Contents

About This Book ......................................................................................................................... ix
About These Authors ................................................................................................................. xi
Acknowledgments ..................................................................................................................... xiii
Chapter 1: The U.S. Healthcare System ....................................................................................... 1
Introduction .................................................................................................................................. 1
Data and Programming Used in This Book .................................................................................. 2
Terminology ................................................................................................................................. 2
Flow of Administrative Healthcare Data ...................................................................................... 3
Key Players .................................................................................................................................. 4
Medical Claim Submission ........................................................................................................... 4
Claim Processing .......................................................................................................................... 5
Recent Legislative Effects ............................................................................................................ 6
  HIPAA ........................................................................................................................................... 6
  Affordable Care Act .................................................................................................................... 6
  All Payer Claims Database ........................................................................................................ 6
  Continuing Enhancements ......................................................................................................... 7
Conclusion ................................................................................................................................... 7
Chapter 2: Introduction to SAS Enterprise Guide and Sample Data ........................................... 9
Introduction ................................................................................................................................... 9
Sample Data ............................................................................................................................... 9
SAS Libraries and Data Sets ......................................................................................................... 12
  Create a Permanent Library ....................................................................................................... 12
  View a SAS Data Set ................................................................................................................ 13
SAS Data Types ............................................................................................................................ 13
Formats ......................................................................................................................................... 14
  DRG Format ............................................................................................................................. 15
  Diagnosis Code Format ........................................................................................................... 16
Applying Formats to SAS Variables ............................................................................................ 19
  Formatting an Existing Variable ............................................................................................... 19
  Placing Results of a Format into a New Variable ...................................................................... 21
Conclusion ................................................................................................................................... 21
Chapter 3: The Payers .................................................................................................................. 23
Introduction ................................................................................................................................... 23
Health Insurance ...................................................................................................................................................... 23
Medicare ............................................................................................................................................................ 24
Medicaid............................................................................................................................................................ 24
Commercial Insurance .................................................................................................................................. 26
Others............................................................................................................................................................... 26
    TRICARE .................................................................................................................................................... 26
    CHAMPVA ............................................................................................................................................... 26
    FECA Black Lung .................................................................................................................................. 26
Conclusion ....................................................................................................................................................... 27

Chapter 4: The Providers .................................................................................................................................. 29
Introduction .................................................................................................................................................... 29
Types of Providers ........................................................................................................................................... 29
    Facility .................................................................................................................................................. 30
    Professional ...................................................................................................................................... 30
    Pharmacy ......................................................................................................................................... 31
    Ancillary ............................................................................................................................................ 31
National Provider Registry .................................................................................................................................. 32
    NPI ..................................................................................................................................................... 32
    Taxonomy .......................................................................................................................................... 32
    Other Provider Identifiers .................................................................................................................. 33
Case Study: Standardizing Provider Names from the National Provider Registry ................................................. 34
Case Study: Using Taxonomy Code to Identify Primary Care Physicians ................................................................. 36
Conclusion ....................................................................................................................................................... 38

Chapter 5: Facility Claims ........................................................................................................................... 39
Introduction .................................................................................................................................................... 39
CMS-1450 Paper Claim Form .......................................................................................................................... 40
837I Electronic Claim Format ........................................................................................................................ 40
Data Elements Unique to Facilities .................................................................................................................. 40
    Type of Bill ........................................................................................................................................ 40
    Admission and Discharge Dates .......................................................................................................... 42
    Patient Discharge Status ...................................................................................................................... 43
    Revenue Code .................................................................................................................................. 43
    Diagnosis Codes ............................................................................................................................... 44
    Present on Admission .......................................................................................................................... 45
    Surgical Procedure Codes .................................................................................................................. 45
    DRG .................................................................................................................................................... 45
    Provider IDs ................................................................................................................................... 46
    Others ............................................................................................................................................... 46
Case Study: Calculating C-Section Rates among Hospitals ................................................................................. 47
    Create Summary Data Set for All Births .............................................................................................. 47
    Create Summary Data Set for C-Section Births ................................................................................ 49
Join Summary Data Sets .................................................................................................................................. 50
Create Bar Graphs .......................................................................................................................................... 51
Case Study: Top Reasons for ER Utilization ................................................................................................. 53
<table>
<thead>
<tr>
<th>Chapter 8: Healthcare Claim Codes</th>
<th>103</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>103</td>
</tr>
<tr>
<td>International Classification of Diseases</td>
<td>104</td>
</tr>
<tr>
<td>Diagnosis Codes</td>
<td>105</td>
</tr>
<tr>
<td>ICD-9-CM</td>
<td>105</td>
</tr>
<tr>
<td>ICD-10-CM</td>
<td>107</td>
</tr>
<tr>
<td>Surgical Procedure Codes</td>
<td>109</td>
</tr>
<tr>
<td>ICD-9-PCS</td>
<td>109</td>
</tr>
<tr>
<td>ICD-10-PCS</td>
<td>110</td>
</tr>
<tr>
<td>Category I</td>
<td>113</td>
</tr>
<tr>
<td>Category II</td>
<td>113</td>
</tr>
<tr>
<td>Category III</td>
<td>114</td>
</tr>
<tr>
<td>HCPCS</td>
<td>114</td>
</tr>
<tr>
<td>Level I</td>
<td>115</td>
</tr>
<tr>
<td>Level II</td>
<td>115</td>
</tr>
<tr>
<td>Level III</td>
<td>115</td>
</tr>
<tr>
<td>Modifiers</td>
<td>115</td>
</tr>
<tr>
<td>HIPPS</td>
<td>116</td>
</tr>
<tr>
<td>Other PPS Code Sets</td>
<td>117</td>
</tr>
<tr>
<td>NDC</td>
<td>117</td>
</tr>
<tr>
<td>LOINC</td>
<td>118</td>
</tr>
<tr>
<td>Case Study: Identifying a Patient with Complex Conditions</td>
<td>118</td>
</tr>
<tr>
<td>Code Simplification with SAS Array Processing</td>
<td>119</td>
</tr>
<tr>
<td>Identifying Members with Complex Conditions</td>
<td>120</td>
</tr>
<tr>
<td>Parameterizing Program 8.3 with Macro Variables</td>
<td>122</td>
</tr>
<tr>
<td>Case Study: Using Formats to Create Data Hygiene Routines</td>
<td>123</td>
</tr>
<tr>
<td>Conclusion</td>
<td>126</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chapter 9: The Members</th>
<th>127</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction</td>
<td>127</td>
</tr>
<tr>
<td>Member Demographics</td>
<td>128</td>
</tr>
<tr>
<td>Member Enrollment</td>
<td>129</td>
</tr>
<tr>
<td>Member Eligibility</td>
<td>130</td>
</tr>
<tr>
<td>Membership Issues of Interest</td>
<td>130</td>
</tr>
<tr>
<td>Membership Maintenance</td>
<td>130</td>
</tr>
<tr>
<td>Electronic Eligibility Inquiry</td>
<td>130</td>
</tr>
<tr>
<td>Changing Member ID</td>
<td>131</td>
</tr>
<tr>
<td>&quot;Cross-Client&quot; Projects</td>
<td>131</td>
</tr>
<tr>
<td>Householding</td>
<td>131</td>
</tr>
</tbody>
</table>
Chapter 1: The U.S. Healthcare System

