

---

---

# Design of a Prospective Payment Patient Classification System for Ambulatory Care

Richard F. Averill, M.S., Norbert I. Goldfield, M.D., Mark E. Wynn, Ph.D., Thomas E. McGuire, Ph.D., Robert L. Mullin, M.D., Laurence W. Gregg, B.S., and Judith A. Bender, Ph.D.

---

---

*The Ambulatory Patient Groups (APGs) are a patient classification system that was developed to be used as the basis of a prospective payment system (PPS) for the facility cost of outpatient care. This article will review the key characteristics of a patient classification system for ambulatory care, describe the APG development process, and describe a payment model based on the APGs. We present the results of simulating the use of APGs in a prospective payment system, and conclude with a discussion of the implementation issues associated with an outpatient PPS.*

## INTRODUCTION

In the early 1980s, the Federal Government enacted into law several major initiatives to control the rapidly rising cost of health services. The implementation of the Medicare inpatient PPS utilizing diagnosis-related groups (DRGs) represents one of these major efforts. Numerous researchers have documented that

the Medicare inpatient PPS has reduced Medicare hospital inpatient expenditures while having no measurable impact on the quality of care delivered (Russell, 1989; Coulam and Gaumer, 1991; Kahn et al., 1990). Although inpatient length of stay has declined, outpatient utilization has grown rapidly because of technological advances that make outpatient care possible for many of those who were previously seen solely as inpatients and because of the preferences of both patients and physicians for the convenience of ambulatory care. As a consequence, total payments for hospital-based outpatient care have rapidly risen. In 1980, Medicare disbursements to hospital outpatient departments were 1.8 billion dollars and represented 5.3 percent of Medicare expenditures (Health Care Financing Administration, 1990a). From 1986 to 1989, Medicare disbursements to hospital outpatient departments increased annually by an average of 17 percent. As a result, in 1989, Medicare disbursements to hospital outpatient departments had increased to 7.3 billion dollars and comprised 7.6 percent of all Medicare disbursements (Health Care Financing Administration, 1990b). In addition to this growth in hospital outpatient department utilization, there has also been dramatic growth in the use of freestanding ambulatory surgery and radiology facilities throughout the United States (Helbing, Latta, and Keene, 1987; Latta, 1987; Prospective Payment Assessment Commission, 1989).

---

This work was supported by the Health Care Financing Administration under Cooperative Agreement Number 17-C-99369/1-02 with 3M Health Information Systems. Richard F. Averill, Norbert I. Goldfield, and Laurence W. Gregg are with 3M Health Information Systems. Mark E. Wynn is with the Office of Research and Demonstrations, Health Care Financing Administration. Thomas E. McGuire is with Analytic Solutions, Inc. Robert L. Mullin is with the Hospital of St. Raphael, Judith A. Bender is with the Department of Operations Research, Yale University. The opinions expressed are those of the authors and do not necessarily reflect the views or policy positions of the Health Care Financing Administration, 3M Health Information Systems, Analytic Solutions, Inc., Hospital of St. Raphael, Yale University, or their sponsors.

With this in mind, Congress, in the Omnibus Budget Reconciliation Act (OBRA) of 1986 (Public Law 99-509), directed the U.S. Department of Health and Human Services to develop a PPS for the facility cost of hospital-based outpatient care. OBRA 1986 called for the design and modeling of a PPS for all hospital outpatient services (e.g., same-day surgery units, emergency rooms, outpatient clinics, etc.). The facility cost refers to the hospital cost for providing care (e.g., room charges, medical and surgical supplies, etc.), and excludes the physician's professional service.

### **PATIENT CLASSIFICATION SYSTEM CHARACTERISTICS**

Fundamental to the design of any PPS for ambulatory care is the selection of the basic unit of payment. The Medicare inpatient PPS uses the hospital admission as the basic unit of payment. The basic unit for ambulatory care is the visit, which represents a contact between the patient and a health care professional. The visit could be for a procedure, a medical evaluation, or an ancillary service such as a chest X-ray. For each type of visit, a prospective price could be established that includes all routine services (e.g., blood tests, chest X-rays, etc.) associated with the visit. If the cost of the routine services rendered during a visit were included in the payment for the visit, hospitals would have the financial incentive to control the amount of services rendered.

An ambulatory patient classification system serves the same function as DRGs in the inpatient PPS. The patient classification system provides the basic product definition for the ambulatory setting and will have important secondary ef-

fects. For example, DRGs have brought about fundamental changes in management, communications, cost accounting, and planning within hospitals. These changes have resulted in improved efficiency in the delivery of inpatient care. The benefits to hospital management that resulted from the adoption of DRGs would also be expected to occur in the ambulatory setting. Thus, the selection of an appropriate patient classification system is critical to the success of an ambulatory PPS and the achievement of the associated secondary benefits. An ambulatory patient classification system should have the following characteristics.

#### **Comprehensiveness**

The patient classification system must be able to describe every type of patient seen in an ambulatory setting. This includes medical patients, patients undergoing a procedure, and patients who receive ancillary services only.

#### **Administrative Simplicity**

The patient classification system should be administratively straightforward to implement. The number of patient classes should be kept to a reasonable number. A patient classification system containing relatively few patient classes (e.g., fewer than the number of DRGs) will be more easily understood by providers and will ease the administrative burden on both facilities and payers. In addition, the data used to define the patient classes should be compatible with existing billing, data collection, coding, storage, and processing practices. Such compatibility will decrease implementation costs, data errors, and other administrative problems.

## Homogeneous Resource Use

The amount and type of resources (e.g., operating room time, medical surgical supplies, etc.) used to treat patients in each patient class should be homogeneous. If resources used vary widely within a patient class, it would be difficult to develop equitable payment rates. If a facility treated a disproportionate share of either the expensive or inexpensive cases within a patient class, then the aggregate payments to that facility might not be appropriate. Further, the facility might be encouraged to treat only the less costly patients within the patient class, causing a potential access problem for the complex cases. Thus, a homogeneous pattern of resource use is a critical characteristic of any patient classification system used in PPS.

## Clinical Meaningfulness

The definition of each patient class should be clinically meaningful. For example, a patient class involving a procedure should, in general, contain only procedures on the same body system which are of the same degree of extensiveness and which utilize the same method (e.g., surgical, endoscopic, percutaneous, etc.). The underlying assumption in a PPS is that hospitals will respond to the financial incentives in the system and become more efficient. Clinical meaningfulness is critical because in order to respond effectively, hospitals must communicate the incentives to their medical staffs. A clinically meaningful patient classification system will be more readily accepted by providers and will be more useful as a communications and management tool.

## Minimal Upcoding and Code Fragmentation

In the patient classification system, there should be minimal opportunities for providers to assign a patient to a higher paying class through upcoding. A patient classification system with many classes that are based on subtle distinctions is susceptible to upcoding. In general, the patient classes should be as broad and inclusive as possible without sacrificing resource homogeneity or clinical meaningfulness. In addition, there should be minimal opportunities for increasing payment by separately reporting the constituent parts of a procedure.

## Flexibility

In a visit-based payment system, there is a wide array of options in terms of which ancillary services should be included in the visit payment. The extent to which ancillary services are included in the visit payment is a policy decision. The patient classification system must be flexible enough to accommodate a full range of options for incorporating ancillary services into the visit payment. In addition, the patient classification system should be structured to allow changes in technology and practice patterns to be easily incorporated. This system should provide a flexible framework that can adapt to such change without requiring a major restructuring of the classification system.

Because of the fundamental role that the patient classification system plays in a PPS, it is essential that the patient classification system possess substantially all of the above characteristics. None of the available ambulatory patient classification systems possessed all the charac-

teristics needed in an ambulatory PPS. Existing ambulatory patient classification systems include ambulatory visit groups (AVGs) (Fetter et al., 1984), products of ambulatory care (PAC) (Tenan et al., 1988), products of ambulatory surgery (PAS) (Kelly et al., 1990), diagnosis clusters (Schneeweiss et al., 1983) and ambulatory surgical center (ASC) categories (*Federal Register*, 1991). Significant limitations exist for each of these systems:

- There are a large number of AVGs (i.e., 570) that create opportunities for up-coding. The AVGs also utilize data that are not routinely collected.
- The broad scope of some of the PAS and PAC classes reduced the clinical homogeneity of these classes.
- Diagnosis clusters do not cover all ambulatory services.
- The ASC categories are not clinically meaningful and do not address medical patients.

None of the existing systems effectively addressed the issue of payment for routine ancillary services. The process of developing the APGs included a review of the approaches used in existing ambulatory patient classification systems. The APG patient classification system was designed specifically for use as the basis of payment in a visit-based ambulatory PPS.

## OVERVIEW

APGs are designed to explain the amount and type of resources used in an ambulatory visit. Ambulatory resources include pharmaceuticals, supplies, ancillary tests, type of equipment needed, type of room needed, treatment time, etc. Patients in each APG have similar clinical characteristics, resource use, and costs.

Similar resource use means that the resources used are relatively constant across all patients within each APG. However, some variation in resource use will remain among the patients in each APG. In other words, the definition of the APG is not so specific that every patient included in the same APG is identical, but rather the level of variation in patient resource use is known and predictable. Thus, although the precise resource use of a particular patient cannot be predicted by knowing the APG of the patient, the average pattern of resource use of a group of patients in an APG can be accurately predicted.

Patients in each APG also have similar clinical characteristics. Similar clinical characteristics mean that the patient characteristics included in the definition of the APG should relate to a common organ system or etiology and that a specific medical specialty should typically provide care to the patients in the APG. In addition, all available patient characteristics that consistently affect resource use should be included in the definition of the APGs. For example, patients with diabetes may or may not have ketoacidosis. Although these patients are the same from organ system, etiology, and medical specialist perspectives, the APGs will assign these patients to different patient classes because the presence of ketoacidosis consistently increases the resource use of diabetic patients. On the other hand, sets of unrelated surgical procedures should not be used to define an APG because there is no medical rationale to substantiate that resource use would be expected to be similar.

The definition of similar clinical characteristics is, of course, dependent on the goal of the classification system. For

APGs, the definition of clinical similarity relates to the medical rationale for differences in resource use. If, on the other hand, the classification goal was related to patient prognosis, then the definition of patient characteristics that were clinically similar might be different. The requirement that APGs be clinically homogeneous caused more patient classes to be formed than is necessary for explaining resource use alone. For example, patients with a dilation and curettage or a simple hemorrhoid procedure are quite similar in terms of most measures of resource use. However, different organ systems and different medical specialties are involved. Thus, the requirement that APGs have similar clinical characteristics precludes the possibility of these types of patients being in the same APG.

