upon the number of neck or back procedures performed during calendar year 2000. In addition, procedures were divided into two groups: those with spinal fusion and those without spinal fusion. Approximately 33 percent of the neck and back procedures also included spinal fusion.

Outcome/Utilization Measures and Exclusion Criteria

Procedure Rate (age and sex adjusted). The procedure rate is shown for each HMO and is based upon the number of neck and back procedures divided by the total number of adult HMO members in calendar year 2000. This rate is reported per 10,000 adult members.

HMO rates for each age and sex category (cell) were determined from all data combined (that is, adult HMO members, aggregated). This rate served as a comparison for each of the HMO plans. Cases excluded from the procedure rate analysis for neck and back procedures are listed in Table 11H.

Of the 5,251 neck and back procedures (HMO) and 17,427 procedures (statewide) submitted to PHC4 for inclusion in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, one duplicate HMO record and 10 duplicate statewide records were identified. As a result, after the removal of excluded records, 5,193 HMO records and 17,165 statewide records were analyzed.

Table 11H. Exclusions from “Procedure Rate” Analysis for Neck and Back Procedures

	HMO	
	Total Hospitalizations	
	<i>N</i>	<i>% of Total</i>
<i>Total hospitalizations before exclusions</i>	5,250	100.0
<i>Exclusions:</i>		
❖ Age < 18 years	10	0.2
❖ Refusion (in any position)	24	0.5
❖ Pathological spinal fractures	8	0.2
❖ Spinal nerve root injury	2	< 0.1
❖ Paraplegia	4	0.1
❖ Unspecified paralysis	1	< 0.1
❖ Spinal fracture	2	< 0.1
❖ HIV infection	0	0.0
❖ Quadriplegia	2	< 0.1
❖ Hemiplegia	2	< 0.1
❖ Infantile cerebral palsy	0	0.0
❖ Date/sex problems	2	< 0.1
<i>Total exclusions</i>	57	1.1
<i>Total hospitalizations remaining in analysis</i>	5,193	98.9

In-Hospital Complications (risk-adjusted). In-hospital complications were reported separately for fusion and non-fusion procedures and were calculated for each HMO. In-hospital complications are any one of a particular set of ICD.9.CM codes in any procedure or secondary diagnosis position in a discharge record associated with the neck/back hospitalization. Calculation of the actual in-hospital complications percent for an individual HMO plan incorporated the total number of neck and back cases with at least one complication by each plan in the numerator and the total number of neck and back hospitalizations for the plan in the denominator. Refer to Appendix C: *Definition of In-Hospital Complications for Surgical Procedures* for a detailed description of the in-hospital complications associated with these procedures. The exclusions to the in-hospital complications analysis are found in Table 11I. Statewide percents were used to risk adjust each HMO plan's in-hospital complications percent.

Table 11I. Exclusions from “In-Hospital Complications” Analysis for Neck and Back Procedures

	Statewide	
	Total Hospitalizations	
	<i>N</i>	<i>% of Total</i>
<i>Total hospitalizations before exclusions</i>	17,417	100.0
<i>Exclusions:</i>		
❖ Procedure Rate exclusions	252	1.4
❖ Hospitalizations with a missing <i>Atlas Outcomes®</i> PLOS	169	1.0
<i>Total exclusions</i>	421	2.4
<i>Total hospitalizations remaining in analysis</i>	16,996	97.6

Length of Stay, Risk-Adjusted. The inpatient length of stay for neck and back procedures is the period of hospitalization beginning with the date of admission in which the procedure was performed and ending with the date of discharge of the same hospitalization (length of stay is calculated as discharge date minus admit date). Hospitalizations that were excluded from the risk-adjusted length of stay analysis for neck and back procedures are listed in Table 11J. The statewide database was used as the comparative reference.

Table 11J. Exclusions from “Length of Stay” (LOS) Analysis for Neck and Back Procedures

	Statewide		
	Total Hospitalizations		
	<i>N</i>	<i>% of Total</i>	<i>Avg. LOS</i>
<i>Total hospitalizations before exclusions</i>	17,417	100.0	2.0
<i>Exclusions:</i>			
❖ In-Hospital Complications exclusions	421	2.4	3.9
❖ Death in hospital	4	< 0.1	7.8
❖ Outliers (LOS > 30 days)	3	< 0.1	55.3
<i>Total exclusions</i>	428	2.5	4.3
<i>Total hospitalizations remaining in analysis</i>	16,989	97.5	2.0

Prostatectomy

Inclusion Criteria

Only adult (age 18 – 64 years) males were included in this analysis. Cases were included in the data analysis for prostatectomy if they included procedure codes for this procedure as defined by one of the ICD.9.CM codes listed in Appendix A: *Description of Study Population*.

Data Analyzed

The analyses of prostatectomy utilization and outcome measures were based upon the total number of radical prostatectomy procedures (2,918 statewide and 1,074 for HMOs) reported in calendar year 2000. Prostatectomies done by a different surgical approach (i.e., transurethral prostatectomy) were excluded. Radical prostatectomy is most often done when cancer is present or assumed to be present. The clinical indications for choosing one surgical approach over another for prostatectomy are very different. Therefore, only radical prostatectomies were analyzed. Cases were included in the data analysis for prostatectomy procedures if they had a radical prostatectomy procedure performed during an inpatient hospitalization and were in DRGs 334 and 335. A total of 741 (HMO) and 1,854 (statewide) admissions, after exclusions, matched these criteria.

Outcome/Utilization Measures and Exclusion Criteria

Procedure Rate (age adjusted). The procedure rate is shown for each HMO using the total number of procedures (radical only) per 10,000 male members. Calculation of the actual prostatectomy procedure rate for an individual HMO plan incorporated the total number of radical prostatectomy procedures by HMO in the numerator and the total number of HMO adult male members in the denominator. HMO rates for each age category (cell) were determined from all data combined (that is, HMO prostatectomy procedures for male members, aggregated). This rate served as a comparison for each of the HMO plans.

Of the 1,074 prostatectomy procedures (HMO) and 2,918 procedures (statewide) submitted to PHC4 for inclusion in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report, three duplicate HMO records and eight duplicate statewide records were identified. Cases excluded from the procedure rate analysis for prostatectomy are listed in Table 11K.

Table 11K. Exclusions from “Procedure Rate” Analysis for Prostatectomy

	HMO	
	Total Hospitalizations	
	<i>N</i>	<i>% of Total</i>
<i>Total hospitalizations before exclusions</i>	1,071	100.0
<i>Exclusions:</i>		
❖ Age < 18	1	0.1
❖ Non-acute care hospitalization	1	0.1
❖ HIV infection	0	0.0
❖ Non-radical prostatectomy	325	30.3
❖ DRGs other than 334 or 335	3	0.3
<i>Total exclusions</i>	330	30.8
<i>Total hospitalizations remaining in analysis</i>	741	69.2

In-Hospital Complications (risk-adjusted). This measure was calculated for each HMO. In-hospital complications are any one of a particular set of ICD.9.CM codes in any procedure or

secondary diagnosis position in a discharge record associated with the prostatectomy hospitalization. Calculation of the actual in-hospital complications percent for an individual HMO plan incorporated the total number of prostatectomy cases with at least one complication, by each plan, in the numerator and the total number of prostatectomy hospitalizations for the plan in the denominator. Refer to Appendix C: *Definition of In-Hospital Complications for Surgical Procedures* for a detailed description of the complications associated with prostatectomy procedures. The exclusions to the in-hospital complications analysis are found in Table 11L. Statewide percents were used to risk adjust each HMO plan's in-hospital complications percent.

Table 11L. Exclusions from “In-Hospital Complications” Analysis for Prostatectomy

	Statewide Total Hospitalizations	
	<i>N</i>	<i>% of Total</i>
<i>Total hospitalizations before exclusions</i>	2,910	100.0
<i>Exclusions:</i>		
❖ Procedure Rate exclusions	1,056	36.3
❖ Missing <i>Atlas Outcomes</i> ® PLOS	17	0.6
<i>Total exclusions</i>	1,073	36.9
<i>Total hospitalizations remaining in analysis</i>	1,837	63.1

Length of Stay, Risk-Adjusted. The inpatient length of stay outcome measure is a valuable indicator of the time spent under a provider's care. It was calculated from a single hospitalization only, beginning with the date of admission and ending with the date of discharge (length of stay is calculated as discharge date minus admit date). Hospitalizations that were excluded from the risk-adjusted length of stay analysis for prostatectomy procedures are listed in Table 11M. The statewide database was used as the comparative reference.

Table 11M. Exclusions from “Length of Stay” (LOS) Analysis for Prostatectomy

	Statewide Total Hospitalizations		
	<i>N</i>	<i>% of Total</i>	<i>Avg. LOS</i>
<i>Total hospitalizations before exclusions</i>	2,910	100.0	3.1
❖ In-Hospital Complications exclusions	1,073	36.9	2.7
❖ Death in hospital	0	0.0	—
❖ Outliers (LOS > 30 days)	0	0.0	—
<i>Total exclusions</i>	1,073	36.9	2.7
<i>Total hospitalizations in analysis</i>	1,837	63.1	3.4

BIBLIOGRAPHY

Preventing Hospitalization through Primary Care: General Topics

- Billings, J., et al. (1996). Recent findings on preventable hospitalizations. Health Affairs, 15(3), 239-249.
- Billings, J., et al. (1993). Data watch, impact of socioeconomic status on hospital use in New York City. Health Affairs, Spring, 162-173.
- Bindman, A., et al. (1995). Preventable hospitalizations and access to health care. Journal of the American Medical Association, 274(4), 305-311.
- Fleming, S. T. (1995). Primary care, avoidable hospitalization, and outcomes of care: A literature review and methodological approach. Medical Care Research and Review, 52(1), 88.
- Friedman, B. (1999). Tracking the State Children's Health Insurance Program with hospital data: National baselines, state variations, and some cautions. Medical Care Research and Review, 56(4), 440.
- Gill, J. M. (1997). Can hospitalizations be avoided by having a regular source of care? Family Medicine, 29(3), 166-171.
- Gill, J. M., et al. (1998). The role of provider continuity in preventing hospitalizations. Archives of Family Medicine, 7, 352-357.
- Lambrew, J. M., et al. (1996). The effects of having a regular doctor on access to primary care, Medical Care, 34(2), 138-151.
- McConnochie, K. M., et al. (1999). How commonly are children hospitalized for dehydration eligible for care in alternative settings? Archives of Pediatric Adolescent Medicine, 153, 1233-1241.
- McKinnon, M. S., et al. (1996). Disease management program for asthma: Baseline assessment of resource use. American Journal of Health-System Pharmacology, 53, 535-541.
- Mort, E. A., et al. (1996). Physician response to patient insurance status in ambulatory care clinical decision-making. Medical Care, 34(8), 783-797.
- O'Sullivan, M. J., et al. (1996). Preventable hospitalizations: A tool for planning and marketing ambulatory health care services. Journal of Ambulatory Care Management, 19(2), 84-95.
- Pappas, G., et al. (1997). Potentially avoidable hospitalizations: Inequalities in rates between US socioeconomic groups. American Journal of Public Health, 87(5), 811.
- Parchman, M. L., et al. (1999). Preventable hospitalizations in primary care shortage areas. Archives of Family Medicine, 8, 487-491.
- Parchman, M. L., et al. (1994). Primary care physicians and avoidable hospitalizations. The Journal of Family Practice, 39(2), 123-128.
- Powe, N. R., et al. (1996). System-wide provider performance in a Medicaid Program, profiling the care of patients with chronic illnesses. Medical Care, 34(8), 798-810.
- Schreiber, S., et al. (1997). The meaning of ambulatory care sensitive admissions: Urban and rural perspectives. The Journal of Rural Health, 13(4), 276-284.

- Shi, L., et al. (1999). Patient characteristics associated with hospitalizations for ambulatory care sensitive conditions in South Carolina. *Southern Medical Journal*, 92(10), 989.
- Solberg, L. I., et al. (1990). The Minnesota Project: A focused approach to ambulatory quality assessment. *Inquiry*, 27, 359-367.
- Starfield, B. (1994). Costs vs. quality in different types of primary care settings. *Journal of the American Medical Association*, 272(24), 1903-1908.
- Weissman, J. S., et al. (1992). Rates of avoidable hospitalization by insurance status in Massachusetts and Maryland. *Journal of the American Medical Association*, 268(17), 2388-2394.
- Wickizer, T. M., et al. (1999). Effects of health care cost-containment programs on patterns of care and readmissions among children and adolescents. *American Journal of Public Health*, 89(9), 1353-1358.

Preventing Hospitalization through Primary Care: Specific Conditions

- Amin, S. P., et al. (1999). Direct health care costs for treatment of diabetes mellitus and hypertension in an IPA-group-model HMO. *American Journal of Health-System Pharmacology*, 56, 1515-1520.
- Arness, M. K., et al. (2000). Norwalk-like viral gastroenteritis outbreak in U.S. Army trainees. *Emerging Infectious Diseases*, 6(2), 204.
- Burkhart, D. M. (1999), Management of acute gastroenteritis in children. *American Family Physician*, 60(9), 2555.
- McCue, J. D. (1999). UTIs in at-risk patients: Are they 'complicated'? *Infectious Medicine*, 16 (8), 533-540.
- Stapleton, A. (1999). Prevention of recurrent urinary-tract infections in women. *Lancet*, 353 (9146), 7.

Managing On-Going Illnesses: General Topics

- Bassin, E. (1999). Episodes of care, a tool for measuring the impact of healthcare services on cost and quality. *Disease Management Outcomes*, 6(6), 319-325.
- Friedman, N. et al. (1999). Implementing disease management programs within an integrated delivery system. *Disease Management Outcomes*, 6(6), 355-363.
- Leider, H. L. (1999). Gaining physician buy-in for disease management initiatives. *Disease Management Outcomes*, 6(6), 327-333.
- Lewis, A. (1999). 'Build versus buy' in disease management, separating fact from myth. *Disease Management and Health Outcomes*, 6(6), 315-318.
- Prochaska, J. O., et al. (1999). Helping cure healthcare systems, changing minds and behavior. *Disease Management Outcomes*, 6(6), 335-341.

Managing On-Going Illnesses: Specific Illnesses

Chronic Obstructive Pulmonary Disease (COPD)

Griffiths, T. L., et al. (2000). Results at 1 year of outpatient multidisciplinary pulmonary rehabilitation: A randomised controlled trial. Lancet, 355(9201), 362.

Kerstjens, H. (1999). Stable chronic obstructive pulmonary disease, British Medical Journal, 7208, 495.

Melton, L. (2000). New treatments proposed for chronic obstructive pulmonary disease. Lancet, 355(9202), 472.

Asthma

Asthma disease management resource manual (1997). American College of Allergy, Asthma and Immunology.

Asthma management alternatives for the new millennium (2000). The American Journal of Managed Care, 6(7) supplement, S321-404.

Asthma specialist consultation guidelines: Asthma referral protocol adopted by the American College of Allergy, Asthma and Immunology; the American Academy of Allergy, Asthma and Immunology; and the Joint Council of Allergy, Asthma and Immunology (1995). Journal of Allergy and Clinical Immunology, 5, part 2, 729-31.

Blaiss, M. S. (1997). Outcomes analysis in asthma. Journal of the American Medical Association, 278(22), 1874-80.

Bukstein, D., & Luskin, A. (1998). Specialty influence on acute care resource utilization by asthma patients. Annals of Allergy, Asthma and Immunology, 80, 106.

Centers for Disease Control and Prevention (1995). Vital and health statistics, current estimates from the national health interview survey, 1994. U.S. Department of Health and Human Services, Public Health Service, National Center for Health Statistics, Publication No. PHS 96-1521.

Centers for Disease Control and Prevention (1995). Vital and health statistics, national hospital discharge survey: Annual summary, 1993. U.S. Department of Health and Human Services, Public Health Service, National Center for Health Statistics, Publication No. PHS 95-1782.

Dales, R. E., et al. (1992). Asthma management preceding an emergency department visit. Archives of Internal Medicine, 152, 2041-44.

DaSilva, R. (1996). A disease management case study on asthma. Clinical Therapeutics, 18, 1374-82.

Doan, T. et al. (1996). An intervention program to reduce the hospitalization cost of asthmatic patients requiring intubation. Annals of Allergy, Asthma and Immunology, 76, 513-18.

D'Souza, W. et al. (1996). Trial of a "credit card" asthma self-management plan in a high-risk group of patients with asthma. Journal of Allergy and Clinical Immunology, 97(5), 1085-92.

- Forecasted state-specific estimates of self-reported asthma prevalence – United States, 1998 (1998). Morbidity and Mortality Weekly Report, 47(47), 1022-25.
- Fowles, J. et al. (1990). Measuring the severity and outcomes of asthma care by generalists and allergists. Journal of Allergy Clinical Immunology, 85, 195.
- Gaioni, S. J. et al. (1996). Treatment outcomes in an outpatient asthma center: Retrospective questionnaire data. American Journal of Managed Care, 999-1008.
- Guidelines for the diagnosis and management of asthma (1997). National Institutes of Health, Bethesda, Md., NIH Publication No. 97-4051.
- International consensus report on diagnosis and management of asthma (1992). National Institutes of Health, Bethesda, MD, NIH Publication No. 92-3091.
- Jowers, J. R. et al. (2000). Disease management program improves asthma outcomes. The American Journal of Managed Care, 6(5), 585-92.
- Keenan, J. M. (1995). Optimizing health: Asthma management as a model for the new managed care. Managed Care Medicine, 20-28.
- Legorreta, A. P. et al. (1998). Compliance with national asthma management guidelines and specialty care: A health maintenance organization experience. Archives of Internal Medicine, 158, 457-64.
- MacDonald, S. C. et al. (1999). Self-reported asthma in adults and proxy-reported asthma in children – Washington, 1997-1998. Morbidity and Mortality Weekly Report, 48(40), 918-20.
- Mahr, T. A. & Evans, R. (1993). Allergist influence on asthma care. Annals of Allergy, Asthma and Immunology, 71, 115-20.
- Mannino, D. M. et al. (1998). Surveillance for asthma – United States, 1960-1995. Morbidity and Mortality Weekly Report, 47(SS-1), 1-28.
- Mayo, P. H. et al. (1990). Results of a program to reduce admissions for adult asthma. Annals of Internal Medicine, 112, 864-71.
- Practice parameters for the diagnosis and treatment of asthma (1995). Journal of Allergy and Clinical Immunology, 96, part 2, 707-870.
- Smith, D. H. et al. (1997). A national estimate of the economic costs of asthma. American Journal of Respiratory and Critical Care Medicine, 156, 787-93.
- Sperber, K. et al. (1995). Effectiveness of a specialized asthma clinic in reducing asthma morbidity in an inner-city minority population. Journal of Asthma, 32, 335-43.
- Storms, B. et al. (1995). Effect of allergy specialist care on the quality of life in patients with asthma. Annals of Allergy, Asthma and Immunology, 75, 491-94.
- Thomas, P. et al. (1996). A retrospective assessment of cost avoidance associated with the use of nedocromil sodium metered-dose inhaler in the treatment of patients with asthma. Clinical Therapeutics, 18, 939-52.

