

The IBM Outpatient Event Grouping: Analytic need, business applications and methodology



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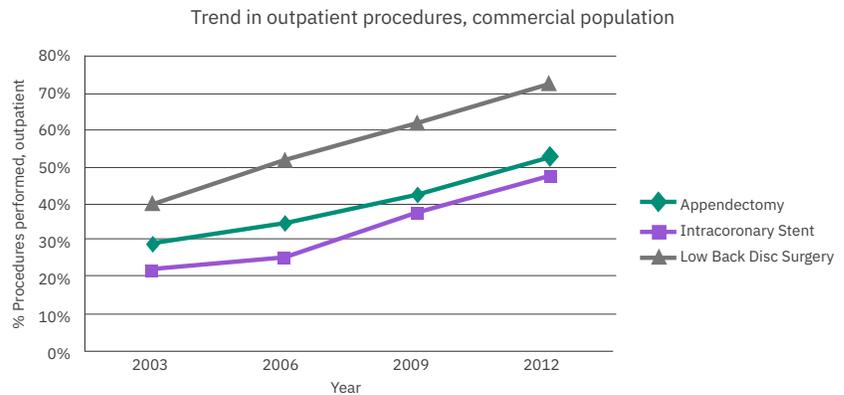
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Introduction

Advancements in less invasive surgical techniques and anesthesia, together with payment policies that encourage outpatient care, have resulted in significant shifts in surgical (and other major invasive) procedures from an inpatient to an outpatient setting. Procedures that previously required general anesthesia and/or overnight hospitalization are now often done with minimal sedation, allowing the patient to return home the day of the procedure.

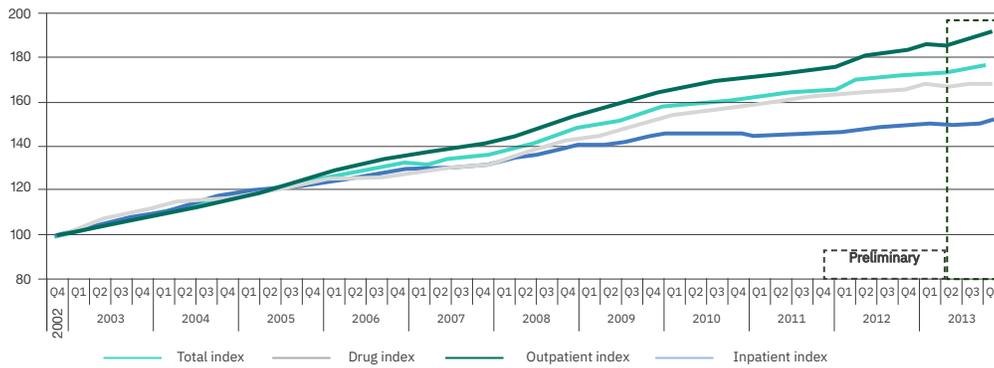
Nationally, the rate of surgeries performed in an outpatient versus inpatient hospital setting grew from 16 percent in 1980 to 63 percent in 2005.¹ An example of this trend can be seen in the IBM® MarketScan® Data (Figure 1 below), which shows a distinct increasing trend in outpatient delivery of three common surgical procedures—appendectomy, coronary stent insertion and low back disc surgery.

Figure 1: Trend in three common surgeries (IBM MarketScan Data)



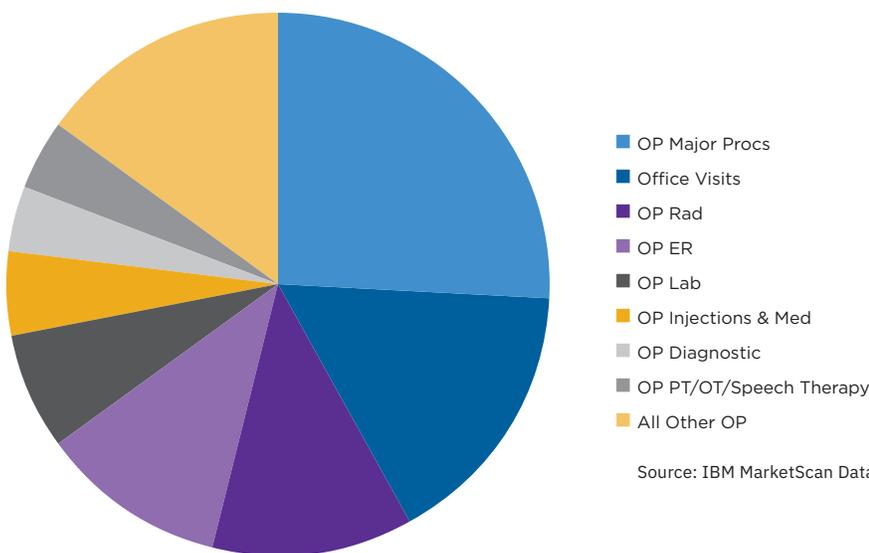
At least partly as a result of these trends in surgical care, a more significant portion of overall healthcare spending is occurring in the outpatient setting. From 2003 to 2012, the fastest growing rate of healthcare payments was in the outpatient setting² (Figure 2).