Introduction ................................................................................................................. 1

Data and Programming Used in This Book ................................................................. 2

Terminology ................................................................................................................ 2

Flow of Administrative Healthcare Data ...................................................................... 3

Key Players ................................................................................................................. 4

Medical Claim Submission ........................................................................................... 4

Claim Processing ........................................................................................................ 5

Recent Legislative Effects ........................................................................................... 6

   HIPAA ...................................................................................................................... 6
   Affordable Care Act ................................................................................................. 6
   All Payer Claims Database ..................................................................................... 6
   Continuing Enhancements ...................................................................................... 7

Conclusion .................................................................................................................. 7

Introduction

The U.S. healthcare system is massive, multifaceted, and complex. So is the data that it produces. Your annual visit to the doctor generates data. If you are insured, a form of this data makes its way to your health insurance company, which reimburses your doctor for your care. When you pick up a prescription at your local pharmacy, another type of healthcare data is created. If you give birth at a hospital, the hospital produces yet more data. The insurer houses even more data—providers, benefit structures, and membership all contribute data content to the success of the total business operation.

This book focuses on healthcare data as experienced by a health insurance company. The data is the product of financial reimbursement for health care services. Commonly referred to as administrative healthcare data, it is the result of the relationships among providers, recipients, and payers of health care services. From birth to death, you are generating administrate healthcare data through your interactions with the provider community and your insurer. If you have ever been to a doctor’s office, admitted to a hospital, or covered by an employer healthcare plan, then you already have a rudimentary understanding of the material addressed by this book. A comprehensive understanding of this data is a prerequisite for any analytics.

This book explains the source and content of administrative healthcare data and its related management. It illustrates concepts with actual healthcare case studies. Sample data is created in such a way that it closely simulates real healthcare data. All applications are created with SAS Enterprise Guide and Base SAS, which is further described in Chapter 2. They can be lifted straight from the book and put to use immediately.

This book is intended for the programmer/analyst charged with the analysis of administrative healthcare data. You will learn about how the data originates, what it contains, and best practices for programmatically managing this data. This book will give you the solid foundational knowledge to be a successful healthcare data analyst. This book is not intended to teach healthcare data analytics or analytical programming; that would be the next step in the readers’ learning path.
Data and Programming Used in This Book

This book uses a fictitious insurance company, Healthy Living, Inc., to illustrate concepts of administrative healthcare data. The company’s primary business is to pay medical claims to providers for services rendered to the company’s insured members. As a result, Healthy Living, Inc., is the custodian of several large sources of post-adjudication data originating from institutional, professional, and ancillary providers.

Through the use of SAS Enterprise Guide, this book shows you how to build a number of analytical applications of Healthy Living, Inc.’s rich administrative healthcare data. Some key applications include:

- C-section rates across various hospitals
- Top reasons for emergency room (ER) utilization
- Outreach reports identifying children who miss their checkups
- Identifying patients who do not adhere to their medication regimes
- Reporting on key financial metrics

This book is intended for the healthcare analyst regardless of his or her level of proficiency with SAS Enterprise Guide or SAS programming. As a result, SAS code shown throughout the book is deliberately kept at an accessible level. This approach allows the healthcare analyst who is new to SAS to understand the programming techniques shown in the book. The advanced SAS programmer analyst also benefits from the simplified coding approach as they may add complexities and efficiencies to suit their purpose.

Terminology

Language is so important. It is difficult to run a data analysis project if the team members are not speaking a common language, defining terms in the same way, or deriving information with agreed upon algorithms. Terminology and language are of the utmost importance in the discussion and analysis of administrative healthcare data.

Every project should start at the whiteboard and not on a keyboard. Begin by defining common goals, terminology, and methodology. If the goal is to arrive at utilization metrics for office visits per member per year, how are we to define an office visit, a member, a year? You would be surprised at the variety of possible results when everyone is not on the same page.

The importance of getting the terminology on a common plane cannot be underestimated. It is okay to define an office visit by Place of Service or by CPT® code (Common Procedural Terminology). But it is not okay to define it both ways in the same project. Spend the time to get it right among the project team.
Chapter 1: The U.S. Healthcare System

Table 1.1 defines some terms that will be used synonymously in this book to describe certain concepts.

<table>
<thead>
<tr>
<th>Concept</th>
<th>Synonymous term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beneficiary of medical services</td>
<td>patient, member, recipient</td>
</tr>
<tr>
<td>Supplier of medical services</td>
<td>provider, practitioner</td>
</tr>
<tr>
<td>Reimburser of service cost</td>
<td>payer, insurer, managed care organization (MCO), health insurance plan</td>
</tr>
<tr>
<td>Medical claim</td>
<td>encounter, claim</td>
</tr>
<tr>
<td>Visit</td>
<td>episode of care, encounter</td>
</tr>
</tbody>
</table>

What is the difference between “health care” and “healthcare”? In this book, we will use the two-word phrase to describe the actions of the provider—a well-child checkup is health care. The phrase is an adjective modifying the noun. The single word we will use to describe the system as a whole—healthcare data, healthcare policy. It is generally used as an adjective.