APGs were developed to encompass the full range of ambulatory settings including same-day surgery units, hospital emergency rooms, and outpatient clinics. APGs, however, do not address phone contacts, home visits, nursing home services, or inpatient services. Data from several sources, including hospital outpatient departments and ambulatory surgical centers, were used in developing the APGs. However, better cost data from non-hospital sites are needed in order to determine if there are any problems with applying APGs to non-hospital sites. Although the anticipated initial application of APGs focuses on Medicare patients, APGs were developed to represent ambulatory patients across the entire patient population. For example, APGs relating to pregnancy were developed, even though pregnancy is not often encountered in the Medicare population.

APGs were developed to differentiate facility costs and not professional costs.

However, professional costs relate primarily to professional time and, therefore, directly relate to facility time. Professional time can serve as a proxy for the amount of time a patient used the resources of the facility. During the development of APGs, facility costs such as supplies and equipment, as well as professional time, were taken into consideration.

The data elements used to define APGs were limited to the information routinely collected on the Medicare claim form and consisted of the diagnoses coded in *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM), procedures coded in *Current Procedural Terminology, Fourth Edition* (CPT-4), age, gender and visit disposition. The patient characteristics used in the definition of the APGs were restricted to those readily available, in order to ensure that the APGs could be readily implemented (Public Health Service and Health Care Financing Administration, 1980; American Medical Association, 1977).

### **SELECTION OF THE INITIAL CLASSIFICATION VARIABLE**

The first step in developing a patient classification system is to choose the initial classification variable. In the DRGs, the principal diagnosis is used to classify patients into a set of mutually exclusive major diagnostic categories (MDCs). Within each MDC, procedure, age, and complication and comorbidities are used to complete the DRG classification system. APGs use procedure instead of diagnosis as the initial classification variable. The decision to do so was based on the following considerations:

- When a significant procedure is performed in an ambulatory setting, it is normally the reason for the visit. The procedure will normally be scheduled in advance and will consume the vast majority of resources associated with the visit.
- With procedure as the initial classification variable, each procedure will be assigned to only one APG. With principal diagnosis as the initial classification variable, the same procedure could be assigned to many different APGs depending on the principal diagnosis. Having each procedure in only one APG also reduces the number of APGs and simplifies the establishment of prospective prices.

Once the decision to use procedure as the initial classification variable was made, it was then necessary to partition all procedures into a set of mutually exclusive and exhaustive procedure groups. The first step in the process was to identify all procedures that could be done only on an inpatient basis. An inpatient procedure was defined as a procedure that requires at least 24 hours of postoperative recovery time or monitoring before a patient can be safely discharged. Some procedures, such as craniotomies, are clearly inpatient procedures. However, there are other procedures, such as the treatment of an open fracture, that are normally done on an inpatient basis but can sometimes be done on an ambulatory basis. Further, patients with the same CPT-4 procedure code can have a great deal of variation in the complexity of the procedure performed. For example, the treatment of an open humeral fracture can vary considerably in complexity.

Only the simplest cases of procedures normally done on an inpatient basis are done on an ambulatory basis. Thus, an open humeral fracture treated on an ambulatory basis will have minimal bone displacement and tissue damage. Such procedures are included in the APG procedure classification. When grouping procedures together to form homogeneous subclasses, it is important to recognize the variations of severity within a CPT-4 code and that only the simplest cases of complex procedures are treated in an ambulatory setting.

The procedures that could be performed on an ambulatory basis were then assigned to one of the following two classes:

- *Significant Procedure.* This is a procedure that is normally scheduled, constitutes the reason for the visit, and dominates the time and resources expended during the visit (e.g., the excision of a skin lesion). Significant procedures range in scope from debridement of nails to pacemaker replacements as well as significant tests such as a stress test.
- *Ancillary Services.* The term ancillary services is used to refer to both ancillary tests and ancillary procedures. An ancillary test is one that is ordered by the primary physician to assist in patient diagnosis or treatment. Radiology, laboratory, and pathology constitute ancillary tests. An ancillary procedure is a procedure that increases but does not dominate the time and resources expended during a visit. Examples of ancillary procedures are immunizations or the insertion of an intrauterine device (IUD).

Only patients with a significant procedure are assigned to significant procedure APGs. All medical services provided to the patient are assumed to be an integral part of the procedure. Patients who received medical treatment but who had no significant procedures performed are assigned to medical APGs. Examples of medical treatments which do not involve a significant procedure include treatment for poisoning, neonatal care, and well care.

Figure 1 illustrates the APG partition based on services rendered or procedures performed. Patients who undergo a significant procedure are assigned to a significant procedure APG. For example, a patient who had a simple skin excision performed to remove a skin lesion would be placed in a significant procedure APG based on the CPT-4 code which describes the precise procedure. Patients receiving medical treatment which does not involve a significant procedure are assigned to medical APGs. A patient who visited a physician to have a skin lesion evaluated and had no significant procedures performed would be assigned to a medical APG based on the ICD-9-CM diagnosis code. A patient who neither received medical treatment nor underwent a significant procedure, but had an ancillary service performed would be assigned to only an ancillary service APG.

### **DEVELOPMENT OF SIGNIFICANT PROCEDURE CLASSES**

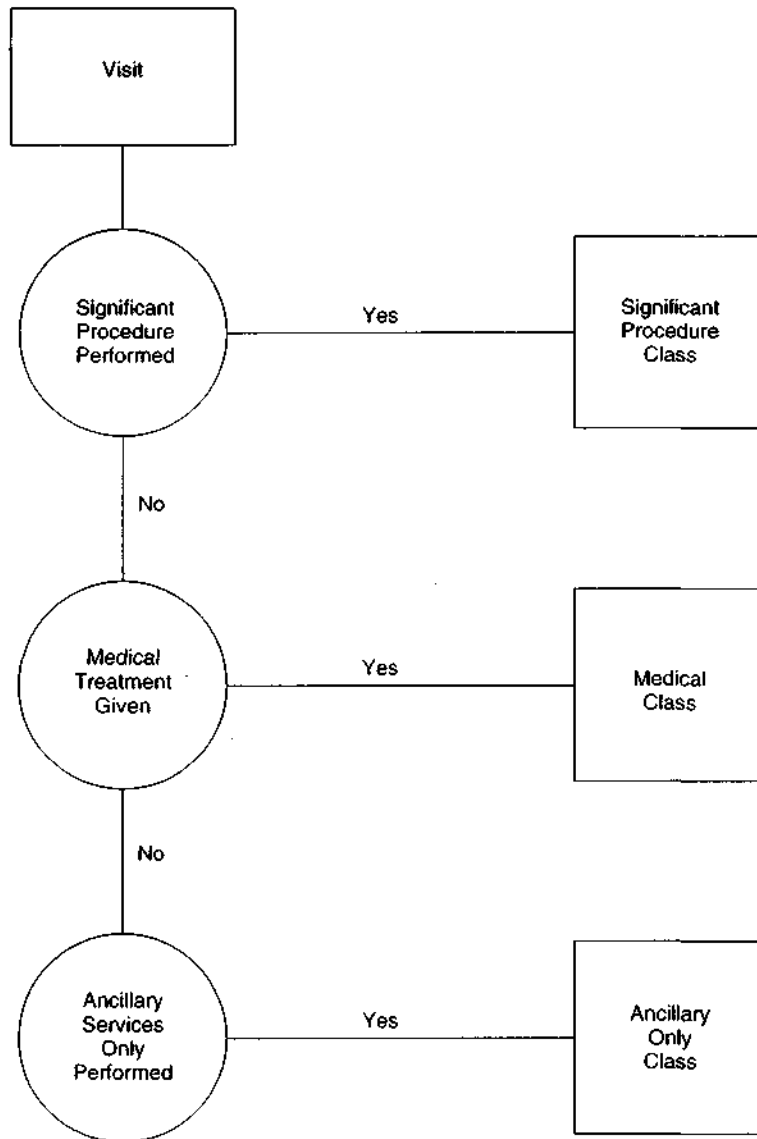
Significant ambulatory procedures are subdivided into groups of CPT-4 codes based on the body system associated with the procedure:

- Skin, subcutaneous tissue, and muscle.

- Breast.
- Bone, joint, and tendon.
- Respiratory, mouth, nose, and throat.
- Cardiovascular.
- Hematology, lymphatic and endocrine.
- Digestive.
- Urinary.
- Male reproductive.
- Female reproductive.
- Nervous.
- Eye.
- Ear.

Body systems were formed as the first step toward ensuring that the procedures in each APG were clinically similar. The significant procedures in each body system generally correspond to a single-organ system and are associated with a particular medical specialty. The body systems used in the procedure APGs are similar to the MDCs for the DRGs. However, there are some significant differences. For example, the body system for skin and subcutaneous tissue includes muscle, whereas muscle is in the musculoskeletal MDC. Muscle was included in the skin and subcutaneous tissue body system because most procedures involving the fascia (connective tissue) are clinically similar to dermal procedures and have similar patterns of resource use. If fascia or muscle procedures were included within the bone and joint body system, then it would have been necessary to form separate APGs for muscle procedures. Thus, the inclusion of muscle in the skin and subcutaneous tissue body system reduced the overall number of APGs. Further, there are MDCs for etiologies such as infectious diseases, mental illness, and drug abuse for which there

**Figure 1**  
**Ambulatory Patient Group Class Partitions, by Service Rendered or Procedure Performed**



SOURCE: Averill, R., Goldfield, N., and Gregg, L., 3M Health Information Systems, Wynn, M., Health Care Financing Administration, McGuire, T., Analytic Solutions, Inc., Mullin, R., Hospital of St. Raphael, and Bender, J., Yale University, 1993.



are no corresponding body systems in the significant procedure APGs.

Some body systems had few procedures performed on an ambulatory basis. For example, except for biopsies or excisions of the thyroid, there are no endocrine procedures performed on an ambulatory basis. Thyroid procedures were included with lymph node biopsies and excisions because they are clinically similar.