- Vollmer, W. M. et al. (1997). Specialty differences in the management of asthma. A cross-sectional assessment of allergists' patients and generalists' patients in a large HMO. Archives of Internal Medicine, 157, 1201-08.
- Weiss, K. B. et al. (1992). An economic evaluation of asthma in the United States. The New England Journal of Medicine, 326(13), 862-66.
- Westly, C. R. et al. (1997). Cost effectiveness of an allergy consultation in the management of asthma. Allergy and Asthma Proceedings, 18, 15-18.
- Zeiger, R. S. et al. (1991). Facilitated referral to asthma specialist reduces relapses in asthma emergency room visits. Journal of Allergy and Clinical Immunology, 87, 1160-68.

Pediatric Asthma

- Asthma hospitalizations and readmissions among children and young adults – Wisconsin, 1991-1995 (1997). Morbidity and Mortality Weekly Report, 46(31), 726-29.
- Asthma mortality and hospitalization among children and young adults – United States, 1980-1993 (1996). Morbidity and Mortality Weekly Report, 45(17), 350-53.
- Friday, G. A. et al. (1997). Profile of children requiring emergency treatment for asthma. Annals of Allergy, Asthma and Immunology, 78, 221-24.
- Hughes, D. et al. (1991). Controlled trial of a home and ambulatory program for asthmatic children. Pediatrics, 87, 54-61.
- Weinstein, A. G. et al. (1996). An economic evaluation of short-term inpatient rehabilitation for children with severe asthma. Journal of Allergy and Clinical Immunology, 98, 264-73.

Diabetes

- American Diabetes Association (2000). Hospital admission guidelines for diabetes mellitus. Diabetes Care, 23, Supplement 1.
- American Diabetes Association (2000). Standards of medical care for patients with diabetes Mellitus. Diabetes Care, 23, Supplement 1.
- Aubert, R. E., et al. Diabetes-related hospitalization and hospital utilization, diabetes in America, 2nd Edition, Chapter 27, 553-569.
- Benbassat, J., et al. (2000). Hospital readmissions as a measure of quality of health care: Advantages and limitations. Archives of Internal Medicine, 160(8), 1074-81.
- Berger, M., et al. (1999). Diabetes care and patient-oriented outcomes. Journal of the American Medical Association, 281(18), 1676-1678.
- Bindman, A. B., et al. (1995). Preventable hospitalizations and access to health care. Journal of the American Medical Association, 274(4), 305-311.
- Currie, C. J., et al. (1996). Patterns of in and out-patient activity for diabetes: A district Summary. Diabetic Medicine, 13(3), 273-80.

- Currie, C. J., et al. (1997). Patterns and costs of hospital care for coronary heart disease related and not related to diabetes. Heart, 87(6), 544-9.
- Currie, C. J., et al. (1997). The epidemiology and cost of inpatient care for peripheral vascular disease, infection, neuropathy, and ulceration in diabetes. Diabetes Care, 21(1), 42.
- Donnan, P. T., et al. (2000). Hospitalizations for people with Type 1 and Type 2 diabetes conditions with the non-diabetic population of Tayside, Scotland. Diabetes Care, 23(12), 1774-9.
- Dunger, D. B. (2001). Predicting cerebral edema during diabetic ketoacidosis. The New England Journal of Medicine, 344(4), 302-303.
- Geraci, J. M., et al. (1999). The association of quality of care and occurrence of in-hospital treatment-related complications. Medical Care, 37(2), 140-8.
- Grundel, B. L., et al. (1999). Diabetes in the managed care setting: A prospective plan. Southern Medical Journal, 92(5), 459-464.
- Harris, M. I. (2000). Health care and health status and outcomes for patients with Type 2 Diabetes. Diabetes Care, 23(6), 754-8.
- Hofer, T. P., et al. (1999). The unreliability of individual physician "report cards" for assessing the costs and quality of care of a chronic disease. Journal of the American Medical Association, 281(22), 2098-2105.
- Marinac, J. S., et al. (2000). Using a severity of illness scoring system to assess intensive care admissions for diabetic ketoacidosis. Critical Care Medicine, 28 (7), 2238-41.
- Morgan, C. L., et al. (2000). The prevalence of multiple diabetes-related complications. Diabetic Medicine, 17(2), 146-51.
- Rosenn, B. M., et al. (2000). Medical complications of diabetes mellitus in pregnancy. Clinical Obstetrics and Gynecology, 43(1), 17-31.
- Shen, W., et al. (1999). Development and validation of the diabetes quality of life clinical trial questionnaire. Medical Care, 37(4), AS45-AS66, Lilly Supplement.
- Sidorov, J. et al. (1996). The integrated approach to diabetes mellitus: The impact of clinical information systems, consumerism, and managed care. Diabetes Spectrum, 9(3), 158-162.
- Smith, D. M., et al. (2000). Predicting non-elective hospital readmissions: A multi-site study. Journal of Epidemiology, 53(11), 1113-8.
- Solomon, C., et al. (1994). Amputations in the surgical budget. New Zealand Medical Journal, 107(973), 78-80.
- Weissman, J. S., et al. (1999). Hospital readmissions and quality of care. Medical Care, 37(5), 490-501.

Acute Myocardial Infarction

- Al Suwaidi, J., et al. (2001). Obesity is associated with premature occurrence of acute myocardial infarction. Clinical Cardiology, 24, 542-547.
- Al Suwaidi, J., et al. (2001). Primary percutaneous coronary interventions in patients with acute myocardial infarction and prior coronary artery bypass grafting. American Heart Journal, 142(3), 452-9.
- Antman, E. M., & Kuntz, K. M. (2000). The length of hospital stay after myocardial infarction. The New England Journal of Medicine, 342, 808-10.
- Bata, I. R., et al. (1997). Decreasing mortality from acute myocardial infarctions: Effect of attack rates and case severity. Journal of Clinical Epidemiology, 50, 787-91.
- Beta blocker treatment after a heart attack (1999). HEDIS 1999, Volume 2, 75-79.
- Block, P. C., et al. (1998). Identification of variables needed to risk adjust outcomes of coronary interventions: Evidence-based guidelines for efficient data collection. Journal of the American College of Cardiology, 32(1), 275-82.
- Brodie, B. R. (2001). Reperfusion therapy for acute myocardial infarction in patients with prior bypass surgery. American Heart Journal, 142(3), 436-39.
- Brooks, J. M., et al. (2000). The marginal benefits of invasive treatments for acute myocardial infarction: Does insurance coverage matter? Inquiry, 37(1), 75-90.
- Cannon, C. P., et al. (2000). Relationship of symptom-onset-to-balloon time and door-to-balloon time with mortality in patients undergoing angioplasty for acute myocardial infarction. Journal of the American Medical Association, 283, 2941-47.
- Canto, J. G., et al. (2000). Payer status and the utilization of hospital resources in acute myocardial infarction. A report from the national registry of myocardial infarction 2. Archives of Internal Medicine, 160, 817-23.
- Canto, J. G., et al. (2000). The volume of primary angioplasty procedures and survival after acute myocardial infarction. The New England Journal of Medicine, 342(21), 1573-80.
- Canto, J. G., et al. (2000). Relation of race and sex to the use of reperfusion therapy in Medicare beneficiaries with acute myocardial infarction. The New England Journal of Medicine, 342, 1094-100.
- Decline in deaths from heart disease and stroke – United States, 1900-1999. (1999) Morbidity and Mortality Weekly Report, 48(30), 649-56.
- Detre, K. M., et al. (2000). The effect of previous coronary artery bypass surgery on the prognosis of patients with diabetes who have acute myocardial infarction. New England Journal of Medicine, 342, 989-97.
- Eagle, K. A. & Guyton, R. A., et al. (1999). ACC/AHA guidelines for coronary artery bypass graft surgery. Journal of the American College of Cardiology, 34(4), 1262-347.

- Furman, M. I., et al. (2001). Twenty-two year (1975-1997). Trends in the incidence, in-hospital and long-term case fatality rates from initial Q-wave and non-Q-wave myocardial infarction: A multi-hospital, community-wide perspective. Journal of the American College of Cardiology, 37(6), 1571-80.
- Grundey S. M., et al. (1999). Assessment of cardiovascular risk by use of multiple-risk-factor assessment equations. Journal of the American College of Cardiology, 34, 1348-59.
- Guadagnoli, E., et al. (1995). Variation in the use of cardiac procedures after acute myocardial infarction. The New England Journal of Medicine, 333, 573-8.
- Hahn, R. A., et al. (1998). Cardiovascular disease risk factors and preventive practices among adults – United States, 1994: A behavioral risk factor atlas. Morbidity and Mortality Weekly Report, 47(SS-5), 35-69.
- Heidenreich P. A., & McClellan M. (2001). Trend in treatment and outcomes for acute myocardial infarction: 1975-1995. American Journal of Medicine, 110(3), 165-74.
- Hospitalization rates for ischemic heart disease – United States, 1970-1986. (1989). Morbidity and Mortality Weekly Report, 38(16), 275-76, 281-84.
- Kennedy, H. L. (2001). Current utilization trends for beta-blockers in cardiovascular disease. American Journal of Medicine, 110 Suppl 5a, 2S-6S.
- Krumholz, H. M. (1998). National use and effectiveness of beta-blockers for the treatment of elderly patients after acute myocardial infarction: National Cooperative Cardiovascular Project. Journal of the American Medical Association, 280(7), 623-9.
- Labinaz, M., et al. (2001). Outcome of ST-segment elevation myocardial infarction in patients with prior coronary artery bypass surgery receiving thrombolytic therapy. American Heart Journal, 141(3), 469-77.
- Lahey, S. J., et al. (1998). Hospital readmission after cardiac surgery. Does "fast track" cardiac surgery result in cost saving or cost shifting? Circulation, 98, II-35-II-40.
- Maynard, C., et al. (1997). Factors associated with rehospitalization in patients with acute myocardial infarction. The American Journal of Cardiology, 80, 777-79.
- Mehta, R. H., et al. (2002). Improving quality of care for Acute Myocardial Infarction. Journal of the American Medical Association, 287(10), 1269-1276.
- McElduff P., & Dobson A. J. (2001). Case fatality after an acute cardiac event: The effect of smoking and alcohol consumption. Journal of Clinical Epidemiology, 54(1), 58-67.
- Mukumal, K. J. et al. (2001). Impact of Diabetes on long-term survival after acute myocardial infarction. Diabetes Care, 24, 1422-1427.
- Mukumal, K. J., et al. (2001). Prior alcohol consumption and mortality following acute myocardial infarction. Journal of the American Medical Association, 285(15), 1965-70.
- National Heart, Lung, and Blood Institute - National Institutes of Health (1995). Rapid identification and treatment of patients with acute myocardial infarction/acute cardiac ischemia in the emerging managed care environment: Exploring the issues – National Heart Attack Alert Program Coordinating Committee Meeting (December 12, 1995).

- Newby, L., et al. (2000). Cost effectiveness of early discharge after uncomplicated acute myocardial infarction. The New England Journal of Medicine, 342(11), 749-55.
- Peterson, L. R., et al. (1999). Reperfusion therapy in patients with acute myocardial infarction and prior coronary artery bypass graft surgery (National Registry of Myocardial Infarction-2). American Journal of Cardiology, 84(11), 1287-91.
- Ryan, T. J., et al. (1999). 1999 Update: The ACC/AHA guidelines for the management of patients with AMI: Executive summary and recommendations. Circulation, 100, 1016-30.
- Sgura, F. A., et al. (2001). Length of stay in myocardial infarction. Cost & Quality, 25, 12-20.
- Spinler, S. A., et al. (2001). New recommendations from the 1999 American College of Cardiology/American Heart Association acute myocardial infarction guidelines. Annals of Pharmacotherapy, 35(5), 589-617.
- Stone, G. W., et al. (2000). Clinical and angiographic outcomes in patients with previous coronary artery bypass graft surgery treated with primary balloon angioplasty for acute myocardial infarction. Second Primary Angioplasty in Myocardial Infarction Trial (PAMI-2) Investigators. Journal of the American College of Cardiology, 35(3), 605-11.
- Trends in ischemic heart disease death rates for blacks and whites – United States, 1981-1995. (November 1998). Morbidity and Mortality Weekly Report, 47(44), 945-49.
- Vaccorino, V., et al. (1999). Sex-based differences in early mortality after myocardial infarction. The New England Journal of Medicine, 341, 217-225.
- Vaccorino, V., et al. (2000). Impact of history of diabetes mellitus on hospital mortality in men and women with first acute myocardial infarction. The National Registry of Myocardial Infarction 2 Participants. American Journal of Cardiology, 85(12), 1486-9; A7.
- Westfall J. M., & McGloin J. (2001). Impact of double counting and transfer bias on estimated rates and outcomes of acute myocardial infarction. Medical Care, 39(5), 459-68.
- Zijlstra, F., et al. (November 1999). Long-term benefit of primary angioplasty as compared with thrombolytic therapy for acute myocardial infarction. The New England Journal of Medicine, 341(19), 1413-19.

“Episode of Care”

- Garnick, D. W., et al. (1990). Services and charges by PPO physicians for PPO and indemnity patients – an episode of care comparison. Medical Care, 28(6), 894-906.
- Guadagnoli, E., & McNeil, B. J. (1994). Outcomes research: Hope for the future or the latest rage? Inquiry, 31, 14-24.
- Hornbrook, M. C., et al. (1985). Health care episodes: Definition, measurement and use. Medical Care Review, 42(2), 163-218.
- Mehta, S. S., et al. (1999). Determining an episode of care using claims data – diabetic foot ulcer. Diabetes Care, 22(7), 1110-15.
- Rosen A. K., & Mayer-Oakes A. (1999). Episodes of care: Theoretical frameworks versus current operational realities. Journal on Quality Improvement, 25(3), 111-128.

- Salkever, D. S., et al. (1982). Episode-based efficiency comparisons for physicians and nurse practitioners. Medical Care, 20(2), 143-53.
- Salkever, D. S., et al. (1976). Episodes of illness and access to care in the inner city: A comparison of HMO and non-HMO populations. Health Services Research, 252-70.
- Schulman, K. A., et al. (1999). A claims data approach to defining an episode of care. Health Services Research, 34(2), 603-21.
- Showstack, J. A., et al. (1987). Episode-of-care physician payment: A study of coronary artery bypass graft surgery. Inquiry, 24, 376-83.

Surgical Procedures: General Topics

- Garnick, D. W., et al. (1990). Services and charges by PPO physicians for PPO and indemnity patients – an episode of care comparison. Medical Care, 28(6), 894-906.
- Guadagnoli, E., & McNeil, B. J. (1994). Outcomes research: Hope for the future or the latest rage? Inquiry, 31, 14-24.
- Hornbrook, M. C., et al. (1985). Health care episodes: Definition, measurement and use. Medical Care Review, 42(2), 163-218.
- Mehta, S. S., et al. (1999). Determining an episode of care using claims data – diabetic foot ulcer. Diabetes Care, 22(7), 1110-15.
- Salkever, D. S., et al. (1982). Episode-based efficiency comparisons for physicians and nurse practitioners. Medical Care, 20(2), 143-53.
- Salkever, D. S., et al. (1976). Episodes of illness and access to care in the inner city: A comparison of HMO and non-HMO populations. Health Services Research, 252-70.
- Schulman, K. A., et al. (1999). A claims data approach to defining an episode of care. Health Services Research, 34(2), 603-21.
- Showstack, J. A., et al. (1987). Episode-of-care physician payment: A study of coronary artery bypass graft surgery. Inquiry, 24, 376-83.

Surgical Procedures: Specific Procedures

Hysterectomy

- Aubard, Y., et al. (1996). Laparoscopically assisted vaginal hysterectomy for non-malignant disease of the uterus. Report on a personal series of 126 cases. European Journal of Obstetrics and Gynecology and Reproductive Biology, 68, 147-54.
- Bernstein, S. J., et al. (1993). The appropriateness of hysterectomy: A comparison of care in seven health plans. Journal of the American Medical Association, 269(18), 2398-2402.
- Brett, K. M., et al. (1997). Epidemiology of hysterectomy in the United States: Demographic and reproductive factors in a nationally representative sample. Journal of Women's Health, 6(3), 309-16.