Flow of Administrative Healthcare Data

The U.S. healthcare system is rife with stakeholders and unique relationships among them. To understand the flow of administrative healthcare data you need to understand those relationships and the supply chain that results in the data available to healthcare analysts. If this sounds simple, apologies; it is not!

Think about the flow of data from a provider perspective. The provider interacts with a patient (the insured member), initiating the gathering of information that is needed for the accurate and timely reimbursement by the payer for the services rendered. In a fee-for-service (FFS) model, the provider submits a claim to the payer for reimbursement. In a capitation model, a “medical claim” is still submitted, but only for the purpose of data collection, not actual payment. The payer then adjudicates the claim based on additional information about the member and the provider, resultant data is moved to an operational data store, and the member is notified of any out-of-pocket expenses for which they are responsible. Figure 1.1 graphically describes these important relationships. Reimbursement models will be discussed in Chapter 3.
Key Players

One way to conceptualize the data origin is from a provider orientation. They initiate the data flow and, depending upon the provider type, use different claim submission mechanisms and provide different data elements. As Figure 1.2 illustrates, there are only four provider types—Professionals, Facilities, Pharmacies, and Ancillaries. These will be discussed in detail in Chapter 4.

There are three types of payers—Commercial, Medicare, and Medicaid. More on these in Chapter 3.

Policy makers, legislators, and regulators have a significant impact on the behavior of the above mentioned key players. Their role, while very important, will not be discussed in this book.

Medical Claim Submission

The mechanism by which providers submit reimbursement information to payers has changed dramatically in the past few decades. Initially it was a paper-based system, with those forms and formats improving over time. Many commercial payers with tech-savvy decision makers then worked with their provider community to implement electronic data interchange (EDI) formats for the transmittal of medical claim information. These local initiatives to move away from paper-based instruments provided very efficient processes. With the
implementation of the Health Insurance Portability and Accountability Act of 1996 (HIPAA), yet greater strides were made in the efficient and effective submission of claims information. HIPAA mandated the use of clearly defined electronic formats under “Title II: Administrative Simplification,” reducing over 400 EDI formats to a standard set of less than a dozen that are used by all providers and payers.

The form and format of the data transmittal differ slightly depending upon provider type. Professional and Ancillary providers use the CMS-1500 paper form or its electronic counterpart, the 837P format. Facilities use the CMS-1450 paper form or its electronic counterpart, the 837I format. Pharmacists, who have been electronic seemingly forever, use the National Council for Prescription Drug Programs (NCPDP) electronic format.

Despite the HIPAA mandate driven by compliance dates, paper forms are still being used in a limited way. We need not discuss the reasons for this here, but suffice it to say that you may see reference to paper forms for the foreseeable future.

---

**Claim Processing**

In Figure 1.1, consider the processes by which the payer receives, processes, and provisions administrative healthcare data. The figure suggests a complex relationship of data elements, both at the source and at the target. There are quite a few moving parts and pieces to consider. For analysts, the data source is typically the Enterprise Data Warehouse (EDW) and/or its many progeny, but for the payer enterprise it is a variety of claims and provider, member, and organizational policy information. Operational data sources reside (and are managed) in the EDW—membership, provider, and plan benefit data are all maintained as current by various departments within the health plan. It is this operational data that is necessary to accurately process inbound claims so that resultant adjudicated claim information is accurately stored in the EDW. The thoughtful analyst will understand how the data moves within the payer organization.

Adjudication, by definition, is “the act of pronouncing judgment based on the evidence presented.” Medical claims adjudication is the process by which claims for reimbursement, as submitted by the provider (or patient), are processed into a payment transaction. The “evidence presented” comes in the form of membership, enrollment, and eligibility information; provider enrollment and contractual information; and the submitted claim describing the services rendered. The “judgment pronounced” is the payment made to the provider on behalf of the insured member. The complexities of an adjudication system are not within the scope of this book, but grasping the concept, with its input and outputs, is a key building block in our foundational knowledge.

Also not within the scope of this book is the notion that there is a strong relationship between a benefits structure, service costs, and insurance premiums. At the risk of defending insurance companies, it is fair to say that, in a simple fee-for-service model, insurance companies are a pass-thru facilitator for reimbursement, from member funds, of incurred provider service cost. Having said that, the insurer does have to make a profit on its business investment and, at the same time, be a contending player in the marketplace. A managed care, performance-based, or negotiated fee-for-service model allows for increased efficiencies, which leads to profitability and product sales. Health plans utilize many programs (e.g., disease management programs, provider profiling) to improve the efficiency of the delivery system. Measuring these precise dynamics is what health plan analysts do. Understanding this building block will direct you into the important world of healthcare policy, legislation, actuarial modeling, and sales/marketing.
Recent Legislative Effects

Much attention has been paid to the healthcare industry at the local, state, and federal levels. Several recent legislative efforts bear mentioning, although they will not be discussed further.

**HIPAA**

The implementation of HIPAA was the “Y2K” problem of the healthcare industry—a major transitional effort that was very resource intensive but necessary and productive for the industry.

From a data perspective, Title II: Administrative Simplification is the most interesting. This component of HIPAA requires the Department of Health and Human Services (HHS) to adopt national standards for electronic healthcare transactions and national identifiers for providers, health plans, employers, and individuals. To date, several of the most important gains from a data perspective are:

- 837 electronic claim format for Institutional, Professional, and Dental providers
- Unique national identifiers
  - National Provider Identifier (NPI)
  - Employer Identification Number (EIN)
- Codification of standard code sets such as diagnostic and procedure codes

We will learn more about these concepts in subsequent chapters.