Once each significant procedure was assigned to a body system, the procedures in each body system were subdivided into clinically similar classes. The classification variables considered in the formation of the procedure classes are shown in Table 1. In general, method was used as the primary classification variable. Different methods such as surgery, endoscopy, manipulation, dilation, catheterization, laser, and needle often require different types of rooms, equipment, and supplies as well as different amounts of time. For example, procedures in the respiratory body system are initially divided by method into surgical, endoscopic, needle or catheter, and non-invasive test subgroups. On the other hand, most male reproductive procedures are surgical; therefore, the male reproductive body system was initially subdivided on site and not method. Surgical procedures were usually subdivided based on type (i.e., incision, excision, or repair). The time required to perform a procedure depends on the type of procedure, with repairs generally taking the most time. Thus, surgical skin procedures were divided into separate incision, excision, and repair groups. Endoscopic procedures were often divided into separate classes depending on purpose (i.e., diagnostic or therapeutic). Therapeutic endoscopic pro-

**Table 1**  
**Classification Variables Considered in the Development of the Significant Procedure Ambulatory Patient Group Classes**

Variable	Example
Site	Face, hand, etc.
Extent	Excision size: 2 cm. versus 20 cm.
Purpose	Diagnostic or therapeutic
Type	Incision, excision, or repair
Method	Surgical, endoscopic, etc.
Device	Insertion or removal
Medical Specialty	Urology, gynecology, etc.
Complexity	Time needed to perform procedure

NOTE: Cm. is centimeter.

SOURCE: Averitt, R., Goldfield, N., and Gregg, L., 3M Health Information Systems, Wynn, M., Health Care Financing Administration, McGuire, T., Analytic Solutions, Inc., Mullin, R., Hospital of St. Raphael, and Bender, J., Yale University, 1993.

cedures generally require more time. The extent of a procedure was often taken into consideration. Thus, skin excisions of 2 centimeters and 20 centimeters are assigned to different APGs.

Another aspect of extent is the complexity of the procedure. Complexity basically refers to the amount of time normally required to perform a procedure. For example, the excision of a pressure ulcer will generally require more time than the excision of a skin lesion. Thus, the excision of the pressure ulcer was viewed as more complex and, therefore, assigned to a different APG. Anatomical site (e.g., face, hand, etc.) within a body system was used in order to ensure clinical similarity (e.g., procedures of the external ear versus the internal ear) and was also used to implicitly reflect complexity (e.g., treatment of a closed fracture of a finger is usually less complex than treatment of a closed fracture of other sites).

If a procedure involved the insertion of a device (e.g., neurostimulator), then a separate APG was formed in order to recognize the cost of the device. Medical specialty was never explicitly used in the significant procedure APG formation, but procedures normally done by different

medical specialties were usually put in different APGs.

This process resulted in the formation of 145 significant procedure APGs.

## **DEVELOPMENT OF MEDICAL CLASSES**

Medical APGs describe patients who receive medical treatment but do not have a significant procedure performed during the visit. The fact that a patient had a specific significant procedure performed provides a great deal of precise information regarding the amount and type of resources typically used during the visit. Patients without a significant procedure (i.e., medical patients) can use a wide range of resources depending on the condition of the patient at the time of the visit. Medical patients can be described using the diagnoses of the patient coded in the ICD-9-CM, which allows both specific diseases (e.g., pneumonia) as well as signs, symptoms, and findings (SSFs) (e.g., chest pain, melena, elevated sedimentation rate, etc.) to be coded. The term "diagnosis" will be used to refer generically to SSFs and diseases. The standard Medicare claims form and the ICD-9-CM ambulatory coding guidelines require that the diagnosis that was the primary reason for the visit be indicated. Further, any additional diagnoses that are present may be listed on the claim as secondary diagnoses. The primary variable used to form the medical APGs is the diagnosis coded as the reason for the visit. The reason for the visit is the primary determinant of the resources used (e.g., time, tests ordered, etc.) during the visit. Thus, the medical APGs are based on the type of patient being treated.

The treatment of a medical patient is often highly influenced by the SSFs present

at the time of the visit. In general, the coding of a disease simply indicates that the disease was present but gives no indication of how extensive or severe the disease was at the time of the visit. The coding of SSFs in addition to the underlying disease provides some indication of the extensiveness of the disease. The use of SSFs in the definition of the medical APGs was difficult because of the following limitations in the ICD-9-CM codes for SSFs:

- Many of the ICD-9-CM codes for SSFs are not precise. For example, abdominal rigidity (code 7894) has no precise clinical definition.
- There are a large number of SSF codes that refer to abnormal laboratory results that are imprecise. For example, a diagnosis of hypokalemia does not convey useful information because the range of potassium levels associated with hypokalemia can vary significantly in terms of clinical significance.

In addition to the imprecision of many of the SSF codes, the use of SSFs as a primary variable in the medical APGs could create opportunities for upcoding. If the APGs for SSFs had a high payment weight, then there would be a financial motivation to code the SSFs instead of the underlying disease. The fact that the ICD-9-CM coding rules allow only non-routine SSFs to be coded also limited the applicability of SSFs in the definition of the medical APGs. As a result of the problems associated with SSFs, the SSFs used in the definition of the medical APGs were restricted to SSFs with the following characteristics:

- SSFs with a relatively precise clinical meaning.

- SSFs that were significant enough not to be a routine part of most diseases.
- SSFs that were significant enough to tend to dominate the resources used during the visit. Thus, upcoding is not an issue because assignment to the SSF APG is appropriate irrespective of the underlying disease.

A single major SSF APG for medical patients was formed. Examples of SSFs included in the major SSF APG are meningismus and gangrene. In addition to the SSF codes, there were also ICD-9-CM codes included in the major SSF APG that specify both the underlying disease and the SSF (e.g., diabetic ketoacidosis). A patient is assigned to the major SSF APG whether the major SSF is coded as the reason for the visit or as a secondary diagnosis. The major SSF APG identifies the medical patients with extensive diseases who are usually treated in emergency rooms and who require significant amounts of resources. Patients who have non-major SSFs coded as the reason for the visits are assigned to the medical APG that is usually associated with the SSF (e.g., cough is assigned to the upper respiratory infection APG).

In addition to the presence of a major SSF, there are also two other indicators that can be used to identify patients with extensive diseases. Patients who die (e.g., trauma or acute myocardial infarction patients) during an ambulatory visit or who are admitted to the hospital following an ambulatory visit often use large amounts of resources. Deaths and hospital admissions are particularly relevant for patients treated in the emergency room. Patients who are admitted through the emergency room have the emergency room charges included in the inpatient

bill. However, patients seen in one hospital's emergency room but admitted to another hospital will have an outpatient claim for the emergency room visit. Patients who die or are admitted are atypical and are assigned to a separate APG. The process of forming the medical APGs begins with the identification of patients who died or were admitted followed by the identification of patients who had a major SSF.

After patients who died, who were admitted, or who had a major SSF are assigned to separate APGs, the medical APGs were formed primarily on the basis of the ICD-9-CM diagnosis code that was the reason for the visit. Thus, all possible ICD-9-CM diagnoses were divided into a set of mutually exclusive and clinically similar classes. The classification variables considered in the formation of the medical classes are shown in Table 2.

The initial variable used to form the medical APGs was the etiology of the diagnosis that was the reason for the visit:

- Well care and administrative.
- Malignancy.
- Trauma.
- Poisoning.
- Mental diseases.
- Alcohol and drug abuse.
- Pregnancy.
- Neonate.
- Body system.

As a first step in the formulation of the medical APGs, each ICD-9-CM diagnosis code was assigned to one of the etiology subgroups. Malignancies and trauma were assigned to separate subgroups because they had unique resources associated with the care provided (e.g., frequent radiology and laboratory services). The body system group encompasses a broad

spectrum of diseases from acute infectious diseases to chronic diseases such as hypertension. The body system group was then divided into subgroups based on the specific body system of the diagnosis that was the reason for the visit:

- Nervous diseases.
- Eye diseases.
- Ear, nose, throat, and mouth diseases.
- Respiratory diseases.
- Cardiovascular diseases.
- Digestive diseases.
- Musculoskeletal diseases.
- Skin and breast diseases.
- Endocrine, nutritional, and metabolic diseases.
- Kidney and urinary tract diseases.
- Male reproductive diseases.
- Female reproductive diseases.
- Immunologic and hematologic diseases.
- Infectious diseases.

The initial subdivision of the medical APGs is shown in Figure 2. Once all the subclasses based on the etiology and the body system were formed, then the other classification variables in Table 2 were used to further subdivide each etiology and body system.

Whether a diagnosis was acute or chronic was not explicitly used in the formation of the medical APGs. There are medical APGs that contain only diagnoses that are acute or chronic, but a medical APG was never formed for the explicit purpose of identifying acute or chronic diseases. Medical specialty was never explicitly used in the medical APG formation, but diseases normally treated by different medical specialties were usually put in different APGs. If, for certain

**Table 2**  
**Classification Variables Considered in the Development of the Medical Ambulatory Patient Group Classes**

Variable	Example
Etiology	Trauma, malignancy, etc.
Body System	Respiratory, digestive, etc.
Type of Disease	Acute or chronic
Medical Specialty	Ophthalmology, gynecology, etc.
Patient Age	Pediatric, adult, etc.
Patient Type	New or old
Complexity	Time needed to treat the patient