- Carlson, K. J., et al. (1994). The Maine women's health study: I. Outcomes of hysterectomy. Obstetrics and Gynecology, 83(4), 556-65.
- Carlson, K. J., et al. (1993). Indications for hysterectomy. The New England Journal of Medicine, 328(12), 856-60.
- Dorsey, J. H., et al. (1995). Clinical indications for hysterectomy route: Patient characteristics or physician preference? American Journal of Obstetrics and Gynecology, 173(5), 1452-60.
- Doucette, R. C., & Scott, J. R. (1996). Comparison of laparoscopically assisted vaginal hysterectomy with abdominal and vaginal hysterectomy. The Journal of Reproductive Medicine, 41(1), 1-6.
- Haas, S., et al. (1993). Variations in hysterectomy rates across small geographic areas of Massachusetts. American Journal of Obstetrics and Gynecology, 169(1), 150-54.
- Harris, W. J. (1997). Complications of hysterectomy. Clinical Obstetrics and Gynecology, 40(4), 928-38.
- Kjerulff, K. H., et al. (1996). Chronic gynecological conditions reported by US women: Findings from the national health interview survey, 1984-1992. American Journal of Public Health, 86(2), 195-99.
- Kjerulff, K. H., et al. (1993). Hysterectomy and race. Obstetrics and Gynecology, 82(5), 757-64.
- Lepine, L. A., et al. (1997). Hysterectomy surveillance – United States, 1980-1993. Morbidity and Mortality Weekly Report, 46(SS-4), 1-15.
- London, R., et al. (1999). Payer cost savings with endometrial ablation therapy. American Journal of Managed Care, 5(7), 889-97.
- Luoto, R., et al. (1997). Socioeconomic variations in hysterectomy: Evidence from a linkage study of the Finnish hospital discharge register and population census. Journal of Epidemiology and Community Health, 51, 67-73.
- Trotter, J. P., & Glasser, M. H. (1995). Alternative approaches to hysterectomy: Clinical and economic implications for managed care. Medical Interface, 8(3), 123-29.
- Van Den Eeden, S. K., et al. (1998). Quality of life, health care utilization, and costs among women undergoing hysterectomy in a managed-care setting. American Journal of Obstetrics and Gynecology, 178(1), 91-100.
- Wilcox, L. S., et al. (1994). Hysterectomy in the United States, 1988-1990. Obstetrics and Gynecology, 83(4), 549-55.

Breast Cancer Procedures

- Ayanian, J. Z., et al. (1993). The relation between health insurance coverage and clinical outcomes among women with breast cancer. The New England Journal of Medicine, 329(5), 326-331.
- Bertin, M. L., et al. (1998). Determinants of surgical site infection after breast surgery American Journal Infectious Control, 26(1), 61-65.

- Bostwick, J., et al. (1997). Reconstruction of the Breast. Surgical Oncology Clinic of North America, 6(1), 71-89.
- Burstein, H. J., (2000). Primary care for survivors of breast cancer. The New England Journal of Medicine, 343(15), 1086-1094.
- Hadley, J., et al. (1997). Breast cancer treatment choice and mastectomy length of stay: A comparison of HMO and other privately insured women. Inquiry, 34, 288-301.
- Kahn, L. H., et al. (1996). The validity of hospital administrative data in monitoring variations in breast cancer surgery. American Journal of Public Health, 86(2), 243-245.
- Liu, C. D., et al. (1997). Overnight closed suction drainage after axillary lymphadenectomy for breast cancer. American Surgeon, 63(10), 868.
- Love, S. M., et al. (2000). Dr. Susan Love's Breast Book (3rd edition). Cambridge, MA: Perseus Publishing.
- Mitchell, J. M., et al. (1997). The effect of insurance coverage on breast cancer patients' treatment and hospital choices. American Economic Review, 87(2), 448.
- Palit, T. K., et al. (2000). Cost analysis of breast conservation surgery compared with modified radical mastectomy with and without reconstruction. The American Journal of Surgery, 179, 441-445.
- Polednak, A. P. (2000). Geographic variation in postmastectomy breast reconstruction. Plastic Reconstructive Surgery, 106(2), 298-301.
- Randal, J. (1998). Post-mastectomy pain found to be common: Treatment options sparse, but growing. Journal of the National Cancer Institute, 90(10), 731.
- Riley, G. F., et al. (1999). Stage at diagnosis and treatment patterns among older women with breast cancer. Journal of the American Medical Association, 281(8), 720-726.
- Roses, D. F., et al. (1999). Complications of level I and II axillary dissection in the treatment of carcinoma of the breast. Annals of Surgery, 230(2), 194-201.
- Sainsbury, J. C., et al. (2000). Breast cancer. British Medical Journal, 321(7263), 745.
- Sakorafas, G. H., et al. (1999). Ductal Carcinoma *in situ* (DCIS) of the breast: Evolving perspectives. Cancer Treatment Reviews 2000, 26, 103-125.
- Sandelin, K., et al. (1998). Management, morbidity, and oncologic aspects in 100 consecutive patients with immediate breast reconstruction. Annals of Surgical Oncology, 5(2), 159-165.
- Woodworth, P. A., et al. (2000). Seroma formation after breast cancer surgery: Incidence and predicting factors. American Surgeon, 66(5), 444.
- Yeh K. A., et al. (1998). Immediate breast reconstruction in breast cancer: Morbidity and outcome. The American Surgeon, 64(12), 1195-9.

Neck and Back Procedures

- Carey, T. S., et al. (1996). Patterns of ordering diagnostic tests for patients with acute low back pain. Annals of Internal Medicine, 125(10), 807-814
- Davis, H. (1994). Increasing rates of cervical and lumbar spine surgery in the United States, 1979-1990. SPINE, 19(10), 1117-1124.
- Deyo, R. A. (1993). Results of Discectomy Compared with Discectomy and Fusion. Acta Orthopaedica Scandinavica, Supplement 251(64), 45- 46.
- Einstadter, D., et al. (1993). Variation in the rate of cervical spine surgery in Washington State. Medical Care, 31(8), 711-718.
- Fritsch, E. W., et al. (1996). The failed back surgery syndrome, reasons, intraoperative findings, and long-term results: A report of 182 operative treatments. Spine, 21(5), 626-633.
- Hill, G. M., et al. (1987). Chemonucleolysis as an alternative to laminectomy for the herniated lumbar disc, experience with patients in a private orthopedic practice. Clinical Orthopaedics and Related Research, 225, 230-233.
- Katz, J. N., (1995). Lumbar spinal fusion, surgical rates, costs, and complications. Spine, 20(24S), 78S-83S.
- Romano, P. S., et al. (1997). Elective cervical discectomy in California. Postoperative in-hospital complications and their risk factors. SPINE, 22(22), 2677-2692.
- Silvers, H. R. (1988). Microsurgical versus standard lumbar discectomy. Neurosurgery, 22(5), 1988, 837-841.
- Slotman, G. J. (1996). Laparoscopic L5-S1 discectomy: A cost-effective, minimally invasive general surgery-neurosurgery team alternative to laminectomy. The American Surgeon, 62(1), 64-68.
- Watters, W. C. (1994). Anterior cervical discectomy with and without fusion, results, complications, and long-term follow-up. Spine, 19(20), 2343-2347.
- Wilson-McDonald, J. (1996). The case for spinal fusion is unproved. British Medical Journal, 312(7022), 39.

Prostatectomy

- Bankhead, C. (2000). Prostatectomy has highest long-term survival rates. Urology Times.
- Benoit R. M., Naslund, M. J, & Cohen J. K. (2000). Complications after radical retropubic prostatectomy in the Medicare population. Urology, 56, 116-20.
- Chang, P. L., et al. (1997). Use of transurethral prostatectomy clinical path to monitor health outcomes. Journal of Urology, 157, 177-83.
- Cohen T. C., Olmer L., & Mozes B. (1996). Two-dimensional outcome and analysis as a guide for quality assurance of prostatectomy. International Journal of Quality in Health Care, 8(1), 67-73.

Cohen, S. P. (2001). Prostate cancer Treatment: Therapeutic options based on tumor grade, life expectancy, and patient preferences. Geriatrics.

Gardner, T. A., et al. (2000). Surgical and postoperative factors affecting length of hospital stay after radical prostatectomy. Cancer, 89, 424-30.

Potosky, A. L. (1999). Prostate cancer treatment and ten-year survival among group/staff HMO and fee-for-service Medicare patients. Health Services Research, 34, 525-46.

Miscellaneous

Ashton, C. M., et al. (1997). The association between the quality of inpatient care and early readmission. A meta-analysis of the evidence. Medical Care, 35(10), 1044-59.

Ashton, C. M. & Wray, N. P. (1996). A conceptual framework for the study of early readmission as an indicator of quality of care. Social Science and Medicine, 43(11), 1533-41.

Brennan, T. A., et al. (1991). Incidence of adverse events and negligence in hospitalized patients. Results of the Harvard Medical Practice Study I. The New England Journal of Medicine, 324(6), 370-76.

Cavender, J. B., et al. (1992). Effects of smoking on survival and morbidity in patients randomized to medical or surgical therapy in the coronary artery surgery study (CASS): 10-year follow-up. Journal of the American College of Cardiology, 20(2), 287-94.

Cooper, G. S., et al. (1999). Are readmissions to the intensive care unit a useful measure of hospital performance? Medical Care, 37(4), 399-408.

Frequency of selected procedures (1999). HEDIS 1999, Volume 2, 207-17.

Kossovsky, M. P., et al. (1999). Comparison between planned and unplanned readmissions to a department of internal medicine. Journal of Clinical Epidemiology, 52(2), 151-56.

Kuhlthau, K., et al. (1998). Assessing managed care for children with chronic conditions. Health Affairs, 17(4), 42-52.

Leape, L. L., et al. (1991). The nature of adverse events in hospitalized patients. Results of the Harvard Medical Practice Study II. The New England Journal of Medicine, 324(6), 377-84.

Ludke, R. L., et al. (1993). Relationship between early readmission and hospital quality of care indicators. Inquiry, 30(1), 95-103.

Shipton, S. (1996). Risk factors associated with multiple hospital readmissions. Home Care Provider, 1(2), 83-85.

Thomas, J. W. (1996). Does risk-adjusted readmission rate provide valid information on hospital quality? Inquiry, 28, 258-70.

Thomas, J., & Holloway, J. J. (1991). Investigating early readmission as an indicator for quality of care studies. Medical Care, 29(4), 377-94.

The Tobacco Use and Dependence Clinical Practice Guideline Panel, Staff, and Consortium Representatives (2000). A clinical practice guideline for treating tobacco use and dependence: A US Public Health Service report. Journal of the American Medical Association, 28, 3244-54.

Weissman, J. S., et al. (1999). Hospital readmissions and quality of care. Medical Care, 37(5), 490-501.

Weissman, J. S., et al. (1994). The impact of patient socioeconomic status and other social factors on readmission: A prospective study in four Massachusetts hospitals. Inquiry, 31(2), 163-72.

Wray, N. P., et al. (1997). Application of an analytic model to early readmission rates within the Department of Veterans Affairs. Medical Care, 35(8), 768-81.

MEMBER SATISFACTION

Satisfaction Measures

The following CAHPS Survey Questions are included in the *Measuring the Quality of Pennsylvania's Commercial HMOs* report for calendar year 2000:

- Question 10 “In the last 12 months, how much of a problem, if any, was it to get a referral to a specialist that you needed to see?”
- Question 16 “In the last 12 months, did you make any appointments with a doctor or other health provider for regular or routine health care?”
- Question 18 “In the last 12 months, how many days did you usually have to wait between making an appointment for regular or routine care and actually seeing a provider?”
- Question 21 “In the last 12 months, how long did you usually have to wait between trying to get care and actually seeing a provider for an illness or injury?”
- Question 24 “In the last 12 months, how much of a problem, if any, was it to get the care you or a doctor believed necessary?”
- Question 25 “In the last 12 months, how much of a problem, if any, were delays in health care while you waited for approval from your health plan?”
- Question 41 “In the last 12 months, how much of a problem, if any, was it to get the help you needed when you called your health plan's customer service?”
- Question 42 “In the last 12 months, have you called or written your health plan with a complaint or problem?”
- Question 44 “Was your complaint or problem settled to your satisfaction?”
- Question 47 “How would you rate your health plan now?”

The CAHPS graphs include a response set entitled “Other Responses.” This category is a catchall for survey responses including multiple answers to one question (where a respondent provided more than one answer to the question), missing responses (where the respondent did not provide an answer), and responses indicating that the question was not applicable to the respondent (for example, a response of “I did not see a specialist in the last 12 months” to Question 10 “Was it a problem to get a referral to a specialist that you needed to see”). PHC4 summed the percents of these responses to arrive at the total for the “Other Responses” category.

All reported CAHPS measures include an average for the group of Pennsylvania HMO plans. These were calculated by PHC4 by weighting each plan's score by its CY2000 total commercial enrollment. Also included, when available from NCQA, are national averages. The national averages (provided in the NCQA *Quality Compass* database) include all lines of business across all reporting managed care organizations in the United States.

FINANCIAL INDICATORS

Financial information about the HMO plans is found on the PHC4 Web site only. Only dollar amounts specific to commercial HMO membership are included. (Government funded HMO members, such as Medicare or Medical Assistance, are not included. Federal employee benefit programs are included.) All figures listed in the financial section of the report were submitted by HMOs as part of the 2000 *Annual Statement* submitted to the Pennsylvania Insurance Department. The following table outlines the locations of the data elements in the *Annual Statement* used to develop the Financial Indicators.

Table 12. Location of Data Elements in the Annual Statement

Data Element	Source of Data
Total HMO Revenue	Report #2, Line 7, Column 2
Premium Revenue	Report #2, Line 1, Column 2
Commercial Premium Revenue	Analysis of Operations by Lines of Business (Page 7) Line 1, Columns 2 & 8
Commercial Member Months	Report #4, Lines 1, 6 & 7 (where applicable), Column 6
Commercial Medical Care Expenses	Analysis of Operations by Lines of Business (Page 7) Line 21, Columns 2 & 8
Commercial Administrative Expenses	Analysis of Operations by Lines of Business (Page 7) Line 22, Columns 2 & 8
Commercial Federal Taxes	Analysis of Operations by Lines of Business (Page 7) Line 26, Columns 2 & 8
Commercial (after-tax) Income	Analysis of Operations by Lines of Business (Page 7) Line 27, Columns 2 & 8
Total Commercial Revenue	Analysis of Operations by Lines of Business (Page 7) Line 7, Columns 2 & 8
Total HMO (after-tax) Income	Report #2, Line 27, Column 2
Current Assets	Report #1 – Part A, Line 8, Column 3
Current Liabilities	Report #1 – Part B, Line 9, Column 3
Net Worth	Report #1 – Part B, Line 24, Column 3
Total Liabilities	Report #1 – Part B, Line 15, Column 3

Definitions and formulas for the specific financial indicators are listed below:

Total HMO Revenue includes all revenue received by the licensed corporation including premium, risk and “other” revenue and investment income. During calendar year 2000 (CY2000), premium and risk revenue generated 98.9 percent of all revenues received by the licensed HMOs. There is no fee-for-service revenue for the HMOs.

3-year Change in Total Revenue reflects the change in annual total revenues from the end of CY1997 to the end of CY2000. This measure reflects the extent to which the corporation's HMO line of business is growing or declining.

$$\frac{\text{Total Revenue}_{2000} - \text{Total Revenue}_{1997}}{\text{Total Revenue}_{1997}}$$

Total Premium Revenue as a Percent of Total Revenue indicates that almost all HMO revenue is derived from commercial premiums and Medicare and/or Medical Assistance risk revenue. The majority of non-premium revenue is investment income.

$$\frac{\text{Premium Revenue}_{2000}}{\text{Total Revenue}_{2000}}$$

Commercial Premium Revenue as a Percent of Total Premium Revenue reflects the commercial portion of the HMO's total line of business. For those HMOs where commercial revenue is less than 100 percent of total revenue, the balance of premium revenue is derived from Medicare risk revenue, Medical Assistance risk revenue, and/or administrative service contracts.

$$\frac{\text{Commercial Premium Revenue}_{2000}}{\text{Total Premium Revenue}_{2000}}$$

Commercial Premium Revenue PMPM (per member, per month) is the average monthly premium revenue the HMO received for each member enrolled in a commercial plan during CY2000.

$$\frac{\text{Commercial Premium Revenue}_{2000}}{\text{Commercial Member Months}_{2000}}$$

Medical Loss and Administrative Expense Ratios reflect the portion of each commercial premium dollar spent on health care and administration during CY2000. If an HMO has a Medical Loss Ratio above 100 percent, it is spending more for healthcare services than it receives in commercial premiums.

$$\frac{\text{Commercial Healthcare Expenses}_{2000}}{\text{Commercial Premium Revenue}_{2000}}$$

$$\frac{\text{Commercial Administrative Expenses}_{2000}}{\text{Commercial Premium Revenue}_{2000}}$$

Federal Tax Rate shows what portion of Total Commercial Revenue (including investment and "other" income) is required to pay federal income taxes. Negative tax rates indicate that the HMO has booked a tax credit for CY2000. Non-profit (NP) HMOs have no income tax obligations.

$$\frac{\text{Commercial Federal Taxes}_{2000}}{\text{Total Commercial Revenue}_{2000}}$$

Commercial Net (after-tax) Margin shows the portion of Total Commercial Revenue that remained as income or profit after all commercial-related expenses had been paid. A negative margin indicates that revenues were not sufficient to cover expenses and the HMO's commercial line of business operated at a loss for the calendar year.

$$\frac{\text{Commercial (after-tax) Income}_{2000}}{\text{Total Commercial Revenue}_{2000}}$$

Total HMO Net (after-tax) Margin shows the portion of Total HMO Revenue that remained as income or profit after all expenses had been paid. A negative margin indicates that revenues were not sufficient to cover expenses and the HMO operated at a loss.

$$\frac{\text{Total HMO (after-tax) Income}_{2000}}{\text{Total HMO Revenue}_{2000}}$$

3-year Average Net Margin reflects the average income over the past three calendar years (CY1998 – CY2000) for the Total HMO.

$$\frac{\sum_{1998,1999,2000} \text{Total HMO Net Income}}{\sum_{1998,1999,2000} \text{Total HMO Revenues}}$$

Current Ratio is the ratio of current assets to current liabilities at the end of CY2000. This ratio reflects the HMO's ability to pay expected short-term obligations from expected revenues and liquid assets.

$$\frac{\text{Current Assets}_{2000}}{\text{Current Liabilities}_{2000}}$$

Net Worth to Total Liabilities – The largest liability of each HMO is claims payable, the amount due to healthcare providers for care rendered. In the event premium revenue is not sufficient to completely pay claims, the HMO would have to draw from its Net Assets or Net Worth. This ratio reveals what portion of its Liabilities at the end of CY2000 could have been paid from its Net Worth.

$$\frac{\text{Net Worth}_{2000}}{\text{Total Liabilities}_{2000}}$$

HMO PROFILE

The HMO profile is found on the PHC4 Web site only. Specific sources of data for the HMO profile include:

- The number of commercial members (as of December 31, 2000) is found in section III.A., columns 1 through 4 of the *Annual Report* (submitted to the Pennsylvania Department of Health). Enrollment numbers reported on the PHC4 Web site (identified as the “Number of Commercial Members”) reflect the sum of these columns. Only HMO members enrolled in the Pennsylvania operations of HMOs were included in this total. Some HMOs operate health care plans regionally or nationally; however, only those members that belong to an HMO licensed to operate in Pennsylvania were counted.