**Affordable Care Act**

The passage of the Patient Protection and Affordable Care Act of 2010 (PPACA or commonly ACA) is a monumental change for the industry that is yet to be understood in its totality. While it is primarily “insurance reform,” the effect on our data streams is not to be underestimated. At the time of writing this book not all provisions of the legislation have become effective. Political battles over its rollout are continuing while HHS continues to educate the public.

Provisions under the Affordable Care Act will further improve the issues around data that HIPAA initiated. These include requirements to adopt:

- operating rules for each transaction type
- a unique National Health Plan Identifier (HPID) and National Individual Identifier (NII)
- standard and operating rules for
  - electronic funds transfer (EFT)
  - electronic remittance advice (RA)
  - claims attachments

In addition, insurers will be required to certify their compliance with all rules and regulations. Substantial penalties for failures to certify or comply with the new standards and operating rules are provided for.

One concern to watch for as “improved” data streams and reimbursement models are defined is the possible loss of data granularity.

**All Payer Claims Database**

At the state level there has been much legislation surrounding the need for consolidated sources of claims information. At least twelve states have recently enacted legislation and/or started to collect healthcare claims data from commercial and public payers in an effort to establish an all-payer claims database (APCD).

While the contents of individual states’ APCDs vary, they usually include data elements from member files, provider files, and claims files. The medical claims files include healthcare-related data elements such as diagnosis codes, procedure codes, pharmacy codes, insurance product type, facility type, cost amounts, and
provider information. In essence, the effort is to build a statewide or regional database that would mimic the structure and combine the information that MCOs have in-house.

Policy makers and legislators have been looking for a data source to begin to understand patterns and trends of healthcare utilization and costs. This should prove to be an excellent resource in the coming years. Keep an eye out for how you can play in this space.

**Continuing Enhancements**

While not directly related to legislative actions, it is important to note that the industry is frequently undergoing change as dictated, among other reasons, by changing business models and technology. Several examples will be discussed in later chapters—code sets are revised (e.g., moving from ICD-9 to ICD-10) and electronic transmission formats redefined (e.g., the 5010 version of the 837 electronic claim submission). It is mandatory that the analyst keep abreast of these changes and adjust business practices and programming as necessary.

**Conclusion**

Knowing the origin of every data element in any healthcare analytic project is of paramount importance. One cannot be the best analyst possible without an intimate knowledge of the data—from source to repository. From initiation, transformation, and relationship development to information and action, it is incumbent upon every analyst to understand the original source and content of administrative healthcare data.

Index

A
access to care, defined 195
Accountable Care Organization (ACO) 177
Additional Documentation segment, on pharmacy claims 86t
addresses, on claims 32t
administrative healthcare data, flow of 3–4
Administrative Simplification Compliance Act (ASCA) (2001) 60
admission codes 45, 45t
admission dates 42–43
admission diagnosis code, on claims 44t
admission source, on claims 46t
admission type, on claims 46t
age
   in HEDIS 156
   rating 133t
Age-as-of-Calculation utility macro 181–182
_ALL_keyword 186
ALL= option 151
All Payer Claims Database (APCD) 6–7, 179–180
allowable gap, in HEDIS 156
ambulances, Place of Service codes for 208–209t
Ambulatory Payment Classifications (APCs) 25, 33, 104t, 117t, 187
ambulatory surgical centers, Place of Service codes for 208t
American Hospital Formulary Service (AHFS) 88–89, 90
American Medical Association (AMA) 61, 112
American National Standards Institute (ANSI) 60
anchor date, in HEDIS 156
ancillary claims
   about 10t, 59
   case studies 63–72, 73–80
   data elements unique to CMS-1500/837P 60–62
   payment methodologies 62–63
   provider specialty 62
   submitting medical claims 60
ancillary providers/services 4, 31, 195
ANYALPHA function 170
ARRAY DX 125
ARRAY statement 119, 120, 121, 140, 170, 190
ASC X12 60
Assign Project Library task 12
assisted living facilities, Place of Service codes for 207t
automating
   code 76–80
   PDC graphs generation 98–101
   reports with macro variables 73–80
AXIS statement 99

B
bar graphs, creating 51–53
BEG macro variable 140
beneficiary of medical services, synonyms for 3t
benefit, in HEDIS 157
bill sequence 206t
Billing Unit Standard 84t
birthing centers, Place of Service codes for 208t
BOOK keyword 12
Boolean logic 38
Booz Allen Hamilton 88
business case 154
BY statement 92, 95, 121
BYTE function 192, 193

C
CALCULATED keyword 65, 76, 173
callable macro programs, creating 135–136
capitation 23, 24, 195
CARDS technique 125
case management, defined 195
Case Mix Groups (CMGs) 25, 117
case studies
   ancillary claims 63–72, 73–80
   financial metrics 143–148, 148–149, 149–151
   healthcare claim codes 118–122, 123–126
Healthcare Effectiveness Data and Information
Set (HEDIS) 158–170
members 134–141
pharmacy claims 90–101
professional claims 63–72, 73–80
case-mix adjustment, defined 195
CATS function 36
CATX function 35, 121, 125
Centers for Medicare & Medicaid Services (CMS)
See also specific claim forms
defined 195
Healthcare Common Procedure Coding System
(HCPCS) 43, 61, 83, 104t, 114–115
ICD9 code sets 123
Medicare administered by 24
National Plan and Provider Enumeration System
(NPPES) 32
website 105, 107, 179
CHAMPVA 26
character variables 13–14
children, identifying missed checkups by 63–72
Civilian Health and Medical Program of the
Uniformed Services (CHAMPUS) 26
claim form, defined 195
See also specific forms
Claim segment, on pharmacy claims 85t
ClaimID 10
ClaimLine 10
claims
See also ancillary claims
See also facility claims
See also pharmacy claims
data types 10t
defined 195
processing 5
submitting 4–5, 60
elements unique to 60–62
Place of Service codes for 207–210t
for professional providers 30
sample 202f
COALESCE function 35, 146
COB/Other Payments segment, on pharmacy claims
85t
code
automating 76–80
simplifying with SAS Array processing 119–120
coinsurance, defined 196
colon modifier 38
colorectal cancer screening 156–170
commercial insurance
about 26
defined 196
as provider ID 33t
Common Procedural Terminology (CPT) 61
community mental health centers, Place of Service
codes for 209t
community rating 133t
complexity, HEDIS and 154
compliant population 157–158
Compound segment, on pharmacy claims 85t
comprehensive inpatient rehabilitation facilities,
Place of Service codes for 210t
COMPRESS function 19, 124, 171
conceptual data model 11f
Condition Code 46t
continuous enrollment
about 132
in HEDIS 156
conversion factor (CF) 63
copayment, defined 196
correctional facilities, Place of Service codes for
207t
Coupon segment, on pharmacy claims 85t
CREATE statement 76, 187
CREATE TABLE statement 190
"cross-client" projects 131
C-section rates, calculating among hospitals 47
Current Dental Terminology (CDT), defined 196
about 112–114
code set 104t
defined 196
custodial care facilities, Place of Service codes for
208t
D
data
expanding using SAS data step 91–92
used in this book 2
Data Dictionary 84t
Index 227