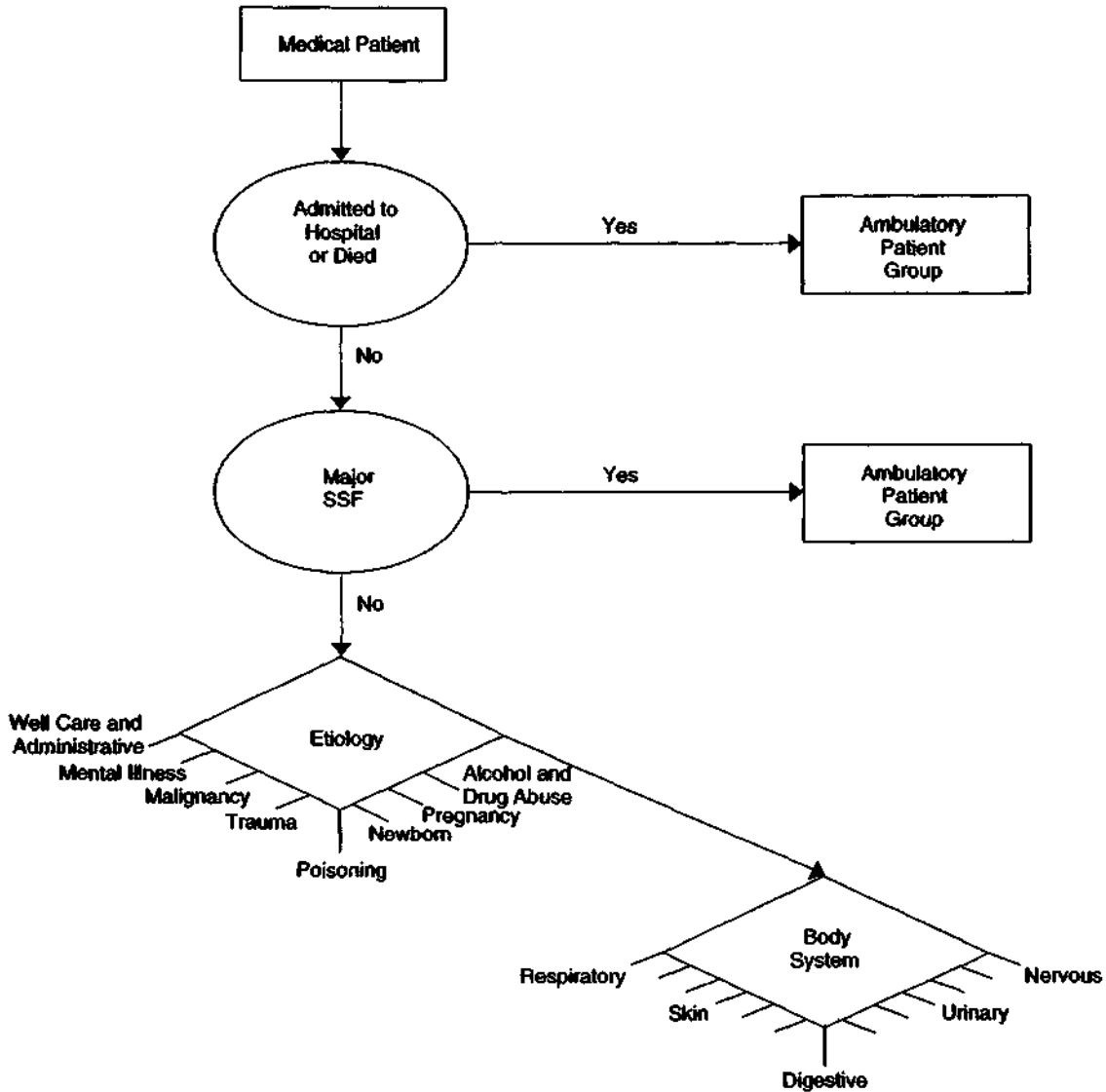
SOURCE: Averill, R., Goldfield, N., and Gregg, L., 3M Health Information Systems, Wynn, M., Health Care Financing Administration, McGuire, T., Analytic Solutions, Inc., Mullin, R., Hospital of St. Raphael, and Bender, J., Yale University, 1993.

diseases, pediatric patients are usually treated differently (e.g., asthma), then patient age was used to form pediatric APGs.

Whether a patient was a new patient or an old patient was considered as a possible variable in the formation of the medical APGs. However, the new patient-old patient distinction was not used for the following reasons:

- There is difficulty in establishing a precise definition of a new patient. New can refer to either the physician or the facility. Thus, a patient may be considered new only the first time the patient is treated as an outpatient at the hospital. Alternatively, the patient may be considered new for each visit in which the patient is treated by a different physician. From a resource use perspective, the presence of new diagnoses or problems is often just as important as whether the patient is new to the facility or physician. The only definition of new that is not prone to upcoding is new to the facility.
- The impact on resources of whether a patient is a new patient varies by setting. For emergency room and same-day surgery units, the fact that

**Figure 2**  
**Initial Medical Class Logic**



NOTE: SSF is signs, symptoms, and findings.

SOURCE: Averill, R., Goldfield, N., and Gregg, L., 3M Health Information Systems, Wynn, M., Health Care Financing Administration, McGuire, T., Analytic Solutions, Inc., Mullin, R., Hospital of St. Raphael, and Bender, J., Yale University, 1993.

the patient is new has little impact on resource use. For an outpatient clinic, a new patient often utilizes more resources.

- To the extent that there are followup visits for a patient, they typically occur at the same facility as the initial visit. These lower cost visits balance out the often more costly initial visit.
- The designation of whether a patient is a new or old patient is not present on the current Medicare UNIBILL UB-92 claim form. Thus, a change in reporting requirements would be necessary.

Patient complexity basically refers to the amount of time and tests normally required to treat a patient. In a visit-based payment system, visit time is an important determinant of facility fixed cost because it directly affects both the number of visits that can be provided and the amount of overhead costs that are allocated to each visit. In forming the medical APGs, visit time was considered an important factor in the determination of resource use and the associated facility cost. Thus, separate medical APGs were formed to recognize differences in visit time. For example, a visit for a skin malignancy normally takes considerably less time than a visit for a hematological malignancy.

The final issue that was considered in the formation of the medical APGs was the amount and type of ancillary services that are typically provided to a patient. Because the cost of some ancillary services will be included in the base-visit payment, patients with different profiles of ancillary service use needed to be in different APGs.

This process resulted in the formation of 80 medical APGs.

## **DEVELOPMENT OF ANCILLARY SERVICE CLASSES**

Ancillary services refer to ancillary tests (i.e., laboratory, radiology, and pathology) and ancillary procedures (e.g., immunization, anesthesia, insertion of an IUD, etc.). Ancillary APGs were formed for each type of ancillary service.

### **Laboratory**

The laboratory department in which the laboratory test is typically performed was used as the primary variable in the formation of the laboratory APGs. Thus, tests performed by the different laboratory departments (e.g., hematology, microbiology, toxicology, etc.) were assigned to different APGs. The testing method (e.g., radioimmunoassay) was used to a limited extent when the method represented a substantially different type of test with relatively clear indication for usage. However, in general, different methods of performing the same test were placed in the same APG. A laboratory technician will typically employ different methods depending on the precision of result that is needed. However, different methods are also employed depending on the training of the laboratory professional. For example, although there is a clear difference between a fluorimetric versus chromatographic method in the determination of the calcium level, there frequently are not precise indications on when to do one versus the other. As a consequence, the different methods for performing the same test were usually assigned to the same APG. The same type of laboratory test (e.g., chemistry) was sometimes differentiated by the source of specimen (e.g., blood versus urine) in order to account for the labor cost of collecting and

transporting the specimen. Finally, the same type of laboratory test was usually differentiated based on the complexity of the test. Tests that required more time, technicians with greater skill levels, or expensive equipment were assigned to different APGs. For example, multichannel chemistry tests were assigned to a separate APG from other chemistry tests because of the cost of the equipment used to perform a multichannel chemistry test. Laboratory tests that required no equipment and are typically performed during a visit (e.g., blood or urine dipstick tests) were assigned to a single APG as a result of their very low level of complexity. During the development of the laboratory APGs, physicians who either headed or worked in hospital laboratory departments and technicians who perform the tests were consulted. In addition, the laboratory relative value units (RVUs) developed by the College of American Pathologists were utilized. There are a total of 23 laboratory APGs.

### Radiology

The type of equipment (magnetic resonance imaging [MRI], computerized assisted tomography [CAT], plain film, etc.) was the primary classification variable for the radiology APGs because the cost of the radiology equipment varies considerably across the different types of radiological procedures. Diagnostic X-rays were distinguished based on whether a radio-opaque contrast media was used because there are additional costs associated with the supply cost of the contrast media and the injection of the contrast media. Diagnostic X-rays requiring a radio-opaque contrast media were divided based on the anatomic site studied

because the anatomic site, in general, reflected the complexity of the procedure. Nuclear medicine was separated into diagnostic and therapeutic groups. There are a total of 20 radiology APGs.

### Pathology

Pathology is divided into two APGs based on the complexity of the pathology test. Pathology tests requiring more time or greater skill levels were assigned to the complex pathology APG.

### Anesthesia

All of anesthesiology is assigned to a single APG. The APG payment system includes the cost of anesthesia in the payment for a significant procedure. The CPT-4 codes do not differentiate between general and local anesthesia, and it was therefore not possible to create separate general and local anesthesia APGs. However, the procedures in each significant procedure APG typically have the same type of anesthesia administered. Thus, the absence of a differentiation on the type of anesthesia did not present a problem.

### Ancillary Tests and Procedures

Other ancillary tests include electrocardiograms, other electrocardiographic tests, and vestibular function tests. Ancillary procedures are procedures that do not dominate the time and resources expended during a visit but do increase the time and resources expended during a visit. Thus, ancillary procedures can be performed as part of a medical visit. Ancillary procedures include immunizations, introduction of needles and catheters, simple anoscopy, biofeedback and hypnotherapy, infusion therapy, minor uri-

nary tube changes, minor gynecological procedures, and minor ophthalmological procedures. Immunizations are divided into three APGs based primarily on the cost of the vaccine (e.g., rabies vaccination is considered a complex immunization). There are a total of 15 ancillary test and procedure APGs.

### Chemotherapy

There are two significant procedure APGs for chemotherapy that are based on the route of administration of the chemotherapy (i.e., intravenous push versus continuous infusion). These two significant procedure APGs reflect the difference in supplies and the labor cost of monitoring the administration of the chemotherapy drug. There is a second major cost component associated with chemotherapy, and that is the cost of the chemotherapy drug. Chemotherapy drug costs can vary considerably, and, therefore, three additional chemotherapy APGs were formed to reflect the costs of chemotherapy drugs. Thus, the payment for a chemotherapy visit is composed of two APGs, one for the route of administration and one for the chemotherapy drug.

### SUMMARY OF DEVELOPMENT

The process of formulating the APGs was highly iterative, involving statistical results from historical data combined with clinical judgment. A preliminary classification was developed, based solely on clinical judgment. The preliminary classification was then evaluated using several data bases including both Medicare and non-Medicare patients and contact time between provider and patient as well as charge data. The data bases used in the evaluation were as follows:

- 1987 Part B Medicare annual data consisting of summary charge data by CPT-4 code.
- 1987 Medicare outpatient sample consisting of a 5-percent outpatient sample containing 232,827 procedure claims.
- 1988 Medicare outpatient data containing all Medicare hospital outpatients with a date of service from the last 2 weeks of October 1988, totaling 1.6 million outpatient claims.
- 1988 New York State data containing approximately 400,000 claims from New York hospitals and community health centers, including contact time between provider and patient.
- 1985 National Ambulatory Care Survey data consisting of 72,000 visits drawn from 2,789 office-based physicians that included contact time between provider and patient.
- U.S. Army Ambulatory Care data base consisting of 516,006 visits to army hospitals and clinics that included contact time between provider and patient.
- Relative value scales including relative values for physicians (Relative Value Studies, Inc., 1984) and the resource-based relative value scale (RBRVS) (Hsiao et al., 1988).