The same procedure was followed for the December 31, 1999 *Annual Report*. The 1999 totals were then subtracted from the 2000 totals and the percent change is reported (identified as the “Change in Commercial Enrollment” variable on the PHC4 Web site).

- The “Number of General Acute Care (GAC) Hospitals in the Network” was taken from each HMO’s most recent Provider Directory filed with the Department of Health. PHC4 tallied the number of GAC hospitals in those counties where, according to the Department of Health, each HMO was licensed to do business. The “Number of GAC Hospitals in the Network” was then divided by the total number of GAC hospitals within these counties (as defined by data submissions to PHC4) and is reported as the “Percentage of all GAC Hospitals in the Plan’s Service Area.” In addition, the number of GAC hospitals in the Provider Directory located outside the HMO’s service area was determined and reported as “Additional GAC Hospitals in Network.”
- The “NCQA Accreditation Status” variable was obtained from the NCQA Web site and was current as of the time of publication.

APPENDIX A: DESCRIPTION OF STUDY POPULATION

Includes codes that were later removed as clinical exclusions

Ear, Nose, Throat Infection

- The diagnosis codes were analyzed only when listed as the principal diagnosis.

ICD.9.CM Diagnosis Codes	Description
017.4x x = 0 - 6	Tuberculosis of ear
034.0	Streptococcal sore throat
055.2	Postmeasles otitis media
112.82	Candidal otitis externa
380.10	Infective otitis externa, unspecified
380.11	Acute infection of pinna
380.12	Acute swimmers' ear
380.14	Malignant otitis externa
380.16	Other chronic infective otitis externa
381.00	Acute nonsuppurative otitis media, unspecified
381.01	Acute serous otitis media
381.02	Acute mucoid otitis media
381.03	Acute sanguinous otitis media
381.04	Acute allergic serous otitis media
381.05	Acute allergic mucoid otitis media
381.06	Acute allergic sanguinous otitis media
381.10	Chronic serous otitis media, simple or unspecified
381.19	Other chronic serous otitis media
381.29	Other chronic mucoid otitis media
381.3	Other and unspecified chronic nonsuppurative otitis media
381.4	Nonsuppurative otitis media, not specified as acute or chronic
382.00	Acute suppurative otitis media without spontaneous rupture of ear drum
382.01	Acute suppurative otitis media with spontaneous rupture of ear drum
382.1	Chronic tubotympanic suppurative otitis media
382.2	Chronic atticofacial suppurative otitis media
382.3	Unspecified chronic suppurative otitis media
382.4	Unspecified suppurative otitis media
382.9	Unspecified otitis media
461.0	Acute maxillary sinusitis
461.1	Acute frontal sinusitis
461.2	Acute ethmoidal sinusitis
461.3	Acute sphenoidal sinusitis

Ear, Nose, Throat Infection continued

ICD.9.CM Diagnosis Codes	Description
461.8	Other acute sinusitis
461.9	Acute sinusitis, unspecified
462	Acute pharyngitis
463	Acute tonsillitis
464.0	Acute laryngitis
464.10	Acute tracheitis without mention of obstruction
464.11	Acute tracheitis with obstruction
464.20	Acute laryngotracheitis without mention of obstruction
464.21	Acute laryngotracheitis with obstruction
464.30	Acute epiglottitis without mention of obstruction
464.31	Acute epiglottitis with obstruction
464.4	Croup
465.0	Acute laryngopharyngitis
465.8	Acute upper respiratory infections of other multiple sites
465.9	Acute upper respiratory infections of unspecified site
472.0	Chronic rhinitis
472.1	Chronic pharyngitis
472.2	Chronic nasopharyngitis
473.0	Chronic maxillary sinusitis
473.1	Chronic frontal sinusitis
473.2	Chronic ethmoidal sinusitis
473.3	Chronic sphenoidal sinusitis
473.8	Other chronic sinusitis
473.9	Unspecified sinusitis (chronic)
474.00	Chronic tonsillitis
474.01	Chronic adenoiditis
474.02	Chronic tonsillitis and adenoiditis
476.0	Chronic laryngitis
476.1	Chronic laryngotracheitis
487.1	Influenza with other respiratory manifestations

High Blood Pressure (Hypertension)

- The diagnosis codes were analyzed only when listed as the principal diagnosis.

ICD.9.CM Diagnosis Codes	Description
401.0	Malignant essential hypertension
401.1	Benign essential hypertension
401.9	Unspecified essential hypertension
402.00	Malignant hypertensive heart disease without congestive heart failure
402.10	Benign hypertensive heart disease without congestive heart failure
402.90	Unspecified hypertensive heart disease without congestive heart failure
403.00	Malignant hypertensive renal disease without mention of renal failure
403.10	Benign hypertensive renal disease without mention of renal failure
403.90	Unspecified hypertensive renal disease without mention of renal failure
404.00	Malignant hypertensive heart and renal disease without mention of congestive heart failure or renal failure
404.10	Benign hypertensive heart and renal disease without mention of congestive heart failure or renal failure
404.90	Unspecified hypertensive heart and renal disease without mention of congestive heart failure or renal failure

Gastrointestinal Infections (Enteritis/Colitis/Gastroenteritis)

- The diagnosis codes were analyzed only when listed as the principal diagnosis.

ICD.9.CM Diagnosis Codes	Description
003.0	Salmonella gastroenteritis
006.2	Amebic nondysenteric colitis
009.0	Infectious colitis, enteritis, and gastroenteritis
009.1	Colitis, enteritis, and gastroenteritis of presumed infectious origin
558.2	Toxic gastroenteritis and colitis
558.9	Other and unspecified noninfectious gastroenteritis and colitis

Kidney/Urinary Tract Infection

- The diagnosis codes were analyzed only when listed as the principal diagnosis.

ICD.9.CM Diagnosis Codes	Description
590.00	Chronic pyelonephritis without lesion of renal medullary necrosis
590.01	Chronic pyelonephritis with lesion of renal medullary necrosis
590.10	Acute pyelonephritis without lesion of renal medullary necrosis
590.11	Acute pyelonephritis with lesion of renal medullary necrosis
590.2	Renal and perinephric abscess
590.3	Pyeloureteritis cystica
590.80	Pyelonephritis, unspecified
590.9	Infection of kidney, unspecified
599.0	Urinary tract infection, site not specified

Chronic Obstructive Pulmonary Disease (COPD)

- The diagnosis codes were analyzed only when listed as the principal diagnosis.

ICD.9.CM Diagnosis Codes	Description
491.20	Obstructive chronic bronchitis without mention of acute exacerbation
491.21	Obstructive chronic bronchitis with acute exacerbation
492.0	Emphysematous bleb
492.8	Other emphysema
496	Chronic airway obstruction, not elsewhere classified
506.4	Chronic respiratory conditions due to fumes and vapors

Asthma (Pediatric and Adult)

- The diagnosis codes were analyzed only when listed as the principal diagnosis.

ICD.9.CM Diagnosis Codes	Description
493.00	Extrinsic asthma without mention of status asthmaticus
493.01	Extrinsic asthma with status asthmaticus
493.02	Extrinsic asthma with acute exacerbation
493.10	Intrinsic asthma without mention of status asthmaticus
493.11	Intrinsic asthma with status asthmaticus
493.12	Intrinsic asthma with acute exacerbation
493.20	Chronic obstructive asthma without mention of status asthmaticus
493.21	Chronic obstructive asthma with status asthmaticus
493.22	Chronic obstructive asthma with acute exacerbation
493.90	Asthma, unspecified without mention of status asthmaticus
493.91	Asthma, unspecified with status asthmaticus
493.92	Asthma, unspecified with acute exacerbation

Diabetes

- The diagnosis codes were analyzed only when listed as the principal diagnosis.

ICD.9.CM Diagnosis Codes	Description
250.00	Uncomplicated – Non-insulin dependent, controlled
250.01	Uncomplicated – Insulin dependent, controlled
250.02	Uncomplicated – Non-insulin dependent, uncontrolled
250.03	Uncomplicated – Insulin dependent, uncontrolled
250.1x	With Ketoacidosis, where x = 0,1,2,3
250.2x	With Hyperosmolarity, where x = 0,1,2,3
250.3x	With Other Coma, where x = 0,1,2,3
250.4x	With Renal Manifestations, where x = 0,1,2,3
250.5x	With Ophthalmic Manifestations, where x = 0,1,2,3
250.6x	With Neurological Manifestations, where x = 0,1,2,3
250.7x	With Peripheral Circulatory Disorders, where x = 0,1,2,3
250.8x	With Other Specified Manifestations, where x = 0,1,2,3
250.9x	With Unspecified Complication, where x = 0,1,2,3

Heart Attack

- The diagnosis codes below were analyzed only when listed as the principal diagnosis.

ICD.9.CM Diagnosis Code	Description
410.01	Acute myocardial infarction of anterolateral wall
410.11	Acute myocardial infarction of other anterior wall
410.21	Acute myocardial infarction of inferolateral wall
410.31	Acute myocardial infarction of inferoposterior wall
410.41	Acute myocardial infarction of other inferior wall
410.51	Acute myocardial infarction of other lateral wall
410.61	Acute myocardial infarction, true posterior wall
410.71	Acute myocardial infarction, subendocardial
410.81	Acute myocardial infarction of other specified sites
410.91	Acute myocardial infarction, unspecified site

Hysterectomy (non-malignant and non-traumatic)

- The procedure codes below were analyzed when listed as a principal or secondary procedure.

ICD.9.CM Procedure Codes	Description
68.3	Subtotal abdominal hysterectomy
68.4	Total abdominal hysterectomy
68.51	Laparoscopically assisted vaginal hysterectomy
68.59	Other vaginal hysterectomy
68.6	Radical abdominal hysterectomy
68.7	Radical vaginal hysterectomy
68.9	Other and unspecified hysterectomy

Breast Cancer Procedures

- The procedure codes were included in the analyses when listed as the principal or secondary procedure.
- The diagnosis codes were analyzed when listed as the principal diagnosis.

ICD.9.CM/CPT Procedure Codes	Description
85.20	Excision or destruction of breast tissue, not otherwise specified
85.21	Local excision of lesion of breast
85.22	Resection of quadrant of breast
85.23	Subtotal mastectomy
85.41	Unilateral simple mastectomy
85.42	Bilateral simple mastectomy
85.43	Unilateral extended simple mastectomy
85.44	Bilateral extended simple mastectomy
85.45	Unilateral radical mastectomy
85.46	Bilateral radical mastectomy
85.47	Unilateral extended radical mastectomy
85.48	Bilateral extended radical mastectomy
19112	Excision of lactiferous duct fistula
19120	Excision of cyst, fibroadenoma, or other benign or malignant tumor aberrant breast tissue, duct lesion, nipple or areolar lesion, male or female, one or more lesions
19125	Excision of breast lesion identified by preoperative placement of radiological marker; single lesion
19126	Each additional lesion separately identified by a radiological marker
19160	Mastectomy, partial
19162	Mastectomy, partial with axillary lymphadenectomy

Breast Cancer Procedures continued

ICD.9.CM/CPT Procedure Codes	Description
19180	Mastectomy, simple, complete
19200	Mastectomy, radical, including pectoral muscles, axillary lymph nodes
19220	Mastectomy, radical, including pectoral muscles, axillary and internal mammary lymph nodes
19240	Mastectomy, modified radical, including axillary lymph nodes, with or without pectoralis minor muscle, but excluding pectoralis major muscle

ICD.9.CM Diagnosis Codes	Description
174.0	Malignant neoplasm of nipple and areola
174.1	Malignant neoplasm of central portion of female breast
174.2	Malignant neoplasm of upper-inner quadrant of female breast
174.3	Malignant neoplasm of lower-inner quadrant of female breast
174.4	Malignant neoplasm of upper-outer quadrant of female breast
174.5	Malignant neoplasm of lower-outer quadrant of female breast
174.6	Malignant neoplasm of axillary tail of female breast
174.8	Malignant neoplasm of other specified sites of female breast
174.9	Malignant neoplasm of breast (female), unspecified
196.3	Secondary and unspecified malignant neoplasm of lymph nodes of axilla and upper limb
198.2	Secondary malignant neoplasm of skin (skin of breast listed as example)
198.81	Secondary malignant neoplasm of breast
233.0	Carcinoma in situ of breast
238.3	Neoplasm of uncertain behavior of breast
239.3	Neoplasm of unspecified nature of breast

Neck and Back Procedures

- The procedure codes were included in the analyses when listed as the principal or secondary procedure.
- The diagnosis codes were analyzed only when listed as the principal diagnosis.

ICD.9.CM Procedure Codes	Description
03.09	Other exploration and decompression of spinal canal
80.50	Excision or destruction of intervertebral disc, unspecified
80.51	Excision of intervertebral disc
80.59	Other destruction of intervertebral disc

Neck and Back Procedures continued

ICD.9.CM Diagnosis Codes	Description
720.0	Ankylosing spondylitis
721.0	Cervical spondylosis without myelopathy
721.1	Cervical spondylosis with myelopathy
721.2	Thoracic spondylosis without myelopathy
721.3	Lumbosacral spondylosis without myelopathy
721.41	Thoracic region spondylosis with myelopathy
721.42	Lumbar region spondylosis with myelopathy
721.90	Spondylosis of unspecified site without mention of myelopathy
721.91	Spondylosis of unspecified site with myelopathy
722.0	Displacement of cervical intervertebral disc without myelopathy
722.10	Displacement of lumbar intervertebral disc without myelopathy
722.11	Displacement of thoracic intervertebral disc without myelopathy
722.2	Displacement of intervertebral disc, site unspecified, without myelopathy
722.4	Degeneration of cervical intervertebral disc
722.51	Degeneration of thoracic or thoracolumbar intervertebral disc
722.52	Degeneration of lumbar or lumbosacral intervertebral disc
722.6	Degeneration of intervertebral disc, site unspecified
722.70	Intervertebral disc disorder with myelopathy of unspecified region
722.71	Intervertebral disc disorder with myelopathy of cervical region
722.72	Intervertebral disc disorder with myelopathy of thoracic region
722.73	Intervertebral disc disorder with myelopathy of lumbar region
722.90	Other and unspecified disc disorder of unspecified region
722.91	Other and unspecified disc disorder of cervical region
722.92	Other and unspecified disc disorder of thoracic region
722.93	Other and unspecified disc disorder of lumbar region
723.0	Spinal stenosis in cervical region
723.1	Cervicalgia
724.00	Spinal stenosis, unspecified region
724.01	Spinal stenosis, thoracic region
724.02	Spinal stenosis, lumbar region
724.09	Spinal stenosis, other
724.1	Pain in thoracic spine
724.2	Lumbago
724.3	Sciatica
724.5	Backache, unspecified
738.4	Acquired spondylolisthesis
756.11	Spondylolysis, lumbosacral region
756.12	Spondylolisthesis

Prostatectomy

- The procedure codes below were analyzed when listed in any procedure position.

ICD.9.CM Procedure Codes	Description
60.21	Transurethral (ultrasound) guided laser induced prostatectomy (TULIP)
60.29	Other transurethral prostatectomy
60.3	Suprapubic prostatectomy
60.4	Retropubic prostatectomy
60.5	Radical prostatectomy
60.62	Perineal prostatectomy
60.69	Other prostatectomy

APPENDIX B: METHODS FOR RESOLVING INCONSISTENT PATIENT IDENTIFIER INFORMATION

In analyzing a series of hospitalizations identified for an adult patient, conflicting sex-birth date combinations (for a single SSN) with the **same** sex value were resolvable if:

1. there were only **two** different birth dates (DOB) that agreed on two of the three DOB components (day, month, year) **and**
2. one of the conflicting DOBs appeared in the database at least two more times than the other (i.e., there were at least two additional occurrences of the more frequent DOB compared to the less frequent DOB) **or** the conflicting DOBs were within 31 days of each other.

The birth date which occurred with greatest frequency (or the more recent birth date if the frequency was the same for both dates) was assigned to all hospitalizations for that SSN.

Multiple sex-birth date combinations (for a single SSN) with the **same** birth date were resolvable if one of the conflicting sex values appeared in the database at least two more times than the other sex value. Thus, the sex value that occurred with the greatest frequency was assigned to all hospitalizations for that SSN as long as there were at least two additional occurrences of the more frequent sex value compared to the other sex value.

APPENDIX C: DEFINITION OF IN-HOSPITAL COMPLICATIONS FOR SURGICAL PROCEDURES

Cases After Exclusions

Hysterectomy Procedure In-Hospital Complications

Type of In-Hospital Complication	Total Cases [†]			Abdominal			Vaginal		
	#	%	Avg. LOS	#	%	Avg. LOS	#	%	Avg. LOS
Procedure/Medical Care Related	850	4.2%	3.8	663	4.7%	4.0	187	3.0%	2.9
Digestive System.....	484	2.4%	4.3	404	2.9%	4.7	80	1.3%	2.7
Postoperative Hemorrhage	407	2.0%	4.1	281	2.0%	4.5	126	2.0%	3.1
Postoperative Pulmonary Compromise.....	351	1.7%	4.1	306	2.2%	4.1	45	0.7%	4.0
Postoperative Infection.....	135	0.7%	5.6	124	0.9%	5.5	11	0.2%	6.1
Postoperative Cardiac Complications	56	0.3%	4.2	44	0.3%	4.0	12	0.2%	4.9
Hypo/Hypertension.....	53	0.3%	3.4	36	0.3%	3.7	17	0.3%	2.6
Postoperative Pneumonia	44	0.2%	6.0	39	0.3%	6.2	5	0.1%	4.6
Postoperative Venous Thrombosis/ Pulmonary Embolism ...	14	0.1%	8.9	13	0.1%	9.2	1	< 0.1%	5.0
Device/Implant/Graft Complications.....	6	< 0.1%	4.2	4	< 0.1%	4.8	2	< 0.1%	3.0
Postoperative Stroke/Anoxic Brain Damage	3	< 0.1%	4.0	2	< 0.1%	4.5	1	< 0.1%	3.0
Gastric/Intestinal Hemorrhage.....	3	< 0.1%	4.0	2	< 0.1%	3.5	1	< 0.1%	5.0
In-Hospital Death.....	2	< 0.1%	14.5	1	< 0.1%	9.0	1	< 0.1%	20.0
With any complication above.....	2,134	10.5%	3.9	1,690	12.0%	4.2	444	7.2%	2.9
Without any complication above	18,148	89.5%	2.5	12,393	88.0%	2.8	5,755	92.8%	1.9

[†] The term “cases” refers to hospitalizations.