data elements
  unique to CMS-1500/837P 60–62
  unique to facilities 40–46
  unique to pharmacies 86–90
data hygiene routines, creating with formats 123–126
data sets 12–14
DATA step 74, 165, 191, 192, 193
DATALINES4 statement 74
DATASETS procedure 138
dates, on claim forms 32t
DEA, as provider ID 33t
deductible, defined 196
Defense Health Agency (DHA) 26
demographics
  on claim forms 60–61
  of members 128–129
detail files, distinguishing between header files and 10
diagnosis codes
  about 44–45
  on claim forms 61
  format of 16–19
  in healthcare claims 105–109
diagnosis pointer
  on claim forms 61
  linking to 190–193
Diagnosis Related Group (DRG)
  about 15–16
  code 117t
  code set 104t
  defined 196
  formats 14
  Medicare and 25, 33, 45–46
Diagnostic and Statistical Manual of Mental Disorders (DSM-5) 107
discharge dates, on claim forms 42–43
DischgDtChar character variable 20
disease management, defined 196
Disposable Medical Supplies (DMS) 31, 196
DO loop 91, 93, 120, 121, 138, 164, 170, 186, 187, 192
documentation, creating in SAS Enterprise Guide 56–57
$ sign 20
DRG
  See Diagnosis Related Group (DRG)
driver table 155
Drug Listing Act (1972) 86–87
Drug Utilization Review (DUR), defined 196
"dual eligibles" 26
Durable Medical Equipment (DME) 31, 196
DUR/PPS segment, on pharmacy claims 85t

E
Early and Periodic Screening, Diagnosis, and Treatment (EPSDT), defined 196
E-codes 106
837I electronic claim format
  about 5, 40
  for facilities 30
  patient status codes for 210–211t
  revenue codes for 211–223t
837P electronic claim format
  about 5, 60
  for ancillary providers 31
  data elements unique to 60–62
  Place of Service codes for 207–210t
  for professional providers 30
EIN, as provider ID 33t
Electronic Data Interchange (EDI), defined 196
electronic eligibility inquiry 130–131
electronic format 84–86
Electronic Health Record (EHR) 178
Electronic Medical Record (EMR) 178
eligibility
  exclusions to 157
  of members 130
eligible population, in HEDIS 155t, 156–157
emergency rooms, Place of Service codes for 208t
encounters 197
  See also claims
  See also visit
END macro variable 140
END= option 124
EndDOS variable 76–80
end-stage renal disease treatment facilities, Place of Service codes for 210t
Enhanced Therapeutic Classification System (ETC) 88
enrollment, of members 129–130
Enterprise Data Warehouse (EDW) 5
Entity Type Code 32t
episode, defined 197
episode of care
  See visit
ER utilization, reasons for 53–55
%EVAL function 164
Evaluation and Management (E/M), defined 197
event/diagnosis, in HEDIS 157
"evidence presented" 5
experience rating 133t
extended coding
  about 181
  arrays of detail record elements on header record 187–190
  linking to diagnosis pointer 190–193
utility macros 181–187
External Cause of Injury (ECI)  44t, 106
External Code List  84t

F

facilities
  data elements unique to  40–46
  as providers  4, 30
  types of  205t
facility claims
  837I electronic claim format  40
  about  10t, 30, 30t, 39
  CMS-1450 paper claim form  40
  data elements unique to facilities  40–46
Facility segment, on pharmacy claims  86t
FECA Black Lung  26–27
Federal Employees' Compensation Act (FECA)
  (1958)  27
federal poverty level (FPL)  25
federally qualified health centers, Place of Service
  codes for  209t
Facility segment, on pharmacy claims  86t
Fee-for-Service (FFS)
  about  24
  defined  197
  model  3–4, 4f
financial metrics
  about  143
  case studies  143–148, 148–149, 149–151
First DataBank  87, 88
FLOOR function  168, 182
FMTSEARCH option  16
FOBT procedure  173
Food and Drug Administration (FDA)  86
FOOTNOTE statement  99
format catalogs  20
FORMAT= option  151
FORMAT procedure  124, 125, 186
FORMAT statement  74, 93, 186
formats
  about  14
  applying to SAS variables  19–21
  diagnosis code  16–19
  Diagnosis Related group (DRG)  15–16
  using to create data hygiene routines  123–126
formatting existing variables  19–20
formulary, defined  197
FRAME  99
FREQ procedure  186
FROM statement  76, 173
functions
  See specific functions
future healthcare data issues
  about  175
  Accountable Care Organization (ACO)  177
  All Payer Claims Database (APCD)  179–180
  evolving patient medical records  178–179
  global billing  179
  ICD-10  176
  impact of Affordable Care Act  175
  Patient Centered Medical Home (PCMH)  176–
  177
  Pharmacy Benefits Manager (PBM)  177–178
  transparency in pricing  176