The preliminary patient classes formed, based on clinical judgment, were evaluated using reports that displayed aggregate frequency and charge statistics as well as available RVU scales. The report for significant procedure and ancillary service APGs displayed for each CPT-4 code within an APG the count, mean charge, and standard error of charges from each data base as well as the available RVU scales. Using this report, the CPT-4 codes that comprise each APG



were evaluated across all data bases and RVU scales simultaneously. The evaluation looked for consistency of average charges across the CPT-4 codes within an APG across all the data bases, as well as for consistency across the available RVU scales. The report for the medical APGs displayed for each ICD-9-CM diagnosis code the summary statistics for charges and visit time. The evaluation of the medical APGs looked for consistency of average charges and visit time across the ICD-9-CM codes within an APG across all the data bases. As the APGs were being formed, the definitions were circulated to clinical consultants for comments on clinical appropriateness. Nearly 100 professionals throughout the country commented and consulted on the construction of the APGs. This process of defining APGs and reviewing them both clinically and with the data was repeated numerous times. The overall objective of the process was to have clinically similar groups of patients with similar resource use but to achieve these objectives with as few APGs as possible.

During the formation of DRGs, charge data was, in general, found to reflect the relative needs of patients. The number of bed-days and ancillary services consumed by inpatients depended on their needs. However, hospital ambulatory charges are also highly influenced by physician charges. A great deal of effort has been expended in the development RVUs, such as the RBRVS developed for physician payment (Hsiao et al., 1988). RVU systems have been widely used for many years (Relative Value Studies, Inc., 1984). Ambulatory charges for a procedure do not necessarily reflect the actual needs or complexity of an individual patient but are often based on the established RVU for

the procedure. As a consequence, statistical results from charge data often simply reflect the established RVU scales. Although charge data were used extensively in the APG development, it was necessary for the clinical team to make judgments on whether observed hospital charge differences across different procedures reflect real differences in the resources required to perform the procedure or any bias in the established RVU scales.

For example, there are different CPT-4 codes for excisions of benign and malignant skin lesions. RVU and charge data implied that excisions of malignant skin lesions of the same site and size used significantly more resources than benign skin lesions. However, the histology of the lesion is usually not known at the time of the procedure but is established when a pathology report is returned. Further, the excision of a malignant and benign skin lesion of the same site and size is fundamentally the same procedure except that a wider margin is excised for lesions that are suspected to be malignant. Thus, the significant procedure APGs do not differentiate between malignant and benign skin excisions. In addition, procedure APGs avoid assigning procedures to different APGs based on subtle or easily gameable distinctions in the CPT-4 codes. For example, deep and superficial muscle biopsies are in the same APG because the distinction between deep and superficial lacks a precise definition in the CPT-4 coding system.

The development of the APGs required a balance between the number of APGs, clinical consistency, and homogeneity in charges and visit time. Clinical consistency was required in order for any procedures or diagnoses to be grouped into an

APG. However, in general, APGs were not formed solely on clinical grounds. Verification of consistent differences in charges or visit time was required in order to form an APG. In general, infrequent APGs were not formed unless there was strong clinical justification and a large charge difference. For example, pacemaker replacements are infrequent on an outpatient basis, but pacemaker replacements do represent a clinically distinct group of patients with a very high cost. Thus, a pacemaker replacement APG was formed. The end result of the process of forming the APGs is a clinically consistent group of patient classes that are homogeneous in terms of resource use. The process of forming the APGs resulted in a total of 289 APGs (Table 3). The APGs describe the complete range of services provided in the outpatient setting. The APGs can form the basic building blocks for the development of a visit-based outpatient prospective system and can provide a flexible structure for configuring a payment system to meet specific policy objectives.

### APG PAYMENT SYSTEM

In the APG payment system, a patient is described by a list of APGs that correspond to each service provided to the patient. The assignment of multiple APGs to a patient is in contrast with the DRG system that always assigns an inpatient to a single DRG. If a patient has multiple procedures, then the DRGs use a procedure hierarchy to select the most appropriate DRG. The DRG payment includes the cost of all ancillary services provided to the patient. In the outpatient setting, the diversity of sites of service (i.e., same-day surgery units, emergency rooms, and out-

patient clinics), the wide variation in the reasons patients require outpatient care (e.g., well care to critical trauma care), and the high percentage of cost associated with ancillary services (i.e., the cost of ancillary services can often exceed the cost of the base visit) necessitates a patient classification scheme that can closely reflect the services rendered to the patient. The APGs address the diversity within the outpatient setting by assigning patients to multiple APGs when needed. For example, if a patient had two procedures performed plus a chest X-ray and a blood test, then there would be four APGs assigned to the patient (i.e., one APG for each procedure plus the APGs for the chest X-ray and the blood test). In a PPS, each APG would have a standard payment rate, and the payment for a patient could be computed by summing the payment rates across all the APGs assigned to the patient. However, in order to provide incentives for efficiency and to minimize opportunities for upcoding of APGs, not all the APGs assigned to a patient are used in the computation of the payment. The APG system uses three techniques for grouping different services provided

**Table 3**  
**Number of Ambulatory Patient Groups, by Type of Group**

Type of Group	Number
Total	289
Significant Procedure	145
Medical	80
Total Ancillary	64
Laboratory	23
Radiology	20
Pathology	2
Anesthesia	1
Ancillary Tests and Procedures	15
Chemotherapy Drugs	3

SOURCE: Averill, R., Goldfield, N., and Gregg, L., 3M Health Information Systems, Wynn, M., Health Care Financing Administration, McGuire, T., Analytic Solutions, Inc., Mullin, R., Hospital of St. Raphael, and Bender, J., Yale University, 1993.

into a single-payment unit: significant procedure consolidation, ancillary packaging, and multiple significant procedure and ancillary discounting.

### Significant Procedure Consolidation

When a patient has multiple significant procedures, some of the significant procedures may require minimal additional time or resources. Significant procedure consolidation refers to the collapsing of multiple-related significant procedure APGs into a single APG for the purpose of the determination of payment. A significant procedure consolidation list was developed based on clinical judgment. The significant procedure consolidation list identifies, for each significant procedure APG, the other significant procedure APGs that are an integral part of the procedure and can be performed with relatively little additional effort and are, therefore, consolidated. For example, the diagnostic lower gastrointestinal (GI) endoscopy, the proctosigmoidoscopy, and the anoscopy APGs are consolidated into the therapeutic lower GI endoscopy APG. Conversely, unrelated significant procedures are not consolidated by the significant procedure list. For example, the treatment of a closed fracture and the suturing of a skin laceration result in two significant procedure APGs being used in the computation of the payment. Multiple unrelated significant procedures performed during the same visits are not consolidated in order to provide a fair level of payment and to avoid creating the incentives to have separate visits for each procedure.

Significant procedure consolidation also greatly reduces the opportunities for the fragmentation of procedures for the

purpose of increasing payment. For example, all minor skin procedures are consolidated into the significant procedure APGs that involve penetration of the skin (e.g., hernia repair). Because all procedures in the same APG and all significant procedures that can be performed as part of another significant procedure are consolidated into a single APG for payment purposes, fragmentation opportunities are minimized.

### Ancillary Packaging

A patient with a significant procedure or a medical visit may have ancillary services performed as part of the visit. Ancillary packaging refers to the inclusion of certain ancillary services into the APG payment rate for a significant procedure or medical visit. For example, a chest X-ray is packaged into the payment for a pneumonia visit. The packaging of ancillaries does not imply that there would be no payment associated with the packaged ancillary. The cost of the packaged ancillaries would be included in the payment amount for the significant procedure or medical APG. For example, if a packaged ancillary cost \$20 and is performed for 50 percent of the patients in a medical APG, then \$10 (i.e., 50 percent of \$20) would be included in the payment rate for the medical APG.

Under Medicare's DRG-based PPS for hospital inpatient care, all ancillary services provided to a patient are packaged into the payment for the DRG to which the patient is assigned. Because of the nature of outpatient care, it is not clear that all services provided or ordered during a visit can be packaged into one payment rate. Medicare's current payment system for ambulatory care involves sep-

arate payments for ancillary services provided in conjunction with a visit. Ancillary packaging will allow the Medicare program to make a single payment for a well-defined package of ambulatory services, thereby creating a consistent definition of services across providers. Packaging will give providers the incentive to improve their efficiency by avoiding unnecessary ancillaries and by substituting less expensive but equally effective ancillary services for more costly options.

There are also some potential problems in the packaging of ancillaries. Packaging places providers at financial risk. If expensive ancillaries that are not usually performed for a particular type of visit are included in the packaged payment, then the financial risk may be excessive. For example, if a \$500 test that occurs, on average, only once per 100 visits was packaged, then the packaged payment for each visit would include only \$5 for this test. Therefore, only relatively inexpensive, frequently performed ancillaries are packaged. The 1988 Medicare data was used to evaluate ancillary charges and frequency. For example, a laboratory test was considered inexpensive if its average charge in the data base was less than \$40.

There are basically two alternative approaches to packaging: partial packaging or all-inclusive packaging. Under partial packaging, ancillary services that are inexpensive or frequently provided are packaged into the payment for the significant procedure or medical visit. However, other ancillary services, particularly those that are expensive or infrequently performed (such as MRIs), are paid as separate ancillary APGs. Partial packaging limits the providers' risk. Under an all-inclusive packaging, all services (including expensive ancillaries) that are pro-

vided during a visit are packaged into the visit payment. The partial-packaging option is the most appropriate option because it does not impose a high level of risk for providers.

Because partial packaging was utilized in the APG payment system, the subset of ancillary services that would be packaged into a procedure or medical visit needed to be determined. There are two approaches to selecting the ancillaries to be packaged: clinical or uniform.