Breast Cancer Procedure In-Hospital Complications

Type of In-Hospital Complication	Total Cases [†]			Lumpectomy			Mastectomy		
	#	%	Avg. LOS	#	%	Avg. LOS	#	%	Avg. LOS
Procedure/Medical Care Related.....	27	0.8%	4.4	3	0.3%	2.3	24	1.1%	4.7
Digestive System.....	35	1.1%	2.6	13	1.3%	1.5	22	1.0%	3.2
Postoperative Pulmonary Compromise.....	26	0.8%	5.8	7	0.7%	4.7	19	0.8%	6.3
Lymphedema.....	1	< 0.1%	1.0	1	0.1%	1.0	0	0.0%	-
Postoperative Hemorrhage.....	38	1.2%	3.8	11	1.1%	3.3	27	1.2%	4.0
Postoperative Infection.....	9	0.3%	6.1	0	0.0%	-	9	0.4%	6.1
Postoperative Pneumonia.....	6	0.2%	5.2	3	0.3%	4.0	3	0.1%	6.3
Postoperative Cardiac Complications.....	5	0.2%	3.4	1	0.1%	1.0	4	0.2%	4.0
Postoperative Venous Thrombosis/ Pulmonary Embolism.....	8	0.2%	9.1	2	0.2%	9.5	6	0.3%	9.0
Hypo/Hypertension.....	11	0.3%	3.4	2	0.2%	1.0	9	0.4%	3.9
Postoperative Stroke/Anoxic Brain Damage	1	< 0.1%	2.0	0	0.0%	-	1	< 0.1%	2.0
Device/Implant/Graft Complications.....	18	0.6%	4.4	1	0.1%	1.0	17	0.7%	4.6
Gastric/Intestinal Hemorrhage.....	0	0.0%	-	0	0.0%	-	0	0.0%	-
In-Hospital Death.....	1	< 0.1%	15.0	0	0.0%	-	1	< 0.1%	15.0
With any complication above.....	169	5.2%	4.2	41	4.1%	2.9	128	5.6%	4.6
Without any complication above.....	3,092	94.8%	2.0	949	95.9%	1.2	2,143	94.4%	2.3

[†] The term “cases” refers to hospitalizations.

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Appendix C: Definition of In-Hospital Complications for Surgical Procedures

Neck and Back Procedure In-Hospital Complications

Type of In-Hospital Complication	Total Cases [†]			w/o Spinal Fusion			w/ Spinal Fusion		
	#	%	Avg. LOS	#	%	Avg. LOS	#	%	Avg. LOS
Procedure/Medical Care Related	374	2.2%	4.3	233	2.1%	3.4	141	2.5%	5.7
Digestive System	142	0.8%	4.2	53	0.5%	3.1	89	1.6%	4.9
Postoperative Pulmonary Compromise.....	95	0.6%	5.4	36	0.3%	3.8	59	1.0%	6.4
Postoperative Stroke/Anoxic Brain Damage	74	0.4%	4.9	46	0.4%	4.2	28	0.5%	6.1
Postoperative Hemorrhage	55	0.3%	5.4	23	0.2%	5.3	32	0.6%	5.5
Postoperative Cardiac Complications	36	0.2%	4.3	16	0.1%	3.6	20	0.3%	4.9
Hypo/Hypertension.....	35	0.2%	3.1	23	0.2%	2.3	12	0.2%	4.4
Postoperative Infection.....	29	0.2%	12.1	16	0.1%	13.8	13	0.2%	10.1
Device/Implant/Graft Complications.....	27	0.2%	4.0	5	< 0.1%	5.4	22	0.4%	3.7
Postoperative Venous Thrombosis/ Pulmonary Embolism	20	0.1%	6.8	13	0.1%	6.3	7	0.1%	7.6
Postoperative Pneumonia	14	0.1%	8.9	3	< 0.1%	9.3	11	0.2%	8.8
In-Hospital Death	4	< 0.1%	7.8	2	< 0.1%	6.5	2	< 0.1%	9.0
Gastric/Intestinal Hemorrhage	1	< 0.1%	5.0	1	< 0.1%	5.0	0	0.0%	-
With any complication above.....	815	4.8%	4.5	437	3.9%	3.8	378	6.6%	5.4
Without any complication above	16,181	95.2%	1.9	10,832	96.1%	1.6	5,349	93.4%	2.4

[†] The term "cases" refers to hospitalizations.

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Appendix C: Definition of In-Hospital Complications for Surgical Procedures

Prostatectomy Procedures In-Hospital Complications

Type of In-Hospital Complication	Total Cases [†]		
	#	%	Average LOS
Procedure/Medical Care Related	53	2.9%	4.5
Digestive System	50	2.7%	5.6
Postoperative Pulmonary Compromise	19	1.0%	4.8
Postoperative Hemorrhage	24	1.3%	4.3
Postoperative Infection	11	0.6%	4.7
Postoperative Pneumonia	6	0.3%	5.0
Postoperative Cardiac Complications	13	0.7%	3.8
Postoperative Venous Thrombosis/ Pulmonary Embolism	8	0.4%	6.3
Hypo/Hypertension	10	0.5%	4.0
Postoperative Stroke/Anoxic Brain Damage	2	0.1%	6.0
Device/Implant/Graft Complications.....	3	0.2%	7.3
Gastric/Intestinal Hemorrhage	0	0.0%	-
In-Hospital Death	0	0.0%	-
With any complication above	181	9.9%	4.8
Without any complication above	1,656	90.1%	3.2

[†] The term "cases" refers to hospitalizations.

Definition of In-Hospital Complication for Hysterectomy

<u>Type of Complication</u>	<u>ICD.9.CM Code</u>
Procedure/Medical Care Related Events	
ABO incompatibility reaction.....	999.6
accidental puncture or laceration during a procedure.....	998.2
acute reaction to foreign substance accidentally left during a procedure.....	998.7
disruption of operation wound.....	998.3
foreign body accidentally left during a procedure.....	998.4
malignant hyperthermia (e.g. due to anesthesia).....	995.86
non-healing surgical wound.....	998.83
other and unspecified complications of medical care, not elsewhere classified.....	999.9
other specified adverse effects, not elsewhere classified (e.g. hypothermia due to anesthesia).....	995.89
other specified complications of procedures.....	998.89
other transfusion reaction.....	999.8
other vascular complications (e.g. following infusion, perfusion, or transfusion).....	999.2
persistent postoperative fistula.....	998.6
postoperative shock.....	998.0
Rh incompatibility reaction.....	999.7
shock due to anesthesia.....	995.4
unspecified complication of procedure, not elsewhere classified.....	998.9
Digestive System Complications	
digestive system complications (e.g. hepatic failure, intestinal obstruction).....	997.4
Postoperative Pulmonary Compromise	
acute and chronic respiratory failure.....	518.84
acute edema of lung, unspecified.....	518.4
acute respiratory failure.....	518.81
allergic bronchopulmonary aspergillosis.....	518.6
emphysema (subcutaneous) (surgical) resulting from a procedure.....	998.81
iatrogenic pneumothorax.....	512.1
mediastinal tracheostomy.....	31.21 (procedure)
other permanent tracheostomy.....	31.29 (procedure)
other pulmonary insufficiency, not elsewhere classified.....	518.82
pulmonary congestion and hypostasis.....	514
pulmonary insufficiency following trauma & surgery.....	518.5
respiratory complications (e.g. aspiration pneumonia, Mendelson's syndrome).....	997.3
temporary tracheostomy.....	31.1 (procedure)
Postoperative Hemorrhage	
control of hemorrhage, not otherwise specified.....	39.98 (procedure)
control of (postoperative) hemorrhage of bladder.....	57.93 (procedure)
hemorrhage complicating a procedure.....	998.11
hematoma complicating a procedure.....	998.12
seroma complicating a procedure.....	998.13
In-Hospital Death	
discharge status of 20 (expired).....	NA

Definition of In-Hospital Complication for Hysterectomy continued

<u>Type of Complication</u>	<u>ICD.9.CM Code</u>
Postoperative Infection	
infected postoperative seroma.....	998.51
infection and inflammatory reaction due to indwelling urinary catheter.....	996.64
infection and inflammatory reaction due to unspecified device, implant and graft.....	996.60
infection and inflammatory reaction due to vascular device, implant and graft.....	996.62
infection due to other genitourinary device, implant and graft.....	996.65
other infection.....	999.3
other postoperative infection.....	998.59
septicemia.....	038.0-038.9
Postoperative Pneumonia (coded by causative organism)	
Anaerobes.....	482.81
bacterial pneumonia unspecified.....	482.9
bronchopneumonia, organism unspecified.....	485
Chlamydia.....	483.1
Escherichia coli.....	482.82
Hemophilus influenzae.....	482.2
Klebsiella pneumoniae.....	482.0
Legionnaires' disease.....	482.84
Mycoplasma pneumoniae.....	483.0
other gram-negative bacteria.....	482.83
other specified bacteria.....	482.89
other specified organism.....	483.8
pneumonia, organism unspecified.....	486
Pneumococcal pneumonia (Streptococcus pneumoniae pneumonia).....	481
Pseudomonas.....	482.1
Staphylococcus (aureus, unspecified, other).....	482.40-482.49
Streptococcus (Group A, Group B, unspecified, other).....	482.30-482.39
Postoperative Cardiac Complications	
acute myocardial infarction after surgery – initial episode of care only.....	410.x1, x = 0-9
cardiac complications (e.g. cardiac arrest, heart failure).....	997.1
Postoperative Venous Thrombosis/Pulmonary Embolism	
air embolism.....	999.1
iatrogenic pulmonary embolism and infarction.....	415.11
other pulmonary embolism and infarction.....	415.19
other venous embolism and thrombosis of other specified veins.....	453.8
peripheral vascular complications.....	997.2
phlebitis and thrombophlebitis of femoral vein (deep) (superficial).....	451.11
phlebitis and thrombophlebitis of iliac vein.....	451.81
phlebitis and thrombophlebitis of other deep vessels of lower extremities.....	451.19
Hypo/Hypertension	
hypertension, not elsewhere classified.....	997.91
iatrogenic hypotension.....	458.2

Definition of In-Hospital Complication for Hysterectomy continued

<u>Type of Complication</u>	<u>ICD.9.CM Code</u>
Postoperative Stroke/Anoxic Brain Damage	
acute, but ill-defined cerebrovascular disease.....	436
anoxic brain damage	348.1
central nervous system complications (e.g. anoxic brain damage, cerebral hypoxia).....	997.01
iatrogenic cerebrovascular infarction or hemorrhage.....	997.02
intracerebral hemorrhage	431
nervous system complication, unspecified	997.00
occlusion and stenosis of precerebral arteries.....	433.x1, x = 0-3, 8, 9
occlusion of cerebral arteries.....	434.x1, x = 0, 1, 9
other and unspecified intracranial hemorrhage.....	432.0 – 432.9
other nervous system complications.....	997.09
subarachnoid hemorrhage.....	430
Device, Implant or Graft Complications	
mechanical complication due to urethral (indwelling) catheter	996.31
mechanical complication of other genitourinary device, implant, and graft.....	996.39
mechanical complication of unspecified genitourinary device, implant, and graft.....	996.30
other complications due to genitourinary device, implant and graft	996.76
other complications due to vascular device, implant and graft	996.74
Gastric/Intestinal Hemorrhage or Ulceration	
control of (postoperative) hemorrhage of anus	49.95 (procedure)
duodenal ulcer acute with hemorrhage, perforation, or hemorrhage and perforation with or without obstruction.....	532.00-532.21
duodenal ulcer chronic or unspecified with hemorrhage and perforation with or without obstruction	532.60-532.61
duodenal ulcer chronic or unspecified with hemorrhage with or without obstruction	532.40-532.41
gastric ulcer acute with hemorrhage, perforation, or hemorrhage and perforation with or without obstruction.....	531.00-531.21
gastric ulcer chronic or unspecified with hemorrhage and perforation with or without obstruction	531.60-531.61
gastric ulcer chronic or unspecified with hemorrhage with or without obstruction.....	531.40-531.41
gastrojejunal ulcer acute with hemorrhage, perforation or hemorrhage and perforation with or without obstruction.....	534.00-534.21
gastrojejunal ulcer chronic or unspecified with hemorrhage and perforation with or without obstruction	534.60-534.61
gastrojejunal ulcer chronic or unspecified with hemorrhage with or without obstruction.....	534.40-534.41
hemorrhage of gastrointestinal tract, unspecified	578.9
peptic ulcer acute with hemorrhage, perforation, or hemorrhage and perforation with or without obstruction	533.00-533.21
peptic ulcer chronic or unspecified with hemorrhage and perforation with or without obstruction	533.60-533.61
peptic ulcer chronic or unspecified with hemorrhage with or without obstruction.....	533.40-533.41

Definition of In-Hospital Complication for Mastectomy/Lumpectomy

<u>Type of Complication</u>	<u>ICD.9.CM Code</u>
Procedure/Medical Care Related Events	
ABO incompatibility reaction.....	999.6
accidental puncture or laceration during a procedure.....	998.2
acute reaction to foreign substance accidentally left during a procedure	998.7
disruption of operation wound.....	998.3
foreign body accidentally left during a procedure	998.4
malignant hyperthermia (e.g. due to anesthesia).....	995.86
non-healing surgical wound.....	998.83
other and unspecified complications of medical care, not elsewhere classified	999.9
other specified adverse effects, not elsewhere classified (e.g. hypothermia due to anesthesia).....	995.89
other specified complications of procedures.....	998.89
other transfusion reaction	999.8
other vascular complications (e.g. following infusion, perfusion, or transfusion)	999.2
persistent postoperative fistula	998.6
postoperative shock.....	998.0
Rh incompatibility reaction.....	999.7
shock due to anesthesia.....	995.4
unspecified complication of procedure, not elsewhere classified.....	998.9
Digestive System Complications	
digestive system complications (e.g. hepatic failure, intestinal obstruction).....	997.4
Postoperative Pulmonary Compromise	
acute and chronic respiratory failure.....	518.84
acute edema of lung, unspecified	518.4
acute respiratory failure	518.81
allergic bronchopulmonary aspergillosis.....	518.6
emphysema (subcutaneous) (surgical) resulting from a procedure	998.81
iatrogenic pneumothorax	512.1
other permanent tracheostomy.....	31.29 (procedure)
other pulmonary insufficiency, not elsewhere classified	518.82
mediastinal tracheostomy	31.21 (procedure)
pulmonary congestion and hypostasis.....	514
pulmonary insufficiency following trauma & surgery	518.5
respiratory complications (e.g. aspiration pneumonia, Mendelson's syndrome).....	997.3
temporary tracheostomy.....	31.1 (procedure)
Lymphedema	
postmastectomy lymphedema syndrome	457.0
Postoperative Hemorrhage	
control of hemorrhage, not otherwise specified	39.98 (procedure)
hemorrhage complicating a procedure	998.11
hematoma complicating a procedure.....	998.12
seroma complicating a procedure.....	998.13
In-Hospital Death	
discharge status of 20 (expired)	NA

Definition of In-Hospital Complication for Mastectomy/Lumpectomy continued

Type of Complication ICD.9.CM Code

Postoperative Infection

infected postoperative seroma.....	998.51
infection and inflammatory reaction due to indwelling urinary catheter.....	996.64
infection and inflammatory reaction due to unspecified device, implant and graft.....	996.60
infection and inflammatory reaction due to vascular device, implant and graft.....	996.62
infection due to other internal prosthetic device, implant and graft.....	996.69
other infection.....	999.3
other postoperative infection.....	998.59
septicemia.....	038.0–038.9

Postoperative Pneumonia (coded by causative organism)

anaerobes.....	482.81
bacterial pneumonia unspecified.....	482.9
bronchopneumonia, organism unspecified.....	485
Chlamydia.....	483.1
Escherichia coli.....	482.82
Hemophilus influenzae.....	482.2
Klebsiella pneumoniae.....	482.0
Legionnaires' disease.....	482.84
Mycoplasma pneumoniae.....	483.0
other gram-negative bacteria.....	482.83
other specified bacteria.....	482.89
other specified organism.....	483.8
pneumonia, organism unspecified.....	486
Pneumococcal pneumonia (Streptococcus pneumoniae pneumonia).....	481
Pseudomonas.....	482.1
Staphylococcus (aureus, unspecified, other).....	482.40-482.49
Streptococcus (Group A, Group B, unspecified, other).....	482.30-482.39

Postoperative Cardiac Complications

acute myocardial infarction after surgery – initial episode of care only.....	410.x1, x = 0 - 9
cardiac complications (e.g. cardiac arrest, heart failure).....	997.1

Postoperative Venous Thrombosis/Pulmonary Embolism

air embolism.....	999.1
iatrogenic pulmonary embolism and infarction.....	415.11
other pulmonary embolism and infarction.....	415.19
other venous embolism and thrombosis of other specified veins.....	453.8
peripheral vascular complications.....	997.2
phlebitis and thrombophlebitis of femoral vein (deep) (superficial).....	451.11
phlebitis and thrombophlebitis of iliac vein.....	451.81
phlebitis and thrombophlebitis of other deep vessels of lower extremities.....	451.19