G
gender rating  133t
Generic Product Identifier (GPI)  88
Generic Sequence Number (GSN)  88
geographic rating  133t
geographical adjustment (Geographic Practice Cost
  Index [GPCI])  63
global billing  179
GLOBAL statement  186
government health IT  179
GPLOT procedure  99
graphing PDC  96–98
GROUP BY statement  76
group homes, Place of Service codes for  207t
  grouper, defined  197

H

HCFA Common Procedure Coding System, defined
  197
header files, distinguishing between detail files and
  10
Health and Human Services (HHS)  24, 112
"health care," compared with "healthcare"  3
Health Care Financing Administration (HCFA),
  defined  197
Health Home concept  177
Health Insurance Portability and Accountability Act
  (HIPAA) (1996)  4–5, 6, 32, 84, 128, 197
Health Insurance Prospective Payment System
  (HIPPS)  43, 104t, 116–117
Health Maintenance Organization (HMO)  23–24,
  197
health status rating  133t
"healthcare," compared with "health care"  3
healthcare claim codes
  about  103–104
  case studies  118–122, 123–126
  114
diagnosis codes  105–109
Health Insurance Prospective Payment System
  (HIPPS)  116–117
Healthcare Common Procedure Coding System
  (HCPCS)  114–115
International Classification of Diseases  104–105
Logical Observation Identifiers Names and Codes (LOINC)  118
modifiers  115–116
National Drug Code (NDC)  117
surgical procedure codes  109–112
Healthcare Common Procedure Coding System (HCPCS)  43, 61, 83, 104t, 114–115
Healthcare Effectiveness Data and Information Set (HEDIS)
about  64, 153–154
business case  154
case studies  158–170
colorectal cancer screening  156–158
defined  197
reporting system components  155–156
technical challenges  154–155
Healthcare Provider Taxonomy Code (HPTC)  32–33
HEDIS
See Healthcare Effectiveness Data and Information Set (HEDIS)
Hierarchical Condition Category (HCC)  134
Hierarchical Ingredient Code (HIC)  88
HIPAA
See Health Insurance Portability and Accountability Act (HIPAA) (1996)
Home Health Agency (HHA)  30
homeless shelters, Place of Service codes for  207t
homes, Place of Service codes for  207t
hospice, Place of Service codes for  208t
Hospital Acquired Conditions (HAC) cases  45
householding  131
hybrid specification  158

ICD-9-CM  105–107, 197
ICD-9-PCS  109–110
ICD-10  176
ICD-10-CM  107–109, 197
ICD-10-PCS  110–112
identification numbers, in National Provider Registry  32t
IF...THEN statement  95, 145
Import Data task  12, 74
IN operator  37, 38, 119
IN= option  145, 165
%INCLUDE statement  136
independent clinics, Place of Service codes for  209t
independent laboratories, Place of Service codes for  210t
Indian Health Service, Place of Service codes for  207t
Individually Identifiable Health Information (IIHI),
defined  198
industry algorithms  55
industry rating  133t
INFILE statement  74
INFORMAT statement  74
Inpatient Costs per Member per Month  134
inpatient hospitals, Place of Service codes for  208t
Inpatient Prospective Payment System (IPPS)  25,
46, 187
inpatient psychiatric facilities, Place of Service codes for  209t
INPUT statement  74
Insurance segment, on pharmacy claims  85t
insurer
See reimbursers of service cost
INTCK function  138, 168, 182
Intermediate Care Facility (ICF)  30, 209t
International Classification of Diseases (ICD)  104–
105, 104t
International Classification of Diseases, Clinical
Modification (ICD-9-CM)  105
International Classification of Diseases, Nth
Revision, Clinical Modification (ICD CM) codes  44
International Classification of Diseases, Nth
Revision, Procedure Coding System
(ICD PCS) codes  45
INTNX function  77, 93, 138
J
"judgment pronounced"  5
K
Kaiser Family Foundation  25
KEEP= data set option  140
key players  4
keywords
See specific keywords

L
labeler code, on pharmacy claims  87
LAG function  164
Laser Universal Claim Form (PUCF-D01PT)  84
LEAVE statement  125, 170, 190
legislation  6–7
LENGTH statement  74, 121
%LET statement  76–77
LIBNAME statement  12
libraries, creating permanent  12
LIBRARY library  16
Logical Observation Identifiers Names and Codes
(LOINC)  104t, 118, 198

M
%MACRO statement  136
macro variables, automating reports with  73–80
maintenance, of members  130
Major Diagnostic Categories (MDC), defined  198
Managed Behavioral Healthcare Organization (MBHO), defined 198
Managed Care Organization (MCO) 24, 198
See also reimbursers of service cost
Manual Claim Forms Reference Implementation Guide 84t
mass immunization centers, Place of Service codes for 209t
MAX function 76
meaningful use 179
Medicaid
about 25–26
defined 198
as provider ID 33t
medical claims
See claims
medical event, in HEDIS 155t
Medicare
about 24–25, 24–25t
defined 198
as provider ID 33t
Medicare Part A, defined 198
Medicare Part B, defined 198
Medicare Part C, defined 198
Medicare Part D, defined 84, 198
Medicare Physician Fee Schedule (MPFS) 63
medication, computing adherence to 90–101
Medigap Supplemental Insurance 25
Medi-Span 87, 88
member
See beneficiary of medical services
member ID, changing 131
"member identifier" 128
"member months” 131–132, 134–141
members
about 127–128
case studies 134–141
demographics of 128–129
eligibility of 130
enrollment of 129–130
issues of interest to 130–132
maintenance of 130
rate setting for 132–134
risk adjustment 132–134
%MEND statement 136
MERGE statement 95, 190
military treatment facilities, Place of Service codes for 208t
MLOGIC option 137
mobile units, Place of Service codes for 208t
modifiers 115–116
MPRINT option 137, 186–187, 189
N
names, in National Provider Registry 32t
Narrative segment, on pharmacy claims 86t
National Association of Boards of Pharmacy (NABP) 86
National Center for Health Statistics 107
National Committee for Quality Assurance (NCQA) 153, 156
National Correct Coding Initiative (NCCI) 116
National Council for Prescription Drug Programs (NCPDP) 5, 31, 84–86
National Drug Code (NDC)
about 83, 117
code set 104t
defined 198
Directory 87
in pharmacy claims 86–87
National Individual Identifier (NII) 128
National Plan and Provider Enumeration System (NPPES) 32
National Provider Identifier (NPI) 32, 32t
National Provider Registry 32–34
standardizing provider names from 34–36
National Uniform Billing Committee (NUBC) 40, 42, 43, 201f
National Uniform Claim Committee (NUCC) 60, 202
NCCI/MUE (National Correct Coding Initiative/Medically Unlikely Edit) 187
NCPDP Telecommunication vD.0 Continuous Feed (PUCF-D02PT) 84
LEVEL option 186
NODUPKEY option 92
non-residential substance abuse treatment centers, Place of Service codes for 209t
numeric variables 13–14
nursing facilities, Place of Service codes for 208t
O
Occurrence Code 46t
Occurrence Span Code 46t
ODS statement 100, 186
Office of Workers' Compensation Programs (OWCP) 26–27
offices, Place of Service codes for 207t
OPEN function 186
optional exclusions, in HEDIS 155t
options
See specific options
Other diagnosis code 44t
other fields of interest, in pharmacy claims 89–90
OTHERWISE statement 145
OUT= option 92
outcomes measures, defined 198
outpatient care, defined 198
outpatient hospitals, Place of Service codes for 208t
outpatient prospective payment system (OPPS) 25
Index 231