A clinical-packaging approach selects the ancillaries to be packaged on an APG-specific basis. The ancillaries to be packaged are selected primarily on clinical grounds. Thus, only ancillaries that are clinically expected to be a routine part of the specific procedure or medical visit are packaged. The clinical approach has the benefit that the resulting package for a visit is clinically meaningful.

The alternative to clinical packaging is to develop a uniform list of ancillaries that are always packaged into every significant procedure or medical visit. There are several advantages associated with a uniform packaging of ancillaries. A uniform packaging is administratively simple. Once the uniform list of ancillaries is developed, both the Medicare fiscal intermediaries and providers will know that every ancillary on the list is always packaged. Thus, the tracking of the ancillaries that are packaged is straightforward. Further, a uniform list of packaged ancillaries is simple for hospitals to explain to their medical staff, and thus, the incentive to efficiently utilize the packaged ancillaries can be effectively communicated. A uniform list of ancillaries is less prone to manipulation by providers. With a clinical packaging of ancillaries, procedure or medical visits have different levels of an-

cillaries packaged across the different APGs. Thus, there is an incentive to code the patient into the significant procedure or medical APG with the fewest packaged ancillaries. This presents a particular problem for medical visits in which multiple diagnoses are present. For medical visits with multiple diagnoses, the ancillary tests may be performed for the secondary diagnoses. Under a clinical packaging, low-cost, non-routine tests are not packaged into the visit payment. This provides a financial incentive for providers to perform such non-routine tests. A uniform packaging includes a wider array of ancillaries in the packaging for each APG, and thus, there is less opportunity for additional payments from non-routine ancillaries.

A uniform packaging of ancillaries was selected for use in the APG payment model. An attempt to develop a clinical packaging of ancillaries proved difficult. The administrative simplicity, the relative freedom from manipulation, and the wider scope of uniform packaging of ancillaries led to its adoption.

The ancillary APGs included in the uniform packaging are contained in Table 4.<sup>1</sup> The APGs included in the uniform packaging were primarily simple laboratory tests (e.g., basic chemistry), simple pathology, anesthesia, simple radiology (e.g., plain films), other minor tests (e.g., electrocardiograms) and minor procedures, and therapies (e.g., spirometry). In general, the ancillaries in the uniform packaging included ancillaries that are

performed for a wide range of different types of visits and were relatively low cost compared with the average cost of the procedure and medical APGs. Only relatively low-cost ancillaries were included in the uniform packaging because if high-cost ancillaries were packaged into the visit payment, the patients who required such ancillaries would cause a substantial financial loss for the hospital. The list of ancillaries included in the uniform packaging is a policy decision. The cost of medical surgical supplies, drugs, and all other facility-related costs are included in the payment for a significant procedure or medical visit. The only exception is the cost of chemotherapy medication because it is frequently very costly.

### Discounting

When multiple unrelated significant procedures are performed or when the same ancillary service is performed multiple times, a discounting of the APG payment rates can be applied. Discounting refers to a reduction in the standard payment rate for an APG. Discounting recognizes that the marginal cost of providing a second procedure to a patient during a single visit is less than the cost of providing the procedure by itself. For example, discounting could compensate for the reduced cost per procedure of doing multiple significant procedures at the same time. When multiple significant procedures are performed, in general, the patient preparation, use of the operating room, and recovery time is shared between the two procedures. Thus, the cost of doing two procedures at the same time is less than the cost of doing the two procedures at two different times. Discounting can also be used to provide a financial

<sup>1</sup>The uniform packaging APGs shown in Table 4 are those that were included in Version 1.0 of the APGs and were utilized in the data analyses presented here. In subsequent research for Version 2.0 of the APGs, the ancillary APGs that are uniformly packaged were reduced to the following APGs: 351, 365, 391, 419, 421, 423, 425, 426, 428, 431, 434, 436, 440, 443, 447, 461.

incentive not to repeat the same ancillary service multiple times. Because the performance of multiple ancillaries in the same APG may be clinically necessary and appropriate, there is no consolidation of ancillaries within the same APG. Thus, each non-packaged ancillary in the same APG will result in an additional payment. However, in order to provide some financial incentive not to repeat ancillary tests, multiple ancillaries in the same APG could be discounted. The level of any discounting is a policy decision and would be determined during system implementation.

The three components of an APG payment system are shown in Figure 3. In this example, although there are four APGs assigned to the claim, only two of

the APGs are used to compute the final payment amount. The diagnostic lower GI endoscopy (APG 164) is consolidated into the therapeutic lower GI endoscopy (APG 165). The simple surgical pathology (APG 391) is packaged, but the CAT scan (APG 349) is not. A visit-based APG PPS with significant procedure consolidation, uniform ancillary packaging, and multiple APG discounting would have many advantages over the current outpatient payment method, such as the following:

- Many similar units of service are aggregated together, greatly reducing the number of units of service.
- The need to establish separate payment rates for minor differences in the unit of service is eliminated.

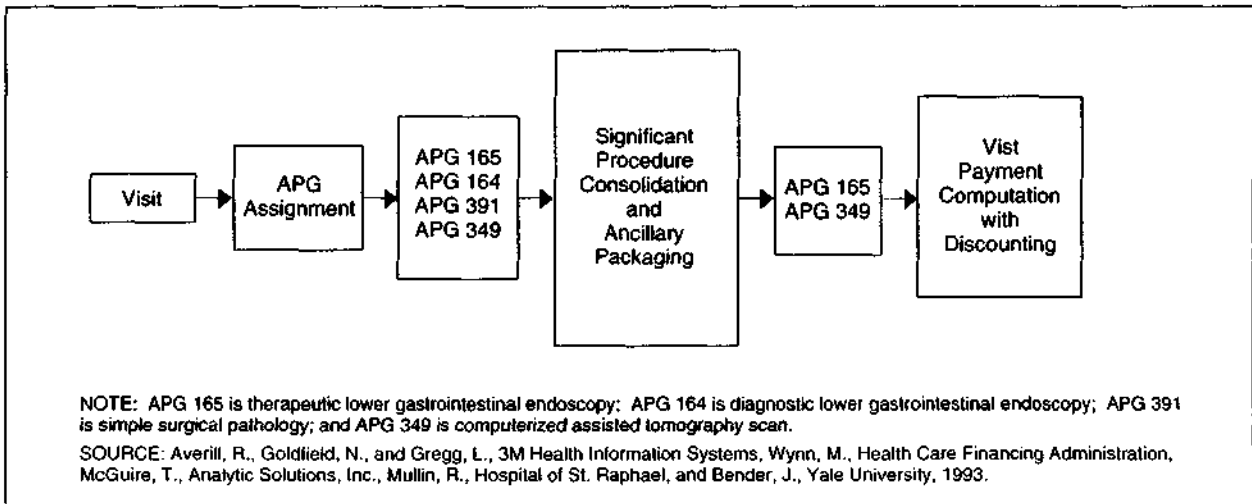
**Table 4**  
**Ancillary Ambulatory Patient Groups (APGs) Included in Uniform Packaging**

APG	APG Description
345	Obstetrical Ultrasound
351	Plain Film
365	Anesthesia
391	Simple Pathology
419	Simple Immunology Tests
421	Simple Microbiology Tests
423	Simple Endocrinology Tests
425	Basic Chemistry Tests
426	Simple Chemistry Tests
428	Multichannel Chemistry Tests
429	Simple Toxicology Tests
431	Urinalysis
434	Simple Clotting Tests
436	Simple Hematology Tests
439	Lithium Level Monitoring
440	Blood and Urine Dipstick Tests
443	Spirometry and Respiratory Therapy
447	Cardiogram
449	Simple Immunization
450	Moderate Immunization
452	Minor Gynecological Procedures
454	Minor Doppler and ECG Monitoring
455	Minor Ophthalmological Injections, Scrapings, and Tests
456	Vestibular Function Tests
457	Minor Urinary Tube Change
458	Simple Anoscopy
459	Biofeedback and Hypnotherapy
460	Provision of Vision Aids
461	Introduction of Needles and Catheter

NOTE: ECG is electrocardiogram.

SOURCE: Averill, R., Goldfield, N., and Gregg, L., 3M Health Information Systems, Wynn, M., Health Care Financing Administration, McGuire, T., Analytic Solutions, Inc., Mullin, R., Hospital of St. Raphael, and Bender, J., Yale University, 1993.

**Figure 3**  
**Ambulatory Patient Group (APG) Payment System**



- The opportunity for unbundling the units of service is greatly reduced.
- There is a financial incentive to use packaged-ancillary services efficiently.
- Multiple procedures during a visit are reasonably compensated but not excessively rewarded.
- Payment of medical visits is based on the type of patient treated and not on the level of the effort reported by the physician.

The structure of the APG payment model provides considerable flexibility. By modifying the level of significant procedure consolidation, ancillary packaging, and discounting, the incentives in the system can be altered in order to achieve specific policy objectives.

### APG PAYMENT SIMULATION

In order to evaluate the APG payment model, a payment simulation on historical Medicare data was performed. The objective of the APG payment simulation was to compute charge-based weights for each APG and to compare the APG-based payments with historical

Medicare charges. Historical charges provide a measure of the relative amount of hospital resources used to treat a patient during an outpatient visit. The Medicare inpatient PPS uses historical charges to compute the relative DRG payment weights. In general, differences in charges reflect differences in the hospital services provided. On a per claim basis, the APG payment simulation compares the total APG payment for a claim with the historical charge for the claim. The expectation is that the total APG payment will reflect the relative variation in historical charges. During the development of APGs, decisions were made on clinical grounds not to have APGs reflect certain differences in historical charging practices (e.g., differences in historical charges for setting a fracture with and without manipulation are not reflected in the APGs). Thus, there are differences between the APG payments and historical charges that are caused by intentional departures from historical charging practices. In addition, the combined payment effect of the aggregation of individual pro-

cedures and diagnoses into APGs, the significant procedure consolidation, the ancillary packaging, and the discounting will result in significant differences between the APG payment for an individual patient and the historical charges. The APG payment simulation computed a single set of national APG charge-based weights and compared the resulting APG payments with historical charges.

### **PAYMENT SIMULATION DATA BASE**

The data base used to evaluate the initial APG payment model was from the 2-week Medicare outpatient sample, consisting of all Medicare hospital outpatient claims with a date of service from the last 2 weeks in October 1988. The 1988 Medicare sample data was divided into two equal-sized random subsamples. The first subsample was used as one of the data bases analyzed during the development of the APG definitions. The second subsample was used in the APG payment simulation and contained 763,934 hospital outpatient claims.