Hypo/Hypertension

hypertension, not elsewhere classified.....	997.91
iatrogenic hypotension.....	458.2

Definition of In-Hospital Complication for Mastectomy/Lumpectomy continued

<u>Type of Complication</u>	<u>ICD.9.CM Code</u>
Postoperative Stroke/Anoxic Brain Damage	
acute, but ill-defined cerebrovascular disease.....	436
anoxic brain damage	348.1
central nervous system complications (e.g. anoxic brain damage, cerebral hypoxia).....	997.01
iatrogenic cerebrovascular infarction or hemorrhage.....	997.02
intracerebral hemorrhage	431
nervous system complication, unspecified	997.00
occlusion and stenosis of precerebral arteries.....	433.x1, x = 0-3, 8, 9
occlusion of cerebral arteries.....	434.x1, x = 0, 1, 9
other and unspecified intracranial hemorrhage.....	432.0 – 432.9
other nervous system complications.....	997.09
subarachnoid hemorrhage.....	430
Device, Implant or Graft Complications	
mechanical complication due to artificial skin graft and decellularized allodermis.....	996.55
mechanical complication due to breast prosthesis	996.54
mechanical complication due to graft of other tissue, not elsewhere classified	996.52
mechanical complication due to urethral (indwelling) catheter	996.31
other complication due to other internal prosthetic device, implant and graft	996.79
other complication due to unspecified device, implant and graft.....	996.70
other complication due to vascular device, implant and graft	996.74
Gastric/Intestinal Hemorrhage or Ulceration	
duodenal ulcer acute with hemorrhage, perforation, or hemorrhage and perforation with or without obstruction.....	532.00-532.21
duodenal ulcer chronic or unspecified with hemorrhage and perforation with or without obstruction	532.60-532.61
duodenal ulcer chronic or unspecified with hemorrhage with or without obstruction	532.40-532.41
gastric ulcer acute with hemorrhage, perforation, or hemorrhage and perforation with or without obstruction.....	531.00-531.21
gastric ulcer chronic or unspecified with hemorrhage and perforation with or without obstruction	531.60-531.61
gastric ulcer chronic or unspecified with hemorrhage with or without obstruction.....	531.40-531.41
gastrojejunal ulcer acute with hemorrhage, perforation or hemorrhage and perforation with or without obstruction.....	534.00-534.21
gastrojejunal ulcer chronic or unspecified with hemorrhage and perforation with or without obstruction	534.60-534.61
gastrojejunal ulcer chronic or unspecified with hemorrhage with or without obstruction.....	534.40-534.41
hemorrhage of gastrointestinal tract, unspecified	578.9
peptic ulcer acute with hemorrhage, perforation, or hemorrhage and perforation with or without obstruction	533.00-533.21
peptic ulcer chronic or unspecified with hemorrhage and perforation with or without obstruction	533.60-533.61
peptic ulcer chronic or unspecified with hemorrhage with or without obstruction.....	533.40-533.41

Definition of In-Hospital Complication for Neck/Back Procedures

<u>Type of Complication</u>	<u>ICD.9.CM Code</u>
Procedure/Medical Care Related Events	
ABO incompatibility reaction.....	999.6
accidental puncture or laceration during a procedure.....	998.2
acute reaction to foreign substance accidentally left during a procedure	998.7
disruption of operation wound.....	998.3
foreign body accidentally left during a procedure	998.4
malignant hyperthermia (e.g. due to anesthesia).....	995.86
non-healing surgical wound.....	998.83
other and unspecified complications of medical care, not elsewhere classified	999.9
other specified adverse effects, not elsewhere classified (e.g. hypothermia due to anesthesia).....	995.89
other specified complications of procedures.....	998.89
other transfusion reaction	999.8
other vascular complications (e.g. following infusion, perfusion, or transfusion)	999.2
persistent postoperative fistula	998.6
postoperative shock.....	998.0
Rh incompatibility reaction.....	999.7
shock due to anesthesia.....	995.4
unspecified complication of procedure, not elsewhere classified.....	998.9
Digestive System Complications	
digestive system complications (e.g. hepatic failure, intestinal obstruction).....	997.4
Postoperative Pulmonary Compromise	
acute and chronic respiratory failure.....	518.84
acute edema of lung, unspecified	518.4
acute respiratory failure	518.81
allergic bronchopulmonary aspergillosis.....	518.6
emphysema (subcutaneous) (surgical) resulting from a procedure	998.81
iatrogenic pneumothorax	512.1
other permanent tracheostomy.....	31.29 (procedure)
other pulmonary insufficiency, not elsewhere classified	518.82
mediastinal tracheostomy	31.21 (procedure)
pulmonary congestion and hypostasis.....	514
pulmonary insufficiency following trauma & surgery	518.5
respiratory complications (e.g. aspiration pneumonia, Mendelson's syndrome).....	997.3
temporary tracheostomy.....	31.1 (procedure)
Postoperative Hemorrhage	
control of hemorrhage, not otherwise specified	39.98 (procedure)
hemorrhage complicating a procedure	998.11
hematoma complicating a procedure.....	998.12
seroma complicating a procedure.....	998.13
In-Hospital Death	
discharge status of 20 (expired)	NA

Definition of In-Hospital Complication for Neck/Back Procedures continued

<u>Type of Complication</u>	<u>ICD.9.CM Code</u>
Postoperative Infection	
infected postoperative seroma.....	998.51
infection and inflammatory reaction due to indwelling urinary catheter.....	996.64
infection and inflammatory reaction due internal joint prosthesis.....	996.66
infection and inflammatory reaction due to nervous system device, implant and graft	996.63
infection and inflammatory reaction due to other internal orthopedic device, implant and graft.....	996.67
infection and inflammatory reaction due to vascular device, implant and graft.....	996.62
other infection	999.3
other postoperative infection.....	998.59
septicemia	038.0–038.9
Postoperative Pneumonia (coded by causative organism)	
anaerobes	482.81
bacterial pneumonia unspecified	482.9
bronchopneumonia, organism unspecified	485
Chlamydia	483.1
Escherichia coli.....	482.82
Hemophilus influenzae	482.2
Klebsiella pneumoniae	482.0
Legionnaires' disease.....	482.84
Mycoplasma pneumoniae.....	483.0
other gram-negative bacteria.....	482.83
other specified bacteria	482.89
other specified organism	483.8
pneumonia, organism unspecified	486
Pneumococcal pneumonia (Streptococcus pneumoniae pneumonia)	481
Pseudomonas.....	482.1
Staphylococcus (aureus, unspecified, other).....	482.40-482.49
Streptococcus (Group A, Group B, unspecified, other)	482.30-482.39
Postoperative Cardiac Complications	
acute myocardial infarction after surgery – initial episode of care only.....	410.x1, x = 0 - 9
cardiac complications (e.g. cardiac arrest, heart failure)	997.1
Postoperative Venous Thrombosis/Pulmonary Embolism	
air embolism	999.1
iatrogenic pulmonary embolism and infarction.....	415.11
other pulmonary embolism and infarction.....	415.19
other venous embolism and thrombosis of other specified veins.....	453.8
peripheral vascular complications.....	997.2
phlebitis and thrombophlebitis of femoral vein (deep) (superficial).....	451.11
phlebitis and thrombophlebitis of iliac vein	451.81
phlebitis and thrombophlebitis of other deep vessels of lower extremities	451.19
Hypo/Hypertension	
hypertension, not elsewhere classified	997.91
iatrogenic hypotension.....	458.2

Definition of In-Hospital Complication for Neck/Back Procedures continued

<u>Type of Complication</u>	<u>ICD.9.CM Code</u>
Postoperative Stroke/Anoxic Brain Damage	
acute, but ill-defined cerebrovascular disease	436
anoxic brain damage	348.1
central nervous system complications (e.g. anoxic brain damage, cerebral hypoxia)	997.01
iatrogenic cerebrovascular infarction or hemorrhage.....	997.02
intracerebral hemorrhage	431
nervous system complication, unspecified	997.00
occlusion and stenosis of precerebral arteries.....	433.x1, x = 0-3, 8, 9
occlusion of cerebral arteries.....	434.x1, x = 0, 1, 9
other and unspecified intracranial hemorrhage.....	432.0-432.9
other nervous system complications.....	997.09
subarachnoid hemorrhage.....	430
Device, Implant or Graft Complications	
mechanical complication due to graft of other tissue, not elsewhere classified	996.52
mechanical complication due to urethral (indwelling) catheter	996.31
mechanical complication of internal orthopedic device, implant and graft	996.4
other complication due to internal joint prosthesis	996.77
other complication due to nervous system device, implant and graft.....	996.75
other complication due to other internal orthopedic device, implant and graft	996.78
other complication due to vascular device, implant and graft	996.74
Gastric/Intestinal Hemorrhage or Ulceration	
duodenal ulcer acute with hemorrhage, perforation, or hemorrhage and perforation with or without obstruction.....	532.00-532.21
duodenal ulcer chronic or unspecified with hemorrhage and perforation with or without obstruction	532.60-532.61
duodenal ulcer chronic or unspecified with hemorrhage with or without obstruction	532.40-532.41
gastric ulcer acute with hemorrhage, perforation, or hemorrhage and perforation with or without obstruction.....	531.00-531.21
gastric ulcer chronic or unspecified with hemorrhage and perforation with or without obstruction	531.60-531.61
gastric ulcer chronic or unspecified with hemorrhage with or without obstruction.....	531.40-531.41
gastrojejunal ulcer acute with hemorrhage, perforation or hemorrhage and perforation with or without obstruction.....	534.00-534.21
gastrojejunal ulcer chronic or unspecified with hemorrhage and perforation with or without obstruction	534.60-534.61
gastrojejunal ulcer chronic or unspecified with hemorrhage with or without obstruction.....	534.40-534.41
hemorrhage of gastrointestinal tract, unspecified	578.9
peptic ulcer acute with hemorrhage, perforation, or hemorrhage and perforation with or without obstruction	533.00-533.21
peptic ulcer chronic or unspecified with hemorrhage and perforation with or without obstruction	533.60-533.61
peptic ulcer chronic or unspecified with hemorrhage with or without obstruction.....	533.40-533.41

Definition of In-Hospital Complication for Prostatectomy

<u>Type of Complication</u>	<u>ICD.9.CM Code</u>
Procedure/Medical Care Related Events	
ABO incompatibility reaction.....	999.6
accidental puncture or laceration during a procedure.....	998.2
acute reaction to foreign substance accidentally left during a procedure.....	998.7
disruption of operation wound.....	998.3
foreign body accidentally left during a procedure.....	998.4
malignant hyperthermia (e.g. due to anesthesia).....	995.86
non-healing surgical wound.....	998.83
other and unspecified complications of medical care, not elsewhere classified.....	999.9
other specified adverse effects, not elsewhere classified (e.g. hypothermia due to anesthesia).....	995.89
other specified complications of procedures.....	998.89
other transfusion reaction.....	999.8
other vascular complications (e.g. following infusion, perfusion, or transfusion).....	999.2
persistent postoperative fistula.....	998.6
postoperative shock.....	998.0
Rh incompatibility reaction.....	999.7
shock due to anesthesia.....	995.4
unspecified complication of procedure, not elsewhere classified.....	998.9
Digestive System Complications	
digestive system complications (e.g. hepatic failure, intestinal obstruction).....	997.4
Postoperative Pulmonary Compromise	
acute and chronic respiratory failure.....	518.84
acute edema of lung, unspecified.....	518.4
acute respiratory failure.....	518.81
allergic bronchopulmonary aspergillosis.....	518.6
emphysema (subcutaneous) (surgical) resulting from a procedure.....	998.81
iatrogenic pneumothorax.....	512.1
mediastinal tracheostomy.....	31.21 (procedure)
other permanent tracheostomy.....	31.29 (procedure)
other pulmonary insufficiency, not elsewhere classified.....	518.82
pulmonary congestion and hypostasis.....	514
pulmonary insufficiency following trauma & surgery.....	518.5
respiratory complications (e.g. aspiration pneumonia, Mendelson's syndrome).....	997.3
temporary tracheostomy.....	31.1 (procedure)
Postoperative Hemorrhage	
control of hemorrhage, not otherwise specified.....	39.98 (procedure)
control of (postoperative) hemorrhage of bladder.....	57.93 (procedure)
hemorrhage complicating a procedure.....	998.11
hematoma complicating a procedure.....	998.12
seroma complicating a procedure.....	998.13
In-Hospital Death	
discharge status of 20 (expired).....	NA

Definition of In-Hospital Complication for Prostatectomy continued

<u>Type of Complication</u>	<u>ICD.9.CM Code</u>
Postoperative Infection	
infected postoperative seroma.....	998.51
infection and inflammatory reaction due to indwelling urinary catheter.....	996.64
infection and inflammatory reaction due to unspecified device, implant and graft.....	996.60
infection and inflammatory reaction due to vascular device, implant and graft.....	996.62
infection due to other genitourinary device, implant and graft.....	996.65
other infection.....	999.3
other postoperative infection.....	998.59
septicemia.....	038.0-038.9
Postoperative Pneumonia (coded by causative organism)	
Anaerobes.....	482.81
bacterial pneumonia unspecified.....	482.9
bronchopneumonia, organism unspecified.....	485
Chlamydia.....	483.1
Escherichia coli.....	482.82
Hemophilus influenzae.....	482.2
Klebsiella pneumoniae.....	482.0
Legionnaires' disease.....	482.84
Mycoplasma pneumoniae.....	483.0
other gram-negative bacteria.....	482.83
other specified bacteria.....	482.89
other specified organism.....	483.8
pneumonia, organism unspecified.....	486
Pneumococcal pneumonia (Streptococcus pneumoniae pneumonia).....	481
Pseudomonas.....	482.1
Staphylococcus (aureus, unspecified, other).....	482.40-482.49
Streptococcus (Group A, Group B, unspecified, other).....	482.30-482.39
Postoperative Cardiac Complications	
acute myocardial infarction after surgery – initial episode of care only.....	410.x1, x = 0-9
cardiac complications (e.g. cardiac arrest, heart failure).....	997.1
Postoperative Venous Thrombosis/Pulmonary Embolism	
air embolism.....	999.1
iatrogenic pulmonary embolism and infarction.....	415.11
other pulmonary embolism and infarction.....	415.19
other venous embolism and thrombosis of other specified veins.....	453.8
peripheral vascular complications.....	997.2
phlebitis and thrombophlebitis of femoral vein (deep) (superficial).....	451.11
phlebitis and thrombophlebitis of iliac vein.....	451.81
phlebitis and thrombophlebitis of other deep vessels of lower extremities.....	451.19
Hypo/Hypertension	
hypertension, not elsewhere classified.....	997.91
iatrogenic hypotension.....	458.2

Definition of In-Hospital Complication for Prostatectomy continued

<u>Type of Complication</u>	<u>ICD.9.CM Code</u>
Postoperative Stroke/Anoxic Brain Damage	
acute, but ill-defined cerebrovascular disease.....	436
anoxic brain damage	348.1
central nervous system complications (e.g. anoxic brain damage, cerebral hypoxia).....	997.01
iatrogenic cerebrovascular infarction or hemorrhage.....	997.02
intracerebral hemorrhage	431
nervous system complication, unspecified	997.00
occlusion and stenosis of precerebral arteries.....	433.x1, x = 0-3, 8, 9
occlusion of cerebral arteries.....	434.x1, x = 0, 1, 9
other and unspecified intracranial hemorrhage.....	432.0 – 432.9
other nervous system complications.....	997.09
subarachnoid hemorrhage.....	430
Device, Implant or Graft Complications	
mechanical complication due to urethral (indwelling) catheter	996.31
mechanical complication of other genitourinary device, implant, and graft.....	996.39
mechanical complication of unspecified genitourinary device, implant, and graft.....	996.30
other complications due to genitourinary device, implant and graft	996.76
other complications due to vascular device, implant and graft	996.74
Gastric/Intestinal Hemorrhage or Ulceration	
control of (postoperative) hemorrhage of anus.....	49.95 (procedure)
duodenal ulcer acute with hemorrhage, perforation, or hemorrhage and perforation with or without obstruction.....	532.00-532.21
duodenal ulcer chronic or unspecified with hemorrhage and perforation with or without obstruction	532.60-532.61
duodenal ulcer chronic or unspecified with hemorrhage with or without obstruction	532.40-532.41
gastric ulcer acute with hemorrhage, perforation, or hemorrhage and perforation with or without obstruction.....	531.00-531.21
gastric ulcer chronic or unspecified with hemorrhage and perforation with or without obstruction	531.60-531.61
gastric ulcer chronic or unspecified with hemorrhage with or without obstruction.....	531.40-531.41
gastrojejunal ulcer acute with hemorrhage, perforation or hemorrhage and perforation with or without obstruction.....	534.00-534.21
gastrojejunal ulcer chronic or unspecified with hemorrhage and perforation with or without obstruction	534.60-534.61
gastrojejunal ulcer chronic or unspecified with hemorrhage with or without obstruction.....	534.40-534.41
hemorrhage of gastrointestinal tract, unspecified	578.9
peptic ulcer acute with hemorrhage, perforation, or hemorrhage and perforation with or without obstruction	533.00-533.21
peptic ulcer chronic or unspecified with hemorrhage and perforation with or without obstruction	533.60-533.61
peptic ulcer chronic or unspecified with hemorrhage with or without obstruction.....	533.40-533.41

APPENDIX D: RISK FACTORS

Preventing Hospitalization through Primary Care *Pediatric Ear, Nose and Throat Infections* Cases age 0 – 17*

Hospitalization Rate		HMO Inpatient Cases*	
		N = 616	
Variable	Number of Cases	Percent of Total	
•Age			
0 – 4 years	317	51.5	
5 – 17 years	299	48.5	
•Sex			
Male	349	56.7	
Female	267	43.3	

* Cases after hospitalization rate exclusions; the HMO database served as the comparative reference.