OUTPUT statement 91, 93

P

package code, on pharmacy claims 87
PAI code 117t
paper claims, forms for 84
   See also specific forms
parenthesis 37
Patient Centered Medical Home (PCMH) 176–177
patient discharge status 43
Patient Protection and Affordable Care Act (2010) 6, 26, 130, 175
Patient Reason diagnosis code 44t
Patient segment, on pharmacy claims 85t
patient status code 210–211t
patients
   See also beneficiary of medical services
   evolving medical records of 178–179
   identifying with complex conditions 118–122
"payer sheet" 84
payers
   See also reimbursers of service cost
about 23
CHAMPVVA 26
commercial insurance 26
FECA Black Lung 26–27
health insurance 23–24
Medicaid 25–26
Medicare 24–25
TRICARE 26
payment methodologies 62–63
PDC
   automating generation of graphs 98–101
   computing 90–91
   graphing 96–98
Personal Health Record (PHR) 178–179
pharmacies
   Place of Service codes for 207t
   as providers 4, 31
Pharmacy Benefits Manager (PBM) 31, 177–178
pharmacy claims
   about 10t, 83
   case studies 90–101
   data elements unique to pharmacy data 86–90
   data expansion using SAS data step 91–92
   NCPDP claim formats 84–86
   transaction segments on 85–86t
Pharmacy Provider segment, on pharmacy claims 85t
Pharmacy Quality Alliance (PQA) 90
physician profiling, defined 199
Place of Service (POS) 31, 62, 199, 207–210t
PMPM costs, calculating 148–149
Point of Service (POS) 24, 31, 199
practitioner
   See supplier of medical services
Preferred Provider Organization (PPO) 24, 199
Prescriber segment, on pharmacy claims 85t
prescription drugs, universal claim form for 203–204f
present on admission, code values for 45
pricing, transparency in 176
Pricing segment, on pharmacy claims 85t
primary care medical home 176–177
Primary Care Physician (PCP)
   about 23
   defined 199
   identifying with Taxonomy Codes 36–38
Principal diagnosis code 44t
principle diagnosis code (PDx) 14
Prior Authorization segment, on pharmacy claims 85t
prisons, Place of Service codes for 207t
PROC step 74
procedure codes, on claim forms 61–62
procedure modifiers 61–62, 104t
process flow 12
processing claims 5
product code, on pharmacy claims 87
Product Line
   defined 199
   in HEDIS 155t, 156
professional claims
   about 10t, 59
   case studies 63–72, 73–80
   data elements unique to CMS-1500/837P 60–62
   payment methodologies 62–63
   provider specialty 62
   submitting medical claims 60
professional providers 4, 30–31
programming, used in this book 2
PROPCASE function 35
Prospective Payment System (PPS), defined 199
Protected Health Information (PHI), defined 199
provider identifiers
   on claim forms 61
   in pharmacy claims 61, 86
Provider IDs 46
provider names, standardizing from National
   Provider Registry 34–36
provider specialty 62
ProviderID 11, 46
providers
   See also supplier of medical services
about 29
ancillary 4, 31, 195
automating reports with SAS Enterprise Builder 56
creating documentation in SAS Enterprise Guide 56–57
facilities 4, 30
National Provider Registry 32–34
pharmacies 4, 31
professional 4, 30–31
types of 4, 4f, 29–31, 30f
psychiatric facilities, Place of Service codes for 209t
psychiatric residential treatment centers, Place of Service codes for 209t
public health clinics, Place of Service codes for 210t
PUT function 20, 146

Q
Quality Management (QM), defined 199
Query Builder 34

R
RANK function 193
rate setting, for members 132–134
rating, defined 199
recipient
See beneficiary of medical services
Red Book 87
Regenstrief Institute 118
reimburer of service cost, synonyms for 3t
Relative Value Unit (RVU) 25, 63
rendered services, in HEDIS 155t
REPORT procedure 149–150
reports
automating with macro variables 73–80
automating with SAS Enterprise Builder 56
residential substance abuse treatment facilities, Place of Service codes for 209t
Resource Utilization Groups (RUGs) 25, 33, 117t
resource-based relative value scale (RBRVS) 25
RETAIN statement 121, 140, 190
revenue code 30t, 43–44, 199, 211–223t
risk adjustment
defined 199
for members 132–134
risk stratification, defined 199–200
ROUND function 64
rural health clinics, Place of Service codes for 210t