An extensive editing process was developed in order to eliminate claims with errors, inconsistencies, or ambiguities. Examples of such edits were multiple visits on the same claim, invalid CPT-4 codes, and the inconsistencies in procedures and charges (e.g., anesthesia charges on a claim with no procedures, etc.). The edits were quite stringent and eliminated 28.3 percent of the claims from the analysis (216,529 claims).

Once the data were edited, the next step in the payment simulation was to define trim points in order to eliminate the extreme charge values from the computation of the average APG charge. In the computation of the inpatient DRG pay-

ment weights, claims with charges that were more than three standard deviations above the mean of the log of charges were eliminated. The outpatient data also contained claims with very low-charge values (e.g., near zero). Therefore, a data-trimming method was selected that trimmed both the extreme low and high values of charge. A non-parametric trimming method using the interquartile range of charges was selected (Andrews et al., 1972). A total of 5.39 percent of the edited claims were trimmed (29,600 claims). After editing and trimming, there were 517,805 claims used in the analysis data base.

In order to provide a comparison with the DRGs, a random sample of 1,021,811 Medicare inpatient discharges from 1988 was obtained. Using Version 7.0 of the DRGs (i.e., the fiscal year 1988 version), low- and high-charge trim points were computed using the same interquartile range trimming method that was applied to the APGs. A total of 4.42 percent of the claims in the inpatient data were trimmed.

### **COMBINATIONS AND FREQUENCY**

Table 5 summarizes, for the edited and trimmed data base, the number of claims and total charges for the three different types of claims. Although significant procedure claims constitute only 13.95 percent of the claims, they account for 52.73 percent of the charges. Conversely, although ancillary-only claims constitute 54.21 percent of the claims, they account for only 27.47 percent of the charges.

Using the edited and trimmed data, the coefficient of variation of charges for each APG was computed. Table 6 shows a comparison of the weighted coefficient of variation of charges across the differ-



**Table 5**  
**Number and Percent of Claims, Total Charges, and Percent of Charges, by Type of Ambulatory Patient Group (APG) Claim**

APG Claim	Number of Claims	Percent of Claims	Charges in Millions	Percent of Charges
Significant Procedure Claims	72,251	13.95	\$57.24	52.73
Medical Claims	164,857	31.84	21.50	19.80
Ancillary Claims	280,697	54.21	29.82	27.47

SOURCE: Averill, R., Goldfield, N., and Gregg, L., 3M Health Information Systems, Wynn, M., Health Care Financing Administration, McGuire, T., Analytic Solutions, Inc., Mullin, R., Hospital of St. Raphael, and Bender, J., Yale University, 1993.

ent types of APGs and DRGs. The weighted coefficient of variation is computed by weighting the coefficient of variation of each APG (or DRG) by the percent of claims in that APG (or DRG) and summing across all the APGs (or DRGs). As can be seen from Table 6, the weighted coefficient of variation of charges for the APGs is comparable with the weighted coefficient of variation of charges for the DRGs. The weighted coefficient of variation of charges for trimmed data for procedure claims is 0.56 for both APGs and DRGs. For medical claims, the weighted coefficient of variation is 0.85 for APGs and 0.66 for DRGs. The probable reason for the medical APGs having a higher weighted coefficient of variation compared with the medical DRGs is that the packaged ancillaries constitute a large proportion of the total charge of a medical visit.

Using the edited and trimmed data, the charge-based weights for each APG were computed. The charge-based weights are expressed in dollars and are a measure of the relative historical charges associated with each APG. Although the charge-based weights are expressed in dollars, they do not represent actual payment amounts that would be based on actual costs. Historical outpatient hospital charges are approximately 42 percent higher than historical outpatient hospital cost (Miller and Sulvetta, 1990). Thus, the charge-based weights represent relative amounts and are not representative of actual APG payment levels for Medicare. The charge-based weights are divided into the direct portion of the APG payment and the portion that results from the ancillary packaging. The direct portion of the APG charge-based weight consists of the charge for the procedure or medical

**Table 6**  
**Weighted Coefficient of Variation and R<sup>2</sup> of Charges for Ambulatory Patient Groups (APGs) Claims and Diagnosis-Related Groups (DRGs) Claims**

APG Claims	Weighted Coefficient of Variation				R <sup>2</sup>			
	APGs		DRGs		APGs		DRGs	
	Untrimmed	Trimmed	Untrimmed	Trimmed	Untrimmed	Trimmed	Untrimmed	Trimmed
Significant Procedure Claims	0.73	0.56	0.95	0.56	0.52	0.74	0.22	0.46
Medical Claims	1.40	0.85	1.07	0.66	0.18	0.38	0.21	0.41
Significant Procedure and Medical Claims Combined	1.23	0.78	1.04	0.63	0.58	0.79	0.27	0.50
Ancillary Claims	1.30	0.54	—	—	0.67	0.81	—	—

SOURCE: Averill, R., Goldfield, N., and Gregg, L., 3M Health Information Systems, Wynn, M., Health Care Financing Administration, McGuire, T., Analytic Solutions, Inc., Mullin, R., Hospital of St. Raphael, and Bender, J., Yale University, 1993.

visit itself plus the charges for additional items such as pharmacy and medical surgical supplies. The average charge-based weight and percent packaged for each APG are summarized in Table 7.<sup>2</sup>

The significant procedure APGs have average charge-based weights that are more than six times higher than the average charge-based weight for the medical APGs. The medical APGs have a much higher percentage of the APG charge-based weight from packaged ancillaries than the significant procedure APGs (i.e., 32.31 percent versus 11.83 percent, respectively). The low percent of the charge-based weights associated with the packaged ancillaries indicates a relatively low financial risk to hospitals resulting from the packaging of ancillaries. Across the APGs with at least 100 claims, the APG with the highest percent of the APG charge-based weight from packaged ancillaries is the medical APG for pneumonia (APG 783) at 54.51 percent. The high percent of packaged ancillaries associated with pneumonia is the result of the packaging of the chest X-ray and the simple laboratory tests that are usually performed for a pneumonia patient. The top 23 APGs in terms of the percent of the charge-based weight from packaged ancillaries are all medical APGs. The high percent of the charge-based weight from packaged ancillaries for medical patients is primarily the result of the relatively low payment for a medical claim. Across the APGs with at least 100 claims, the APG with the lowest percent of the APG charge-based weight from packaged ancillaries is the significant procedure APG for simple laser eye procedures at 0.3 per-

**Table 7**  
**Average Charge-Based Weight and Percent, Packaged by Type of Ambulatory Patient Group (APG) Claim**

APG Claim	Average Charge-Based Weight	Percent Packaged
Significant Procedure Claims	\$750.10	11.83
Medical Claims	117.51	32.31
Significant Procedure and Medical Claims Combined	305.11	26.24
Ancillary Claims	46.75	0.0

SOURCE: Averill, R., Goldfield, N., and Gregg, L., 3M Health Information Systems, Wynn, M., Health Care Financing Administration, McGuire, T., Analytic Solutions, Inc., Mullin, R., Hospital of St. Raphael, and Bender, J., Yale University, 1993.

cent. The 17 APGs with the lowest percent of the charge-based weight from packaged ancillaries are all significant procedure APGs. The charge-based weights are quite consistent with expectations. The APGs with the highest charge-based weight are low-volume significant procedure APGs involving expensive medical surgical supplies or equipment (e.g., pacemaker replacement). The significant procedure APGs with the lowest charge-based weights were therapy APGs (e.g., physical therapy). The medical APG for major SSFs had more than double the average charge-based weight of the next highest medical APG. For ancillary service APGs, the APGs with the highest charge-based weights were the radiological tests using expensive equipment (e.g., MRI). Laboratory tests tended to have relatively low charge-based weights (e.g., urinalysis had the lowest charge-based weight).

Although, in general, the charge-based weights are consistent with clinical expectations, there are several results that were unexpected. For example, the APG for skin and integument grafts had a lower charge-based weight than the APG for complex skin repairs. This result was

<sup>2</sup>A complete list of all the charge-based weights is available upon request from the authors.

unexpected because the cost of obtaining the grafts is included in the charge-based weight for the skin and integument grafts APG. These two APGs are clinically quite distinct and need to be maintained as separate APGs. The consistency of the charge-based weights with clinical expectations demonstrates that the procedure and diagnostic coding on ambulatory claims is reasonably reliable.

None of the discrepancies observed was significant enough to cause any reconsiderations of the definition of any of the APGs. As more accurate data are collected and used to compute APG charge-based weights, the APGs should conform more closely to clinical expectations. The relatively minor discrepancies are not surprising, because the APG charge-based weights represent the first attempt to use historical Medicare procedure, diagnostic, and charge information to compute prospective charge-based weights. Indeed, the initial DRG payment rates used in the first 2 years of PPS contained several discrepancies (*Federal Register*, 1983). For example, for five pairs of DRGs, patients with a complication or comorbidity had a lower payment weight than those without. Once the DRG payment rates were recomputed with more accurate data, all the discrepancies were eliminated. The experience with the DRGs emphasizes the importance of relying on clinical expectations when developing the initial version of a patient classification system.

## **PAYMENT SIMULATION STATISTICAL RESULTS**

For each claim, a total APG payment was computed. The relationship between the historical charge and the total APG

payment was compared using a least-squares regression ( $R^2$ ). A least-squares regression measures the ability of the total APG payment amount to predict the historical charge and provides a measure of the amount of variance in charges explained by the APG cost model.

The Medicare inpatient data was used to compute the  $R^2$  for the DRGs. In the payment model used for the DRG analysis, the payment for each patient was computed as the average charge for the DRG to which the patient was assigned. In the computation of the  $R^2$  for both the APGs and DRGs, the payment amount computed for each claim is unadjusted for wage-rate difference or other factors that can affect hospital costs. The resulting  $R^2$  for the APGs and DRGs are shown in Table 6.

The  $R^2$  for DRGs for untrimmed charges is comparable to the results previously reported in the literature. For example, in a Yale University report the  $R^2$  for DRGs for untrimmed charges for Medicare data was reported as 0.28 (Fetter et al., 1989).