Preventing Hospitalization through Primary Care *Adult Ear, Nose and Throat Infections* Cases age 18 – 64*

Hospitalization Rate		HMO Inpatient Cases*	
		N = 522	
Variable	Number of Cases	Percent of Total	
•Age			
18 – 44 years	347	66.5	
45 – 64 years	175	33.5	
•Sex			
Male	211	40.4	
Female	311	59.6	

* Cases after hospitalization rate exclusions; the HMO database served as the comparative reference.

**Preventing Hospitalization through Primary Care
 High Blood Pressure (Hypertension)
 Cases age 18 – 64***

Hospitalization Rate		HMO Inpatient Cases*	
		N = 466	
Variable	Number of Cases	Percent of Total	
•Age			
18 – 44 years	115	24.7	
45 – 64 years	351	75.3	
•Sex			
Male	223	47.9	
Female	243	52.1	

* Cases after hospitalization rate exclusions; the HMO database served as the comparative reference.

**Preventing Hospitalization through Primary Care
 Gastrointestinal Infections
 Cases age 0 – 64***

Hospitalization Rate		HMO Inpatient Cases*	
		N = 1,062	
Variable	Number of Cases	Percent of Total	
•Age			
0 – 4 years	122	11.5	
5 – 17 years	159	15.0	
18 – 44 years	425	40.0	
45 – 64 years	356	33.5	
•Sex			
Male	421	39.6	
Female	641	60.4	

* Cases after hospitalization rate exclusions; the HMO database served as the comparative reference.

Source: PA Health Care Cost Containment Council, January 1 to December 31, 2000 inpatient discharges.

**Preventing Hospitalization through Primary Care
Kidney/Urinary Tract Infections
Cases age 0 – 64***

Hospitalization Rate	HMO Inpatient Cases*	
	N = 1,412	
Variable	Number of Cases	Percent of Total
•Age		
0 – 4 years	189	13.4
5 – 17 years	167	11.8
18 – 44 years	596	42.2
45 – 64 years	460	32.6
•Sex		
Male	255	18.1
Female	1,157	81.9

* Cases after hospitalization rate exclusions; the HMO database served as the comparative reference.

Managing On-Going Illnesses
COPD
Cases age 18 – 64

Hospitalization Rate	HMO Inpatient Cases* N = 1,193		
Variable	Number of Cases	Percent of Total	
•Age			
18 – 44 years	140	11.7	
45 – 64 years	1,053	88.3	
•Sex			
Male	513	43.0	
Female	680	57.0	
* Cases after hospitalization rate exclusions; the HMO database served as the comparative reference.			

Length of Stay (LOS)	HMO Inpatient Cases* N = 1,171		
Variable	Number of Cases	Percent of Total	Avg. LOS
•Atlas Outcomes® PLOS			
0 – 3.073 days	26	2.2	2.7
3.074 – 3.643 days	155	13.2	3.1
3.644 – 5.125 days	778	66.4	4.0
5.126 – 6.012 days	156	13.3	4.7
6.013+ days	56	4.8	4.8
•Sex			
Male	503	43.0	3.8
Female	668	57.0	4.1
* Cases after length of stay exclusions; the HMO database served as the comparative reference.			

Other Risk Factors Tested			
•Age			
•Atlas Outcomes® ASG (0 & 1, 2 & 3)			
•Heart Failure (no; yes: 398.91, 428.0 – 428.9)			
•Kidney Failure (no; yes: 403.01, 403.11, 403.91, 404.02, 404.12, 404.92, 585)			
•Race/Ethnicity (white, other)			
•Tobacco Use (no; yes: 305.1, V15.82)			

Source: PA Health Care Cost Containment Council, January 1 to December 31, 2000 inpatient discharges.

COPD continued

Percent Rehospitalized	HMO Inpatient Cases*		
	N = 1,155		
Variable	Number of Cases	Percent of Total	% Rehospitalized
• <i>Atlas Outcomes</i> ® ASG			
0 & 1	785	68.0	18.7
2 & 3	370	32.0	28.9
• Age			
18 – 52 years	377	32.6	18.0
53 – 59 years	403	34.9	19.6
60 – 64 years	375	32.5	28.5
• Race			
<i>Black/Other</i>	205	17.7	25.4
<i>White</i>	950	82.3	21.3
* Cases after percent rehospitalized exclusions; the HMO database served as the comparative reference.			
Other Risk Factors Tested			
• <i>Atlas Outcomes</i> ® PLOS (0-3.073, 3.074-3.643, 3.644-5.125, 5.126-6.012, 6.013+)			
• <i>Heart Failure</i> (no; yes: 398.91, 428.0 – 428.9)			
• <i>Kidney Failure</i> (no; yes: 403.01, 403.11, 403.91, 404.02, 404.12, 404.92, 585)			
• <i>Sex</i> (male, female)			
• <i>Tobacco Use</i> (no; yes: 305.1, V15.82)			

Source: PA Health Care Cost Containment Council, January 1 to December 31, 2000 inpatient discharges.

Managing On-Going Illnesses
Pediatric Asthma
Cases under age 18¹

Hospitalization Rate	HMO Inpatient Cases*		
	N = 1,454		
Variable	Number of Cases	Percent of Total	
•Age			
0 – 4 years	635	43.7	
5 – 17 years	819	56.3	
•Sex			
Male	921	63.3	
Female	533	36.7	

* Cases after hospitalization rate exclusions; the HMO database served as the comparative reference.

Length of Stay (LOS)	HMO Inpatient Cases*		
	N = 1,442		
Variable	Number of Cases	Percent of Total	Avg. LOS
•Atlas Outcomes® PLOS			
0 – 1.679 days	18	1.3	1.9
1.680 – 1.831 days	195	13.5	1.7
1.832 – 2.279 days	963	66.8	1.9
2.280 – 2.523 days	203	14.1	2.6
2.524+ days	63	4.4	2.5
•Age			
0 – 1 years	23	1.6	2.9
2 – 11 years	1,143	79.3	2.0
12 – 17 years	276	19.1	2.2

* Cases after length of stay exclusions; the HMO database served as the comparative reference.

Other Risk Factors Tested

- Atlas Outcomes® ASG (0, 1, 2, 3, 4, missing)
- Mechanical Ventilation (no; yes: procedure codes 96.70-96.72)
- Race (black, white, other)
- Sex (male, female)
- Status Asthmaticus with Acute Exacerbation (Group 1 principal diagnosis: 493.01, 493.02, 493.11, 493.12, 493.21, 493.22, 493.91, 493.92; Group 2 principal diagnosis: 493.00, 493.10, 493.20, 493.90)

Adult Asthma continued

Percent Rehospitalized	HMO Inpatient Cases*			
	Variable	Number of Cases	Percent of Total	% Rehospitalized
N = 1,712				
•Race				
	<i>Black</i>	332	19.4	18.1
	<i>White</i>	1,205	70.4	12.2
	<i>Other</i>	175	10.2	18.3
•Atlas Outcomes® PLOS				
	<i>0 – 2.653 days</i>	264	15.4	11.4
	<i>2.654 – 3.741 days</i>	1,139	66.5	14.6
	<i>3.742+ days</i>	309	18.1	14.0
•Sex				
	<i>Male</i>	393	23.0	11.2
	<i>Female</i>	1,319	77.0	14.8
* Cases after percent rehospitalized exclusions; the HMO database served as the comparative reference.				
Other Risk Factors Tested				
•Age				
•Atlas Outcomes® ASG (0, 1, 2, 3, 4, missing)				
•Chronic Obstructive Asthma as principal diagnosis (no; yes: 493.20, 493.21, 493.22)				
•Diabetes (none; diabetes w/o complication, 250.0x; diabetes w/ complication, 250.1x-250.9x)				
•Heart Failure (no; yes: 398.91, 402.02, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.0-428.9)				
•Mechanical Ventilation (no; yes: procedure codes 96.70-96.72)				
•Status Asthmaticus with Acute Exacerbation: (Group 1 principal diagnosis: 493.01, 493.02, 493.11, 493.12, 493.21, 493.22, 493.91, 493.92; Group 2 principal diagnosis: 493.00, 493.10, 493.20, 493.90)				

Source: PA Health Care Cost Containment Council, January 1 to December 31, 2000 inpatient discharges.

Managing On-Going Illnesses
Diabetes
Cases age 18 – 75*

Hospitalization Rate		HMO Inpatient Cases*	
		N = 1,408	
Variable	Number of Cases	Percent of Total	
• Age			
18 – 25 years.....	94	6.7	
26 – 35 years.....	153	10.9	
36 – 45 years.....	270	19.2	
46 – 55 years.....	433	30.8	
56 – 65 years.....	409	29.0	
66 – 75 years.....	49	3.5	
• Sex			
Male.....	584	41.5	
Female.....	824	58.5	

* Cases after hospitalization rate exclusions; the HMO database served as the comparative reference.

Length of Stay (LOS)		HMO Inpatient Cases*	
		N = 1,374	
Variable and Codes	Number of Cases	Percent of Total	Avg. LOS
• Atlas Outcomes® PLOS			
0 – 2.922 days.....	212	15.4	2.1
2.923 – 6.206 days.....	915	66.6	3.7
6.207+ days.....	247	18.0	7.5
• Surgical / Non-surgical DRG			
Surgical DRG.....	334	24.3	7.4
Non-surgical DRG.....	1,040	75.7	3.1
• Non-traumatic Lower Extremity Amputation (excludes diagnosis codes 895.x, 896.x, 897.x)			
No.....	1,221	88.9	3.6
Yes..... (84.10, 84.11, 84.12, 84.13, 84.14, 84.15, 84.16, 84.17)	153	11.1	8.6

* Cases after length of stay exclusions; the HMO database served as the comparative reference.

Other Risk Factors Tested

- Age
- Atlas Outcomes® ASG (0, 1, 2, 3, 4)
- Cancer (none, malignant neoplasm/cancer in situ: 140.0-208.9, 230.0-234.9, history of cancer: v10.00-v10.90)
- Cardiomyopathy (no; yes: 425.3, 425.4, 425.8, 425.9)
- Complicated Hypertension (no; yes: 402.x1, 403.x1, 404.x1, 404.x2, 404.x3, 405.x1, 405.x9)
- COPD (no; yes: 491.20, 491.21, 492.0, 492.28, 496, 506.4, 518.2)
- Diabetes Complications (none; long-term complications: 250.4x-250.9x; short-term complications: 250.02, 250.03, 250.1x-250.3x)
- Heart Failure (no; yes: 398.91, 428.0, 428.1, 428.9)
Note: For those cases having one of the above heart failure codes and a hypertension with congestive heart failure code (402.x1, 404.x1, 404.x3) in the same record, only the hypertension code was counted.
- Ischemic Heart Disease (no AMI) (no; yes: 411-414)
- Obesity (none; morbid: 278.01; unspecified: 278.00)
- Patient's Residence (urban, rural, out-of-state)
- Peripheral Vascular Disease (no; yes: 443.0, 443.1, 443.81, 443.89, 443.9)
- Race/Ethnicity (black non-hispanic; hispanic; white non-hispanic; other/unknown)
- Renal Dialysis (no; yes: v45.1, v56.0, v56.8, procedure codes 39.95, 54.98)
- Sex (male, female)
- Transfer-In Status (no, yes)

Source: PA Health Care Cost Containment Council, January 1 to December 31, 2000 inpatient discharges.

Diabetes continued

Variable	HMO Inpatient Cases*		
	Number of Cases	Percent of Total	% Rehospitalized
N = 1,352			
Percent Rehospitalized			
•Atlas Outcomes® PLOS			
0 – 2.926 days.....	209	15.5	11.0
2.927 – 6.231 days.....	900	66.6	12.6
6.232+ days.....	243	18.0	27.6
•Diabetes Complications			
None.....	35	2.6	2.9
Short-term complications.....	625	46.2	9.8
Long-term complications.....	692	51.2	20.4
•Age			
18 – 35 years.....	241	17.8	14.1
36 – 55 years.....	676	50.0	14.9
56 – 75 years.....	435	32.2	15.6

* Cases after percent rehospitalized exclusions; the HMO database served as the comparative reference.

Other Risk Factors Tested

- Atlas Outcomes® ASG (0, 1, 2, 3, 4)
- Cardiomyopathy (no, yes: 425.3, 425.4, 425.8, 425.9)
- Complicated Hypertension (no, yes: 402.x1, 403.x1, 404.x1, 404.x2, 404.x3, 405.x1, 405.x9)
- COPD (no; yes: 491.20, 491.21, 492.0, 492.28, 496, 506.4, 518.2)
- Heart Failure (no; yes: 398.91, 428.0, 428.1, 428.9)
Note: For those cases having one of the above heart failure codes and a hypertension with congestive heart failure code (402.x1, 404.x1, 404.x3) in the same record, only the hypertension code was counted.
- Ischemic Heart Disease (no AMI) (no; yes: 411-414)
- Non-traumatic Lower Extremity Amputations (no; yes: 84.10, 84.11, 84.12, 84.13, 84.14, 84.15, 84.16, 84.17)
Note: Excludes diagnosis codes 895.x, 896.x, 897.x
- Obesity (none; morbid: 278.01; unspecified: 278.00)
- Patient's Residence (urban, rural, out-of-state)
- Peripheral Vascular Disease (no; yes: 443.0, 443.1, 443.81, 443.89, 443.0)
- Race/Ethnicity (black non-hispanic; hispanic; white non-hispanic; other/unknown)
- Renal Dialysis (no; yes: v45.1, v56.0, v56.8, procedure codes 39.95, 54.98)
- Renal Failure (none; chronic: 585; acute: 584.5, 584.6, 584.7, 584.8, 584.9; unspecified: 586)
- Sex (male, female)
- Surgical DRG / Renal Failure (surgical DRG w/ renal failure; surgical DRG w/o renal failure; non-surgical DRG w/ renal failure; non-surgical DRG w/o renal failure)
- Transfer-in Status (no, yes)

Source: PA Health Care Cost Containment Council, January 1 to December 31, 2000 inpatient discharges.

**Heart Attack (AMI)
Cases age 18 – 64***

Hospitalization Rate		HMO Inpatient Cases*	
		N = 3,299	
Variable	Number of Cases	Percent of Total	
•Age			
18 – 19 years	0	0.0	
20 – 44 years	473	14.3	
45 – 64 years	2,826	85.7	
•Sex			
Male	2,492	75.5	
Female	807	24.5	

* Cases after hospitalization rate analysis exclusions; the HMO database served as the comparative reference.

Average Number of Days Hospitalized		Statewide Inpatient Cases*		
		N = 10,884		
Variable and Codes	Number of Cases	Percent of Total	Average # of Days Hospitalized	
•Heart Failure				
No	9,236	84.9	5.3	
Yes	1,648	15.1	9.6	
<i>(398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.0 – 428.9)</i>				
•Atlas Outcomes® PLOS				
0 – 3.843 days	1,684	15.5	3.5	
3.844 – 6.011 days	7,243	66.5	5.6	
6.012+ days	1,957	18.0	9.6	
•Renal Failure – Chronic (includes hypertension with renal failure)				
No	10,589	97.3	5.9	
Yes	295	2.7	10.6	
<i>(403.01, 403.11, 403.91, 404.02, 404.12, 404.92, 585)</i>				

* Cases after average number of days hospitalized analysis exclusions; the statewide database served as the comparative reference.

Other Risk Factors Tested

- Age
- Alcohol and Drug Abuse (none; alcohol & drug abuse- In remission: 303.x3, 304.x3, 305.x3 except 305.13; Not in remission: 291.x, 292.0, 292.82, 303.xx except 303.x3, 304.xx except 304.x3, 305.xx except 305.x3, 357.5, 425.5, 535.3x, 571.0-571.3, 980.0, 980.9, V11.3)
- AMI Type (Q-wave: 410.x1 except 410.71; non-Q-wave: 410.71)
- Atlas Outcomes® ASG (0, 1, 2, 3, 4)
- Cardiomyopathy (no; yes: 425.3, 425.4, 425.8, 425.9)
- Diabetes (none; diabetes w/o complication: 250.0x; diabetes w/ complication: 250.1x-250.9x)
- Obesity (none; morbid: 278.01; unspecified: 278.00)
- Previous CABG (no; yes: V45.81, 414.02, 414.03, 996.03)
- Race (black, white, other/unknown race)
- Renal Dialysis (v45.1, v56.0, v56.8, procedure codes 39.95, 54.98)
- Sex (male, female)

Source: PA Health Care Cost Containment Council, January 1 to December 31, 2000 inpatient discharges.

Heart Attack (AMI) continued

In-Hospital Mortality	Statewide Inpatient Cases*		
	N = 11,388		
Variable and Codes	Number of Cases	Percent of Total	Mortality %
•Atlas Outcomes® ASG			
0.....	137	1.2	0.0
1.....	7,187	63.1	0.6
2.....	3,399	29.8	3.9
3.....	576	5.1	33.2
4.....	89	0.8	58.4
•AMI Type (principal diagnoses)			
Q-wave (410.x1 except 410.71)	6,543	57.5	4.8
Non-Q-wave (410.71)	4,845	42.5	2.1
•Renal Failure – Chronic (includes hypertension with renal failure)			
No.....	11,026	96.8	3.3
Yes (403.01, 403.11, 403.91, 404.02, 404.12, 404.92, 585)	362	3.2	15.7
<hr/>			
* Cases after in-hospital mortality analysis exclusions; the statewide database served as the comparative reference.			
Other Risk Factors Tested			
•Age			
•Alcohol and Drug Abuse (none; alcohol & drug abuse- <u>In remission</u> : 303.x3, 304.x3, 305.x3 except 305.13; <u>Not in remission</u> : 291.x, 292.0, 292.82, 303.xx except 303.x3, 304.xx except 304.x3, 305.xx except 305.x3, 357.5, 425.5, 535.3x, 571.0-571.3, 980.0, 980.9, V11.3)			
•Cardiomyopathy (no; yes: 425.3, 425.4, 425.8, 425.9)			
•Diabetes (none; diabetes w/o complication: 250.0x; diabetes w/ complication: 250.1x-250.9x)			
•Heart Failure (no; yes: 398.91, 402.01, 402.11, 402.91, 404.01, 404.03, 404.11, 404.13, 404.91, 404.93, 428.0 – 428.9)			
•Obesity (none; morbid: 278.01; unspecified: 278.00)			
•Previous CABG (no; yes: V45.81, 414.02, 414.03, 996.03)			
•Race (black, white, other/unknown race)			
•Renal Dialysis (v45.1, v56.0, v56.8, procedure codes 39.95, 54.98)			
•Sex (male, female)			

Source: PA Health Care Cost Containment Council, January 1 to December 31, 2000 inpatient discharges.