Figure 2: Watson Health spending index



In recent years, the largest component of outpatient payments were centered around major procedures (those requiring anesthesia or specific treatment rooms), followed by office visits, then radiology³ (Figure 3). Consequently, the ability to measure and monitor these major outpatient procedures and radiology services has become an area of increasing interest for healthcare organizations.

Figure 3: 2012 Outpatient Payment (OP) distribution



Overview of OPEG

The IBM® Outpatient Event Grouper (OPEG) is the proprietary outpatient event grouping methodology of IBM Watson Health. It is a methodology that relies on statistical relationships, as well as clinical rules, to create distinct outpatient “events” out of administrative claims data. Each event represents a single encounter between a patient and the healthcare system for a major outpatient procedure (a surgical, nonsurgical invasive or major imaging procedure). Each event incorporates all services that were part of that specific encounter, including both the facility and professional care elements (Figure 4).

Figure 4: Schematic representation of a simple outpatient surgical event

Outpatient Surgical Event					
Professional Services			Facility Services		
Anesthesia Claim	Surgeon Claim	Pathologist Claim	Outpatient Hospital Claim		
Anesthesia Services	Surgical Services	Pathology Services	Operating Room Services	Recovery Room Services	Supplies

OPEG was developed and is maintained according to the following core principles:

- **An event represents a single outpatient encounter with the healthcare system, from the patient’s perspective.** Even if a patient requires multiple procedures as part of one “visit” to the provider, that is still considered one event. If the patient actually left the provider site and returned at a different time, that would conceptually represent a new event.
- **An event may consist of both professional and facility claims.** Not all events require both types of components, but when they exist, they should always be included in a single event.
- **More than one event can occur on the same date.** Because events occur in an outpatient setting, an event grouper must account for the possibility of more than one event on a single date.
- **An event may span dates.** For example, if the patient is kept overnight for observation, or if an Emergency Department (ED) visit spans past midnight, this is still considered a single event.
- **A single claim can be assigned to only one event.** Although there are situations where certain claim lines may not appear to have a definitive relationship to the event, a claim cannot be only partially included in an event due to the difficulty of allocating the claim’s financial information appropriately.
- **A combination of two major procedures may represent a significantly different type of event than either of the procedures alone, and should be separately identified.** For example, a patient having only a colonoscopy is likely being treated for a different condition than a patient having a colonoscopy and an upper gastrointestinal (GI) endoscopy during the same encounter. The former typically represents a diagnostic test for colon cancer, while the latter often represents a patient with internal bleeding of unknown origin.

– **Any claims-based grouper should recognize and accommodate claims data quality issues.**

Every effort should be made to accommodate common quality issues, including missing data elements and inconsistent coding across providers.

– **In the outpatient setting, physician providers are more likely to provide reliable diagnosis and procedure information than their facility counterparts.**

In situations of coding inconsistency, preference will be given to the primary physician performing the procedure.

In this white paper, we will describe the most typical applications of OPEG. We will also explain the OPEG methodology, including both the statistical underpinnings and the functional algorithm used to define events.

OPEG business applications

By creating a single unit of analysis for each major event, OPEG enables analyses that would be difficult, if not impossible, to perform using raw claims data alone. Grouping claims data into events provides the ability to analyze trends and variation for specific event types.

Analysts are able to quickly answer questions regarding the frequency, type, site, price, trend and variation in procedures across a population. Utilization and price can be analyzed by patient characteristics (for example, geographic location, benefit plan, age/gender), but also by key event attributes assigned by OPEG. These event attributes include the type of setting in which the event occurred, the primary physician performing the event, the facility utilized, the number of distinct providers involved and the number of major procedures performed as part of the event.

The ability to understand and quantify the price components and variation for each event can answer the following business questions:

**Do segments of my population undergo major procedures at a significantly different rate?
What are the financial implications of this?**

Organizations managing large patient populations often see wide variation in behavior across different segments of their population, especially populations that have vastly different coverage options or are geographically dispersed. This type of variation analysis is of particular interest when analyzing procedures that are considered “preference-sensitive,” that is, elective in nature (versus representing a clear medical best practice).