The  $R^2$  obtained for trimmed data for procedure and medical claims for the APGs was higher than for the DRGs (0.79 for APGs versus 0.50 for DRGs). For procedure claims, the APGs had a much higher  $R^2$  than the DRGs (0.74 for APGs versus 0.46 for DRGs). For medical claims, the DRGs had a slightly higher  $R^2$  than the APGs (0.38 for APGs versus 0.41 for DRGs).<sup>3</sup> Thus, based on  $R^2$ , the APGs

<sup>3</sup>The  $R^2$  for the procedure and medical claims combined is higher than either the procedure or medical claims separately. This is caused by the fact that the charges for procedure claims are much higher than the medical claims. Thus, the medical claims and procedure claims form disjoint sets. When the medical and procedure APGs are pooled together, the linear relationship between payments and charges is strengthened.

have stronger association between payments and historical charges than DRGs. The ancillary only claims have a high  $R^2$  (0.81).

In general, the APGs perform well compared with DRGs. Indeed, for  $R^2$  on trimmed data, which is the most commonly reported statistic, the APGs have an  $R^2$  that is 58 percent higher than the DRGs (0.79 for APGs versus 0.50 for DRGs).

## IMPLEMENTATION ISSUES

The APG patient classification system and the APG payment model provide the framework for a hospital outpatient PPS. However, there are a series of additional issues that must be addressed as part of the implementation of an APG-based PPS:

- *Volume of Visits.* In any visit-based system, hospitals can increase revenue by increasing the number of visits. Under the existing Medicare payment system an increase in visits will increase hospital revenue. A change to a visit-based PPS does not create a new financial incentive to increase visits.
- *Upcoding and Fragmentation of Procedure Codes.* Although the APGs were developed to minimize the opportunities for upcoding, as with DRGs, there will need to be monitoring of hospital coding practices. Fragmentation of procedure codes occurs when a single procedure is reported using multiple procedure codes. The significant procedure consolidation should virtually eliminate the possibility of increasing payments by the fragmentation of procedure codes.
- *Shift of Ancillaries to Non-Hospital Settings as a Result of Ancillary Packag-*

*ing.* In the APG payment model, most of the routine ancillary tests are included as part of the uniform packaging of ancillary services. As a result, hospitals have the incentive not to provide the ancillary services directly but to send the patient to a non-hospital setting for the ancillary tests. The non-hospital facility could then bill Medicare separately for the ancillary tests. However, under OBRA 1986, hospitals are required to provide directly or arrange for all services furnished while the patient is registered as an outpatient and are responsible for diagnostic procedures or tests provided outside the hospital ordered as a result of the outpatient encounter. Full implementation of this provision is necessary under a packaged APG system.

- *Computation of Prospective Payment Rates.* Historical charges were used to compute an initial set of APG charge-based weights. Consideration needs to be given to computing some or all of the APG charge-based weights based on actual resource use instead of historical charges.
- *Hospital-Specific Payment Adjustments.* The inpatient PPS adjusts the DRG payment levels for hospitals based on hospital-specific factors such as labor costs and teaching status. In addition, the inpatient PPS provides outlier payments for high-cost patients. An evaluation of whether such adjustments are necessary in an APG-based outpatient PPS is currently in progress.
- *Coding System Changes.* The APGs are based on CPT-4 codes and ICD-9-CM diagnosis codes. Any limitations in the coding systems will therefore directly affect the APGs. SSFs are important factors in determining the re-

sources used in an ambulatory encounter. The ICD-9-CM codes for SSFs are imprecise and, therefore, can only be used on a limited basis in the APGs. In addition, in the areas of mental illness, drug abuse, and rehabilitation, the diagnostic information is of only limited value. In these areas, the coding of functional health status needs to be evaluated.

- *Update Process.* Continued development of the APGs is needed. For example, improvements in the diagnostic coding for rehabilitation and mental illness patients are needed in order to allow the APGs to reflect the cost of care in these areas. An ongoing update process for the APGs will be necessary.

## CONCLUSIONS

A visit-based APG PPS can provide a useful system for the payment of the facility component of hospital-based outpatient care. The structure of the APG payment model provides considerable flexibility. The level of significant procedure consolidation, ancillary packaging and discounting can be altered in order to change the incentives in the system and achieve specific policy objectives.

The APGs form a manageable, clinically meaningful set of patient classes that relate the attributes of patients to the resource demands and associated costs experienced by a hospital outpatient department. As coding rules change, as more accurate and comprehensive data are collected, or as medical technology or practice changes, the APG definitions can be modified to reflect these changes. Together the APG patient classification and the APG payment model constitute a

flexible framework for establishing an outpatient PPS.

## ACKNOWLEDGMENTS

This research represents a 2-year project that involved the participation of many individual contributors. Nearly 100 clinicians, hospital administrators, regulators, and researchers provided valuable input into the research. Project consultants Robert Fetter, Gerald Doherty, and Donn Duncan, and the Technical Advisory Panel, consisting of Henry Bachofer, Donna Melkonian, Stuart Baker, Paula Eleazar, Henry Miller, Diane Murdock, Nancy Merrick, Karen Lloyd, Bettye Newton, and Harry Wong, provided ongoing clinical and methodological consultation during the project. Outside researchers Joanna Lion and Alan Malbon from Brandeis University, Margaret Sulvetta, Mark Miller, and Colin Flynn from The Urban Institute, Paul Tenan and Herbert Filmore from the New York Department of Health, and James Vertrees and Donna Mahoney from Solon Consulting Group, Inc., provided independent evaluations of the research. The following HCFA staff provided ongoing review and evaluation of the research: Joseph Cramer (Project Officer), Vivian Braxton, Patricia Brooks, Mary Cooper, Ann Fagan, William Goeller, Michael Hupfer, Mel Ingber, Mary Kenesson, Ann Manley, George Morey, Joan Sano, Janet Shermer, Nancy Siebert, Frank Spruill, Thomas Talbott, and Janet Wellham. Barton McCann of HCFA provided clinical review of the research. Data analysis support for the project was provided by Gregory Tsipenyuk, Ananth Rao, and Yvette Wang.

## REFERENCES

- American Medical Association: *Physician's Current Procedural Terminology, Fourth Edition*. Chicago, 1977.
- Andrews, D.F., Bickel, P.J., Hampel, F.R. et al.: *Robust Estimates of Location*. Princeton, NJ. Princeton University Press, 1972.
- Coulam, R.F., and Gaumer, G.L.: Medicare's Prospective Payment System: A Critical Appraisal. *Health Care Financing Review* 1991 Annual Supplement. Pp. 45-47, March 1992.
- Federal Register*: Medicare Program; Prospective Payments for Medicare Inpatient Hospital Services; Interim Final Rule with Comment Period. 48(17), 39876-39886. Office of The Federal Register, National Archives and Records Administration. Washington. U.S. Government Printing Office, September 1, 1983.
- Federal Register*: Medicare: Update of Ambulatory Surgical Center Payment Rates; Additions and Deletions; Notice. Vol. 56, No. 251, 67666-67707. Office of The Federal Register, National Archives and Records Administration. Washington. U.S. Government Printing Office, December 31, 1991.
- Fetter, R.B., Freeman, J., Park, H. et al.: *DRG Refinement with Diagnostic Specific Comorbidity and Complications: A Synthesis of Current Approaches to Patient Classification Final Report Volume I*. Yale University, New Haven. February 1989.
- Fetter, F.B., Averill, R., Lichtenstein, J.L. et al.: Ambulatory Visit Groups: A Framework for Measuring Productivity in Ambulatory Care. *Health Services Research* 19(4):415-437, 1984.
- Health Care Financing Administration: *Medicare: Estimated Hospital Insurance Disbursements, Fiscal Years 1967-1989*. Division of Medicare Cost Estimates, Office of the Actuary. Washington. U.S. Government Printing Office, March 1990a.
- Health Care Financing Administration: *Medicare: Estimated Supplemental Medical Insurance Disbursements, Fiscal Years 1967-1989*. Division of Medicare Cost Estimates, Office of the Actuary. Washington. U.S. Government Printing Office, March 1990b.
- Hsiao, W.C., Braun, P., Yntema, D. et al.: Estimating Physicians' Work for a Resource-Based-Relative-Value Scale. *New England Journal of Medicine* 319(13):835-41, September 29, 1988.
- Helbing, C., Latta, V., and Keene, R.: Hospital Outpatient Services under Medicare. *Health Care Financing Research Brief*. Number 87-4. Health Care Financing Administration, Office of Research and Demonstrations. Baltimore, MD. 1987.
- Kahn, K., Rubenstein, L., Draper, D. et al: The Effects of the DRG-Based Prospective Payment System on Quality of Care for Hospitalized Medicare Patients. *Journal of the American Medical Association* 264(15):1953-1997, October 17, 1990.
- Kelly, W., Fillmore, H., Tenan, P. et al: The Classification of Resource Use in Ambulatory Surgery: the Products of Ambulatory Surgery. *Journal of Ambulatory Care Management* 13(1):55-64, 1990.
- Latta, V.: Medicare: Use and Cost of Hospital Outpatient Services. *Health Care Financing Research Brief*. Number 87-4. Health Care Financing Administration, Office of Research and Demonstrations. Baltimore, MD. 1987.
- Miller, M.E., and Sulvetta, M.: *Medicare Hospital Outpatient Department Services: A Descriptive Analysis*. Urban Institute Working Paper 3725-01-03. Urban Institute. Washington, DC. August 1990.
- Prospective Payment Assessment Commission: *Medicare Prospective Payment for Hospital Outpatient Surgery: The Views of the Prospective Payment Assessment Commission*. Washington, DC. April 1989.
- Public Health Service and Health Care Financing Administration: *International Classification of Diseases, 9th Revision, Clinical Modification*. DHHS Pub. No. 80-1260. Public Health Service. Washington. U.S. Government Printing Office, September 1980.
- Relative Value Studies, Inc.: *Relative Values for Physicians*. New York. McGraw-Hill, 1984.
- Russell, L.: *Medicare's New Hospital Payment System*. The Brookings Institution, Washington, DC. 1989.
- Schneeweiss, R., Rosenblatt, R., Cherkin, D. et al.: Diagnosis Clusters: A New Tool for Analyzing the Content of Ambulatory Medical Care. *Medical Care* 21(1):1363-1370, 1983.
- Tenan, P., Fillmore, H., Caress, B. et al.: PACs: Classifying Ambulatory Care Patients and Services for Clinical and Financial Management. *Journal of Ambulatory Care Management* 11(3):36-53. 1988.

---

Reprint requests: Richard F. Averill, 3M Health Information Systems, 100 Barnes Road, Wallingford, Connecticut 06492.