

INGENIX[®]

Symmetry PEG

Understanding the Cost and Quality of Surgical Procedures: Using Symmetry[™] Procedure Episode Groups[™]

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Introduction

Health care organizations are focused on measuring the cost and quality of health care as a way to improve patient outcomes and overall value of services. Surgical procedures represent a significant driver of overall health care costs; therefore understanding the costs and quality of these procedures can help identify areas where value can be improved.

Historically, assessing the cost and quality of procedural care has been focused on the procedure itself, primarily the same-day services performed or the hospital stay. This approach presents measurement challenges because, while a significant portion of procedural care occurs on the day of a surgery, equally important services happen before and after the procedure such as physical therapy, additional procedures, and patient visits.

Indicators of quality also occur outside the surgical event, such as complications, re-operations, and the delivery of appropriate follow-up. In order to support valid measurement of procedural care, a broader perspective that considers all care related to a procedure is required.

Ingenix Symmetry™ *Procedure Episode Groups*™ (PEG™) provides a sophisticated method that enhances the measurement of procedural care. PEG is grouper software that identifies a unique procedure event as well as the related services performed before and after that procedure, creating a unit of analysis called a *procedure episode*. Procedure episodes describe not only the surgery itself, but the entire sequence of care, including workup and therapies prior to the procedure and post-op activities such as repeated surgery and patient follow-up.

This white paper provides an overview of the value Ingenix PEG can offer in understanding and measuring procedural care beginning with a brief description of the PEG approach, followed by examples of using PEG to support measurement.¹

¹ A more detailed description of the PEG methodology can be found in the Ingenix Symmetry white paper, *Ingenix Symmetry PEG: Assessing Surgical Specialists with Value-based Measurement*, available on the Ingenix Symmetry website.

Procedure Episode Grouping

PEG uses information readily available from administrative claims and encounter data to identify unique procedure episodes and the medical and pharmacy services related to those episodes. PEG episodes are constructed using three key steps:

- 1) Identifying *anchor* procedures around which episodes will be built;
- 2) Building the episodes by identifying and gathering services to, or *grouping* to, an anchor; and
- 3) Limiting service identification to an appropriate *time frame*.

Fully defined episodes are categorized in terms of the clinical nature of the procedure performed and whether or not the episode is complete. Additional information about the episode is also provided, including the provider responsible for care.

Identifying Anchor PROCEDURES

PEG episodes are initiated by procedures, called *anchors* that are performed by a clinician as treatment for a condition. Anchors are identified using the procedure codes recorded on medical service encounters and claims.

Almost 200 anchor categories are defined by PEG and used to aggregate clinically related procedures into unique therapeutic events. Each PEG anchor category belongs to a PEG Practice Category (PPC), which describes the body system corresponding to the procedure, for example, Cardiology, Ophthalmology, and Orthopedics.

Not every procedure qualifies as an anchor. For example, an anchor must be performed by a physician in an appropriate clinical specialty facility and the procedure must be related to the treatment of a relevant clinical condition. To do this, PEG uses information from Symmetry Episode Treatment Groups® (ETG®) to qualify a pertinent procedure to serve as an anchor—the service must be assigned to a clinically

relevant ETG. Finally, only one anchor procedure can occur on the same day within a PEG practice category. In the event that more than one procedure is observed, a hierarchy is employed to select the most appropriate anchor.

CONSTRUCTING PROCEDURE EPISODES

Once a PEG anchor is identified, *eligible search windows* gather claims to the episode. These windows are created using a defined number of days before and after a procedure and segmented into “close” and “further” periods. The close time frame is close to the date of the anchor procedure while the further time frames extend much longer. The length of both time frames is specific to a PEG and can be customized by users. Within each window, services are reviewed based on their clinical relationship to the anchor, with a stronger relationship required for the further time window. The services meeting an appropriate threshold of clinical evidence are grouped to the episode. A claim can only be assigned to one procedure episode.

Each final procedure episode is assigned the following:

- **Responsible Provider**—the clinical provider identified as responsible for managing the procedure and related care
- **Completeness Status**—indicates if an episode was interrupted at the start or end of the final time window because of the existence of a competing PEG anchor or an absence of member enrollment eligibility
- **Combined Status**—indicates that at least two distinct, yet related, procedures were performed on the same date
- **Laterality**, where applicable, will indicate the laterality of the PEG anchor procedure (e.g., bi-lateral knee procedure)

Administrative claims/encounter data and enrollment is prepared by the user and processed using the PEG grouper software. PEG outputs include detail on the individual services grouped to the episode and a summary of the episode’s key characteristics including the PEG anchor category and PPC, responsible provider, completion status, and if the episode involves combined or lateral procedures. The PPCs covered by Version 7.5 of PEG are listed in Table 1.

Table 1. PEG Practice Category Description

PEG Practice Category Description
Cardiology
Gastroenterology/Hepatology/Endoscopy/Hematology
Nephrology/Urology/Gynecology
Neurological/Orthopedic Surgery
Ophthalmology
Otolaryngology

Using Procedure Episode Groups

PEG presents a number of opportunities to understand and compare the services related to procedural care:

- Understanding the prevalence and costs of key procedures;
- Analyzing the mix of services provided in the context of a procedure, including pre- and post-operative care;
- Assessing the use of outpatient care in delivering a procedure and the overall affect on costs of performing surgery in an inpatient versus outpatient setting;
- Using procedure episodes to support bundled payment design;
- Comparing the cost and quality of procedures performed by provider networks and different specialists; and
- Network design and value-based payment—using measurement results to identify and reward high performers.