S
sample data 9–11
SAS Array Processing, code simplification with 119–120
SAS data sets, viewing 13
SAS data step, data expansion using 91–92
SAS Enterprise Builder, automating reports with 56
SAS Enterprise Guide
about 11–12
creating documentation in 56–57
SAS libraries 12–14
SASAUTOS environmental variable 137
schools, Place of Service codes for 207t
SELECT statement 76, 145, 173, 187, 189–190
SET statement 91
Skilled Nursing Facilities (SNF) 25, 30, 43, 208t
SORT procedure 92, 99, 121, 140, 144
SQL procedure 75, 76, 91, 95, 100, 119, 171, 187
SQL statement 186
SSN, as provider ID 33t
StartDOS variable 77–80
statements
See specific statements
subject matter experts (SMEs) 187
summary data
creating 47–50
joining sets 50–51
summary functions 48
Summary Tables task 12
supplier of medical services, synonyms for 3t
surgical procedure codes 45, 109–112
SYMBOL statement 99
SYMBOLGEN system option 136
%SYSFUNC function 186

T
TABLE statement 150, 186
TABULATE procedure 149–151
Taxonomy Codes 32–33, 32t, 36–38
Telecommunication Standard Implementation Guide 84t
temporary lodging, Place of Service codes for 208t
terminology 2–3, 3t
therapeutic class codes, on pharmacy claims 88–89
third-party administrator (TPA) 31
TIN, as provider ID 33t
TITLE statement 99
Trailer segment, on pharmacy claims 86t
Transaction Header segment, on pharmacy claims 85t
TRANSLATE function 187
Tribal 638 facilities, Place of Service codes for 207t
TRICARE 26
Type of Bill (TOB)
about 40–42
defined 200
on facility claims 30t
Type of Service (TOS), defined 200

U
unbundling, defined 200
underwriting, defined 200
UNION operator 171
upcoding, defined 200
UPIN, as provider ID 33t
urgent care facilities, Place of Service codes for 208t
U.S. healthcare system 1
utility macros
   about 181
   Age-as-of-Calculation 181–182
   identifying sparse variables 182–187
Utilization Management (UM), defined 200
Utilization Review (UR), defined 200

V
Value Codes 46t
Value Set Data (VSD), in HEDIS 156t
variability, HEDIS and 154
variables
   See also specific variables
   applying formats to SAS 19–21
   formatting existing 19–20
   identifying sparse 182–187
   placing results of formats into new 20
variety, HEDIS and 154
VARNUM function 186
V-codes 106
velocity, HEDIS and 154
Version 10 (ICD-10) 105
visit, synonyms for 3t
volume, HEDIS and 154

W
walk-in retail health clinics, Place of Service codes for 208t
Washington Publishing Company 40
websites
   All Payer Claims Database (APCD) 180
   American Hospital Formulary Service (AHFs) 88
   American Medical Association (AMA) 112
   Booz Allen Hamilton 88
   Centers for Medicare & Medicaid Services
      (CMS) 24, 105, 107, 123, 179
   Department of Health and Human Services 24
   First DataBank 87
   government health IT 179
   Healthcare Provider Taxonomy Code (HPTC) 32
   industry algorithms 55
   Kaiser Family Foundation 25
   Medicare Physician Fee Schedule (MPFS) 63
   Medi-Span 87
   National Association of Boards of Pharmacy
      (NABP) 86
   National Center for Health Statistics 107
   National Committee for Quality Assurance
      (NCQA) 156
   National Correct Coding Initiative (NCCI) 116
   National Council for Prescription Drug Programs
      (NCPDP) 31, 84
   National Drug Code Directory 87
   National Uniform Billing Committee (NUBC) 40, 42, 43, 201
   National Uniform Claim Committee (NUCC) 60, 202
   Pharmacy Quality Alliance (PQA) 90
   place of service 62
   POS codes 31
   provider specialty 62
   Red Book 87
   Regenstrief Institute 118
   resources 200
   Washington Publishing Company 40
   World Health Organization (WHO) 104

WHEN statement 145
WHERE data set option 99, 140, 187
WHERE statement 76, 89, 100, 168
WORK library 16
Workers’ Compensation segment, on pharmacy
   claims 85t
World Health Organization (WHO) 104–105
About These Authors

Craig Dickstein, an independent Consultant, works with clients and select project teams to implement customized business technology solutions for the healthcare industry. A SAS user since 1978, he has significant experience developing and managing SAS applications and teaching SAS programming for healthcare analysts. With a Master's degree in statistics, Craig served as Director of Statistical Services with Blue Cross Blue Shield of New Hampshire. He has a long history of SAS user group involvement and has been a frequent invited speaker. Craig is a co-author of *Administrative Healthcare Data: A Guide to Its Origin, Content, and Application Using SAS* for SAS Press and a Business Knowledge Series course author/instructor on the same subject for SAS Education.

Renu Gehring is a SAS instructor and consultant. She is also an analyst at the health insurance company CareOregon, Inc. A SAS user since 1993, she holds the following certifications for SAS 9: SAS Certified Base Programmer, SAS Certified Advanced Programmer, SAS BI Content Developer, and SAS Certified Platform Administrator. Renu is passionate about using and teaching SAS technologies to transform business processes. Her expertise is in combining the power of SAS programming, statistical and predictive analytics, and business intelligence to build effective and actionable applications. Renu is the author of *SAS Business Intelligence for the Health Care Industry* for SAS Press. She has an undergraduate degree in History and Economics from Mount Holyoke College and a graduate degree in Economics from Brown University.

Learn more about these authors by visiting their author pages, where you can download free book excerpts, access example code and data, read the latest reviews, get updates, and more:

- [http://support.sas.com/publishing/authors/dickstein.html](http://support.sas.com/publishing/authors/dickstein.html)
- [http://support.sas.com/publishing/authors/gehring.html](http://support.sas.com/publishing/authors/gehring.html)
Gain Greater Insight into Your SAS® Software with SAS Books.

Discover all that you need on your journey to knowledge and empowerment.

support.sas.com/bookstore
for additional books and resources.