**Surgical Procedures
Hysterectomy
Cases age 18 – 64***

Procedure Rate		HMO Inpatient Cases*	
		N = 7,777	
Variable		Number of Cases	Percent of Total
• Age			
18 – 44 years		4,109	52.8
45 – 64 years		3,668	47.2

* Cases after procedure rate exclusions; the HMO database served as the comparative reference.

Length of Stay (LOS)		Statewide Inpatient Cases*		
		N = 20,189		
Variable and Codes		Number of Cases	Percent of Total	Avg. LOS
• Procedure Groupings				
Abdominal/Radical Vaginal Hysterectomy		14,036	69.5	2.9
(68.3, 68.4, 68.6, 68.7)				
Vaginal/Other Hysterectomy.....		6,153	30.5	2.0
(68.51, 68.59, 68.9)				
• Atlas Outcomes® PLOS				
0 – 2.236 days.....		3,124	15.5	2.4
2.237 – 2.787 days		13,427	66.5	2.5
2.788+ days		3,638	18.0	3.1
• Principal Diagnosis Groupings				
Fibroids/Hyperplasia/Endometriosis		11,525	57.1	2.7
(218.x, 621.2, 621.3, 617.x)				
Uterine Prolapse.....		1,863	9.2	2.3
(618.1-618.4)				
Bleeding Abnormalities and Other Principal.....		6,801	33.7	2.6
Diagnoses for Bleeding Abnormalities (626.2- 626.9, 627.0, 627.1)				

* Cases after length of stay exclusions; the statewide database served as the comparative reference.

Other Risk Factors Tested	
• Age	
• Atlas Outcomes® ASG (0, 1, 2, 3, 4, missing)	
• Diabetes (none; diabetes w/o complication: 250.0x; diabetes w/ complication: 250.1x-250.9x)	
• History of Cancer (no; yes: v10.00-v10.9)	
• Race (black, white, other/unknown race)	

Hysterectomy continued

In-Hospital Complications	Statewide Inpatient Cases*		
	Number of Cases	Percent of Total	Complications%
	N = 20,282		
Variable and Codes			
•Procedure Groupings			
<i>Abdominal/Radical Vaginal Hysterectomy</i> (68.3, 68.4, 68.6, 68.7)	14,092	69.5	12.0
<i>Vaginal/Other Hysterectomy</i> (68.51, 68.59, 68.9)	6,190	30.5	7.1
•Race			
<i>Black</i>	1,836	9.0	15.4
<i>White</i>	15,631	77.1	9.9
<i>Other</i>	2,815	13.9	11.0
•Atlas Outcomes® PLOS			
<i>0 – 2.236 days</i>	3,130	15.4	8.7
<i>2.237 – 2.789 days</i>	13,498	66.6	10.0
<i>2.790+ days</i>	3,654	18.0	13.9
* Cases after in-hospital complications exclusions; the statewide database served as the comparative reference.			
Other Risk Factors Tested			
<ul style="list-style-type: none"> •Age •Atlas Outcomes® ASG (0, 1, 2, 3, 4, missing) •Diabetes (none; diabetes w/o complication: 250.0x; diabetes w/ complication: 250.1x-250.9x) •History of Cancer (no; yes: v10.00-v10.9) •Principal Diagnosis Groupings (fibroids/hyperplasia/endometriosis: 218.x, 621.2, 621.3, 617.x; uterine prolapse: 618.1-618.4; bleeding abnormalities and other principal diagnoses: 626.2-626.9, 627.0, 627.1 for bleeding abnormalities) 			

Source: PA Health Care Cost Containment Council, January 1 to December 31, 2000 inpatient discharges.

**Surgical Procedures
Breast Cancer Procedures
Cases age 18 – 64**

Procedure Rate		HMO Cases* N = 2,927	
Variable	Number of Cases	Percent of Total	
•Age			
18 – 44 years.....	695	23.7	
45 – 64 years.....	2,232	76.3	

* Cases after procedure rate exclusions (includes inpatient and ambulatory procedures); the HMO database served as the comparative reference.

Length of Stay (LOS)		Statewide Inpatient Cases* N = 3,260		
Variable and Codes	Number of Cases	Percent of Total	Avg. LOS	
•Procedure Group				
Reconstruction..... (both Mastectomy and Lumpectomy: 85.50-85.54, 85.7, 85.82-85.87, 85.93, 85.96)	633	19.4	3.9	
Mastectomy..... (No Reconstruction: 85.41 – 85.48)	1,641	50.3	1.8	
Lumpectomy..... (No Reconstruction: 85.20 – 85.22)	986	30.3	1.3	
•Atlas Outcomes® PLOS				
0 – 1.567 days.....	503	15.4	1.9	
1.568 – 1.994 days.....	2,170	66.6	1.9	
1.995+ days.....	587	18.0	2.7	
•Race				
Black/Other.....	857	26.3	2.3	
White.....	2,403	73.7	2.0	

* Cases after length of stay exclusions; the statewide database served as the comparative reference.

- Other Risk Factors Tested
- Age
 - Atlas Outcomes® ASG (0, 1, 2, 3, 4, missing)
 - Breast Cancer Type (metastatic: 196.3, 198.2, 198.81; malignant neoplasm: 174.0-174.9, 238.3, 239.3; in situ: 233.0)
 - Diabetes (none; diabetes w/o complication: 250.0x; diabetes w/ complication: 250.1x-250.9x)
 - Family History of Breast Cancer (no; yes: v16.3)
 - Personal History of Breast Cancer (no; yes: v10.3)
 - Obesity (no; yes: 278.00, 278.01)

Breast Cancer Procedures continued

In-Hospital Complications		Statewide Inpatient Cases*		
		N = 3,261		
Variable and Codes	Number of Cases	Percent of Total	Complications %	
•Concurrent Reconstruction				
<i>No</i>	2,628	80.6	3.8	
<i>Yes</i>	633	19.4	11.1	
<i>(85.50-85.54, 85.7, 85.82-85.87, 85.93, 85.96)</i>				
•Atlas Outcomes® PLOS				
<i>0 – 1.567 days</i>	503	15.4	5.4	
<i>1.568 – 1.994 days</i>	2,170	66.5	4.4	
<i>1.995+ days</i>	588	18.0	7.8	
•Breast Cancer Type				
<i>Metastatic</i>	968	29.7	4.1	
<i>(196.3, 198.2, 198.81)</i>				
<i>Malignant Neoplasm</i>	1,897	58.2	5.6	
<i>(174.0-174.9, 238.3, 239.3)</i>				
<i>In Situ</i>	396	12.1	5.6	
<i>(233.0)</i>				
<hr/>				
* Cases after in-hospital complications exclusions; the statewide database served as the comparative reference.				
<hr/>				
Other Risk Factors Tested				
•Age				
•Atlas Outcomes® ASG (0, 1, 2, 3, 4, missing)				
•Diabetes (none; diabetes w/o complication: 250.0x; diabetes w/ complication: 250.1x-250.9x)				
•Family History of Breast Cancer (no; yes: v16.3)				
•Personal History of Breast Cancer (no; yes: v10.3)				
•Procedure Group (mastectomy: 85.41 – 85.48; lumpectomy: 85.20 – 85.22)				
•Obesity (no; yes: 278.00, 278.01)				
•Race (black, white, other)				

Source: PA Health Care Cost Containment Council, January 1 to December 31, 2000 ambulatory and inpatient discharges.

**Surgical Procedures
Neck and Back Procedures
Cases age 18 – 64***

Procedure Rate	HMO Inpatient Cases*	
	N = 5,193	
Variable	Number of Cases	Percent of Total
•Age		
18 years	10	0.2
19 years	13	0.3
20 – 44 years	2,349	45.2
45 – 64 years	2,821	54.3
•Sex		
Male	2,700	52.0
Female	2,493	48.0

* Cases after procedure rate exclusions; the HMO database served as the comparative reference.

Length of Stay (LOS)	Statewide Inpatient Cases*		
	N = 16,989		
Variable and Codes	Number of Cases	Percent of Total	Avg. LOS
•Fusion Location			
No Fusion.....	11,265	66.3	1.7
Cervical/Atlas Axis/Fusion Not Otherwise Specified... (procedures 81.00, 81.01, 81.02, 81.03)	3702	21.8	1.7
Dorsal and Dorsolumbar..... (81.04, 81.05)	62	0.4	6.6
Lumbar and Lumbosacral..... (81.06, 81.07, 81.08)	1,960	11.5	4.0
•Atlas Outcomes® PLOS			
0 – 1.555 days.....	2,624	15.4	1.4
1.556 – 2.593 days	11,310	66.6	1.8
2.594+ days	3,055	18.0	3.4
•Race			
Black	730	4.3	2.9
White	13,448	79.2	2.0
Other	2,811	16.5	1.9

* Cases after length of stay exclusions; the statewide database served as the comparative reference.

- Other Risk Factors Tested**
- Age
 - Alcohol and Drug Abuse (no; yes: 291.x, 292.0, 292.82, 303.xx, 304.xx, 305.xx except 305.1x, 357.5, 425.5, 535.3x, 571.0-571.3, 980.9, v11.3)
 - Benign Tumor (no; yes: 213.2, 215.7, 225.3, 225.4, 225.8, 225.9)
 - Cancer (none; malignant/in situ: 140.0-208.9, 230.0-234.9; history: v10.00-10.9)
 - COPD (no; yes: 491.20, 491.21, 492.0, 492.8, 496, 506.4)
 - Congestive Heart Failure (no; yes: 402.x1, 404.x1, 404.x3, 416.x, 425.x, 428.x)
 - Diabetes (none; diabetes w/o complication: 250.0x; diabetes w/ complication: 250.1x-250.9x)
 - Musculoskeletal Disorders (no; yes: 274.xx, 710.0x, 712.xx, 713.x, 714.xx, 715.xx, 733.0x, v43.6x)
 - Obesity (none; unspecified: 278.00; morbid: 278.01)
 - Osteoporosis (no; yes: 733.0x)
 - Principal Diagnosis Groupings (see "In-Hospital Complications" table on the following page for codes)
 - Procedure Groupings (discectomy: 80.50, 80.51, 80.59; laminectomy: 03.09; discectomy & laminectomy: 80.50, 80.51, or 80.59 & 03.09)
 - Psychological disorders (no; yes: 295.xx, 296.xx, 297.x, 298.x, 299.xx, 300.xx, 301.xx, 309.xx, 310.x, 311, 312.xx)
 - Sex (male, female)
 - Smoking (no; yes: 305.1, v15.82)

Source: PA Health Care Cost Containment Council, January 1 to December 31, 2000 inpatient discharges.

Neck and Back Procedures continued

In-Hospital Complications	Statewide Inpatient Cases*		
		N = 16,989	
Variable and Codes	Number of Cases	Percent of Total	Complications %
•Fusion Location			
<i>No Fusion</i>	11,269	66.3	3.9
<i>Cervical/Atlas Axis/Fusion Not Otherwise Specified</i> <i>(procedures 81.00, 81.01, 81.02, 81.03)</i>	3703	21.8	3.4
<i>Dorsal and Dorsolumbar</i> <i>(81.04, 81.05)</i>	63	0.4	15.9
<i>Lumbar and Lumbosacral</i> <i>(81.06, 81.07, 81.08)</i>	1, 961	11.5	12.3
•Atlas Outcomes® PLOS			
<i>0 – 1.555 days</i>	2,624	15.4	2.4
<i>1.556 – 2.594 days</i>	11,316	66.6	4.3
<i>2.595+ days</i>	3,056	18.0	8.6
•Principal Diagnosis Groupings			
<i>Disc Displacement</i> <i>(722.0, 722.10, 722.11, 722.2)</i>	11,799	69.4	3.5
<i>Disc Degeneration/ Narrowing of Spinal Canal</i> <i>(720.0, 721.0-721.42, 721.90, 721.91, 722.4, 722.51, 722.52, 722.6, 723.0, 724.00-724.09, 738.4, 756.11, 756.12)</i>	4,484	26.4	7.9
<i>Other Disc Disorders/Back Pain</i> <i>(722.70-722.73, 722.90-722.93, 723.1, 724.1-724.3, 724.5)</i>	713	4.2	6.2
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<i>* Cases after in-hospital complications exclusions; the statewide database served as the comparative reference.</i>			
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Other Risk Factors Tested			
<ul style="list-style-type: none"> •Age •Alcohol and Drug Abuse (no, yes-291.x, 292.0, 292.82, 303.xx, 304.xx, 305.xx except 305.1x, 357.5, 425.5, 535.3x, 571.0-571.3, 980.9, v11.3) •Atlas Outcomes® ASG (0, 1) •Benign Tumor (no, yes: 213.2, 215.7, 225.3, 225.4, 225.8, 225.9) •Cancer (none, malignant/in situ; 140.0-208.9, 230.0-234.9, history: v10.00-10.9) •COPD (no, yes: 491.20, 491.21, 492.0, 492.8, 496, 506.4) •Congestive Heart Failure (no, yes: 402.x1, 404.x1, 404.x3, 416.x, 425.x, 428.x) •Diabetes (none; diabetes w/o complication: 250.0x; diabetes w/ complication: 250.1x-250.9x) •Musculoskeletal Disorders (no, yes: 274.xx, 710.0x, 712.xx, 713.x, 714.xx, 715.xx, 733.0x, v43.6x) •Obesity (none, unspecified: 278.00, morbid: 278.01) •Osteoporosis (no, yes: 733.0x) •Procedure Groupings (discectomy: 80.50, 80.51, 80.59, laminectomy: 03.09, discectomy & laminectomy: 80.50, 80.51, or 80.59 & 03.09) •Psychological disorders (no, yes: 295.xx, 296.xx, 297.x, 298.x, 299.xx, 300.xx, 301.xx, 309.xx, 310.x, 311, 312.xx) •Race (black, white, other) •Sex (male, female) •Smoking (no, yes: 305.1, v15.82) 			

Source: PA Health Care Cost Containment Council, January 1 to December 31, 2000 inpatient discharges.

**Surgical Procedures
Prostatectomy
Cases age 18 – 64**

Procedure Rate	HMO Inpatient Cases*	
	N = 741	
Variable	Number of Cases	Percent of Total
•Age		
18 – 44 years	11	1.5
45 – 64 years	730	98.5
* Cases after procedure rate exclusions; the HMO database served as the comparative reference.		

Length of Stay (LOS)	Statewide Inpatient Cases*		
	N = 1,837		
Variable	Number of Cases	Percent of Total	Avg. LOS
•Atlas Outcomes® PLOS			
0 – 2.196 days	40	2.2	3.5
2.197 – 2.556 days	244	13.2	3.1
2.557 – 3.169 days	1,222	66.5	3.3
3.170 – 3.571 days	245	13.3	3.5
3.572+ days	86	4.7	4.4
•Race			
Black	141	7.7	3.6
White	1,259	68.5	3.4
Other	437	23.8	3.2
•Age			
18 – 56 years	654	35.6	3.2
57 – 60 years	543	29.6	3.4
61 – 64 years	640	34.8	3.5
* Cases after length of stay exclusions; the statewide database served as the comparative reference.			

<p>Other Risk Factors Tested</p> <ul style="list-style-type: none"> •Atlas Outcomes® ASG (0, 1, 2) •Diabetes (none; diabetes w/o complication: 250.0x; diabetes w/ complication: 250.1x-250.9x) •Discharge Status (home, acute transfer, non-acute transfer) •Family History of Prostate Cancer (no; yes: v16.42) •Heart Failure (no; yes: 398.91, 428.0 – 428.9) •History of Prostate Cancer (no; yes: v10.46) •Hospital Region (west, central/northeast, southeast) •Obesity (no; yes: 278.00, 278.01) •Other Cancer- Not Prostate (metastatic: 196.0 – 198.81, 198.89 – 199.1; primary: 140.0-184.9, 186.0-195.8, 200.0-208.9, 230.0-233.3, 233.5-236.4, 236.6-239.4, 239.6-239.9; none) •Patient Region (central/northeast, southeast, west, out-of-state)

Source: PA Health Care Cost Containment Council, January 1 to December 31, 2000 inpatient discharges.

Prostatectomy continued

In-Hospital Complications	Statewide Inpatient Cases*		
		N = 1,837	
Variable	Number of Cases	Percent of Total	Complications%
•Race			
<i>Black</i>	141	7.7	14.2
<i>Other</i>	437	23.8	6.4
<i>White</i>	1,259	68.5	10.6
•Atlas Outcomes® PLOS			
<i>0 – 2.556 days</i>	284	15.5	6.0
<i>2.557 – 3.169 days</i>	1,222	66.5	10.3
<i>3.170+ days</i>	331	18.0	11.5
* Cases after in-hospital complications exclusions; the statewide database served as the comparative reference.			
Other Risk Factors Tested			
<ul style="list-style-type: none"> •Age •Atlas Outcomes® ASG (0, 1, 2) •Diabetes (none; diabetes w/o complication: 250.0x; diabetes w/ complication: 250.1x-250.9x) •Discharge Status (home, acute transfer, non-acute transfer) •Family History of Prostate Cancer (no; yes: v16.42) •Heart Failure (no; yes: 398.91, 428.0 – 428.9) •History of Prostate Cancer (no; yes: v10.46) •Hospital Region (west, central/northeast, southeast) •Obesity (no; yes: 278.00, 278.01) •Other Cancer- Not Prostate (metastatic: 196.0 –198.81, 198.89 –199.1; primary: 140.0-184.9, 186.0-195.8, 200.0-208.9, 230.0-233.3, 233.5-236.4, 236.6-239.4, 239.6-239.9; none) •Patient Region (central/northeast, southeast, west, out-of-state) 			

Source: PA Health Care Cost Containment Council, January 1 to December 31, 2000 inpatient discharges.