For example, a surgical approach in treating back disorders has historically been subject to controversy since the value of this approach has not been clearly demonstrated. A recent Dartmouth Atlas study reported that Medicare patients in Casper, Wyo., were more than seven times more likely to undergo back surgery than patients in Honolulu, Hawaii.⁴ Although this data

reflected inpatient treatment only and was specific to Medicare enrollees, it is reasonable to assume that as much or more variation occurs across less invasive outpatient procedures and also exists within the commercially insured population. The ability to measure any differences of this nature, and to quantify the financial impact, will help inform an organization as to what type of action might be appropriate.

Should I be directing my patient population to particular care settings?

The majority of significant outpatient procedures are performed in one of three locations: a physician's office, a hospital outpatient department, or an Ambulatory Surgery Center (ASC). The site of service contributes significantly to the allowable payment. Total payment for procedures performed in offices is typically lower than for those performed in ASCs, which is typically lower than for those performed in outpatient hospital settings. However, hospital-owned and -operated ASCs do not always offer a savings over hospital outpatient units.

In addition, considerable controversy exists as to whether ASCs tend to treat less severe patients, making them appear to be more efficient and resulting in higher profitability than outpatient hospital units.^{5,6,7} The ability to easily assess the frequency of various setting use and the associated price difference can help an organization determine if a patient population (or a subset of the patient population) should be encouraged to utilize specific care settings.

What is an appropriate/fair price for this type of procedure?

Innovations in payment arrangements often include the need to quantify an appropriate average price for a particular procedure. These price estimates must include all components of the procedure, both facility and professional, to be effective. OPEG events provide the foundation for such "reference-based" pricing calculations.

In addition, OPEG allows identification of outlier cases to be excluded from such estimates as desired. These types of price estimates can also serve as the foundation for bundled payment arrangements for which a major procedure is typically the trigger. Understanding the price of the triggering event is the first step in creating an appropriate bundled price.

Who are the most cost-effective providers for this type of procedure?

Even within a particular type of setting, variation in price by individual provider can be significant. The Center for Medicare & Medicaid Services (CMS) recently publicized the payment rates for several hospital outpatient procedures, showing significant differences in payment (and even more significant differences in submitted charges). For example, payment to a hospital for an outpatient "Level I Nerve Injection" ranged from \$100 to \$250, while the corresponding submitted charges ranged from \$175 to over \$5,000.⁸ Considering that this represents payment for a very specific set of CPT® (Current Procedural Terminology) codes, the variation is likely far more significant for major surgical procedures requiring multiple sub-procedures.

While the type of facility (for example, teaching hospital versus community hospital) affects charges and payments, other differences may be due to the preferred treatment protocol at a particular facility (for example, whether all sedation requires oversight by an anesthesiologist).

Finally, the rate at which certain procedures are performed on an inpatient versus outpatient basis can also vary significantly across facilities. For example, analysis by IBM Watson Health showed that in 2010, the percentage of percutaneous coronary intervention (PCI) services performed on an outpatient basis averaged 40 percent nationally, but ranged from as low as 5 percent to as high as 85 percent by specific hospital facility.⁹

Understanding which providers are the most cost-effective can assist organizations in negotiating payment arrangements, as well as encouraging specific provider utilization by their patients.

What trends are apparent over time?

OPEG enables analysis of both utilization and price trends over time. The ability to measure the total price of an event as well as viewing the components of that price (for example, facility versus professional) can help quickly identify aberrant trends for various procedure types. In one pilot study, IBM Watson Health found that for a particular customer, the rate of reimbursement for outpatient low back disc surgery had more than doubled in three years, and was, in fact, approaching the price of an inpatient low back disc surgery. This is a perfect example of finding a “signal within the noise” of outpatient care that might otherwise be overlooked.

OPEG logic

A simplistic approach to aggregating outpatient claim service records into an event would include all outpatient services that occurred on a given patient day in a given place of service. The OPEG algorithm provides more accurate results by separating encounters that occur on a given day, but show very low probability of being related, and also by including service records on adjacent days that meet certain probability thresholds for inclusion. In addition, OPEG takes into consideration common claim coding issues, such as inconsistent site of service, procedural and diagnostic information.

The OPEG methodology addresses four main limitations often encountered when performing analyses on outpatient administrative data:

1. Multiple claim records from multiple providers for a single event. A single healthcare event can result in multiple claim records being generated. OPEG combines the various claims into one event and determines the diagnostic and procedural information that most accurately describes the event.
2. Inconsistency in the quality of claims data. Claims data is notorious for being “messy,” particularly when being obtained from multiple sources with varying degrees of quality control. Claims with quality issues, such as missing or invalid procedure codes, inaccurate places of service, missing diagnosis codes, etc., all lead to complications when performing any analysis. Because OPEG was designed using samples containing millions of actual medical claims, it is able to identify and accommodate situations where improper data is common.
3. Ability to identify multiple events on the same day. Perhaps one of the most difficult aspects of analyzing outpatient care is the fact that patients are not confined to a single location and may, in fact, receive various types of care in different settings on a given day. Conversely, a patient’s outpatient service may actually span more than one day, particularly in the case of ED visits or hospital outpatient major surgeries with observation room care. These nuances prevent the assumption of the relatively simple rule that “everything on a given day is related to one and only one outpatient event.” OPEG includes sophisticated, statistically driven logic that allows for the identification of disparate events on a single day and/or the identification of events that span more than one day.
4. Combinations of procedures related to one event. A complex medical procedure rarely results in a single procedure code. The ability to identify which procedure codes represent “major” procedures, and to then include any related lesser procedures, is a key strength of the methodology. In addition, the OPEG logic understands that when multiple major procedures are performed during the same event, the event may have a significantly different price profile than if either procedure was performed alone. OPEG includes logic that identifies procedure pairings and labels them as combination events rather than simply considering them a typical procedure in either category. This enables the analyst to exclude these combination procedures from analysis or to focus analysis on just the combination procedures when desired.

Grouping algorithm

Events are constructed by first identifying all claims for a patient during a given time period, then organizing these claims into distinct events. The time period unit of analysis is a “dateblock,” which represents a series of up to three consecutive days, each of which includes at least one outpatient encounter, for the same patient. The following points briefly describe the algorithm applied within each dateblock:

- Trigger: An event is triggered by the presence of a major procedure. The most significant procedure is identified based on the hierarchy of IBM Watson Health Procedure Groupings (see Appendix).
- Assignment: Claim lines for the same patient/dateblock are added to the event based on the likelihood that they are part of the same procedure.
- This likelihood is based on both observed statistical relationships, as well as the particular circumstances surrounding the event. For example, if the event represents a major surgery that took place in a facility, the decision logic is more inclusive in nature for services on the same day, based on the assumption that a patient is unlikely to have other events on the same day. In contrast, if the event is a simple MRI (magnetic resonance imaging), the logic may be less inclusive, since there is a greater chance that the patient would have other care on the same day.
- Each claim line is evaluated individually to determine if it should become part of the event.
- Claims with procedure codes will be added to an event based on their procedure group and its relationship to the anchor record’s procedure group.
- Claims without procedures can be joined to an event based on their disease category (see Appendix).
- Facility claims without procedure codes can be included in an event based on their revenue codes.

- In certain situations, claims with the same provider as another claim already included in the event may also be joined to the event.
- After all claims have been evaluated for inclusion in the event, any remaining claims are reviewed to determine if another significant procedure occurred during the dateblock. If an unassigned major procedure is found, another event will be triggered and any remaining unassigned claims will be evaluated for inclusion in the new event. This process is repeated until no unassigned major procedures remain within the dateblock.

Summary

In this paper, we have described the analytic need for OPEG, outlined the most typical business applications of OPEG and explained the methodology used to build events. We have explained the strong statistical underpinnings of OPEG and how the functional algorithm accommodates both the strengths and weaknesses of administrative claims data. Additional information about OPEG can be obtained from IBM Watson Health.

Appendix

Classification systems

Two proprietary classification systems are utilized within OPEG: IBM Watson Health HCPCS (Healthcare Common Procedure Coding System)/CPT-4® Procedure Groupings and Disease Staging categories.

Procedure groups

IBM Watson Health HCPCS/CPT-4 Procedure Groupings are a proprietary categorization schema that groups all HCPCS/CPT procedure codes into approximately 1,000 prioritize groupings. These procedure groupings are the foundation of OPEG.

Every event built includes a particular procedure group as its anchor. The most significant procedure for a patient on a given day is determined by the priority of the procedure groups present. All other claims brought into the event are included based on their relationship to the anchor procedure group. For a list of all events, please contact IBM Watson Health.

Disease staging categories

The IBM Watson Health Disease Categories are a diagnosis grouping schema defined by Disease Staging. There are approximately 600 disease categories (DxCats), organized by body system, which encompass all ICD-9/10 diagnosis codes.

Within OPEG, each individual diagnosis code on an outpatient claim maps to one DxCat. The DxCats are then used in the OPEG matching logic by their association with various procedure groups.

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About IBM Watson Health

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For more information on IBM Watson Health, visit: ibm.com/watsonhealth

Footnotes

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