The remainder of this paper provides examples of PEG applications and their results. To support these examples, administrative claims and enrollment data from a large population were processed using the PEG software. The population included approximately 1 million individuals enrolled one or more months during the time period of January, 2004 through March, 2007. All members included in the database were non-elderly and had complete medical and pharmacy benefits. Standard unit prices were assigned

to all medical and pharmacy services to support comparisons across providers and over time. Using this experience, PEG identified more than 78,426 procedure episodes, grouping services responsible for \$700 million in medical and pharmacy costs, or 12% of the total costs for the population over this time period.

Complete, non-outlier PEG episodes were selected for analysis. Outliers were identified from both a clinical and financial perspective. *Clinical* outliers were those procedure episodes without evidence of an expected clinically and financially important service. For example, for coronary artery bypass graft (CABG) procedures, evidence of an acute inpatient hospital stay is required. Identifying clinical outliers has value in targeting and excluding episodes where available data may not be complete. *Financial* outliers were defined as those procedures with costs significantly outside the normal range for the PEG. Low and high cost trim points were set for each PEG and approximated the 2.5 and 97.5 percentiles in the observed distribution of costs for a PEG.² If an episode had a total overall cost outside of the range defined by the low and high trim points, it was considered a financial outlier and excluded from the analysis.

Episodes can be either complete or incomplete. Of the total episodes identified, 70 percent were found to be complete. After selecting complete episodes, less than one percent were identified as clinical outliers, two percent as low cost outliers, and three percent as high cost outliers. The resulting episodes, 51,678 total episodes, or 95 percent of all complete episodes, were used for the analysis.

UNDERSTANDING PROCEDURE PREVALENCE AND COSTS

Table 2 describes the prevalence for high volume episodes observed and demonstrates the percentage of anchor procedures performed in an inpatient setting. As shown, PEG covers different areas of surgical practice and includes both relatively simple outpatient procedures as well as more complex procedures performed on an inpatient basis. This type of analysis supports a better understanding of the most

² The low and high cost trim points used for the analysis were determined using the empirical data available for the analysis. Clinical outliers and episodes with extremely low cost levels were first removed. For PEG categories with 20 or more episodes, the 2.5th and 97.5th percentiles in the distribution of total costs were then computed and used as the low and high trim points, respectively. For PEG categories where there were less than 20 episodes, a lognormal distribution was used to determine the low and high trims. The approach used to identify and address PEG outliers is customizable by the user.

important procedures an organization performs and the services, costs, and opportunities related to these procedures.

Table 2 also summarizes costs per episode, overall, and by type of service.³ The upper part of the table presents cost per episode, while the lower section shows the same summary using service costs as a percentage of total costs.

Additional detail is provided in both tables for professional services. For the procedures shown, total costs per episode range from approximately \$600 for Closure of the Lacrimal Punctum to \$51,000 for a CABG. By type of service, facility costs (inpatient and outpatient) and professional service costs represent a major portion of total costs. Within professional services, surgery and anesthesia comprise the largest components with physical therapy, evaluation and management (E&M), and diagnostic services (imaging, lab, pathology, and other diagnostic) in close second. As shown, the composition of costs varies across PEGs, in particular the costs related to services performed in an inpatient setting.

PROCEDURE COSTS AND PLACE OF SERVICE

PEG results can also provide insights around the differences in costs for a procedure when performed in an inpatient versus outpatient setting. Table 3 compares costs by setting for six PEGs. As shown, for all selected procedures, the total cost per episode is lower when performed in an outpatient setting. The most significant difference is observed for Implantable Device Defibrillator episodes. Facility services drive the majority of the difference in cost by setting. E&M costs also show some differences, due to no observed inpatient visits for procedures performed in an outpatient setting.

PROCEDURE EPISODES AND BUNDLED PAYMENT

Public and private payers are implementing new approaches to reimburse hospitals and physicians for the services involved in treating an episode of care. These designs, often called “bundled payments” define a set of services to be

³ To support the analysis, the individual services grouped to each PEG episode were assigned a type of service category, using the Ingenix Impact Intelligence service hierarchy. Inpatient facility services include room and board, operating room, diagnostics and other services provided by the facility as part of an inpatient stay. Both acute and non-acute inpatient stays are included. Outpatient facility includes services provided by a hospital or free-standing facility on an outpatient basis, such as operating and recovery room. Pharmacy includes drugs prescribed to an individual and covered under a pharmacy benefit (excludes drugs delivered by a facility as part of an inpatient or outpatient event). Ancillary include services such as durable medical equipment and supplies, transportation, and drugs administered. Professional includes services provided by a physician or other professional—surgery, anesthesia, evaluation and management (E&M visits and consultations), imaging and physical therapy are examples.

Table 2. Prevalence and Cost for Selected PEG Episodes

Percentage of Total Cost Per Episode									Detail on Professional Costs				
PEG Description	# Epis	% Inpatient Procedures	Total	Ancillary	Outpatient Facility	Inpatient Facility	Pharmacy	Professional	Surgery	Anesthesia	E & M	Physical Medicine	Imaging, Lab and Diagnostic Testing
Ophthalmology													
Cataract removal	954	0%	100%	6%	51%	0%	2%	42%	30%	9%	1%	0%	1%
Closure of the lacrimal punctum	436	0%	100%	2%	2%	0%	9%	86%	63%	0%	9%	0%	0%
Destruction of retina	348	0%	100%	1%	7%	0%	0%	92%	75%	0%	3%	0%	0%
Cardiology													
Coronary artery bypass graft	205	100%	100%	2%	3%	78%	0%	16%	9%	4%	2%	0%	2%
Coronary artery catheterization (diagnostic)	2,254	29%	100%	7%	42%	31%	2%	18%	5%	0%	5%	0%	7%
Coronary artery catheterization w/ non-drug stent	286	71%	100%	7%	23%	51%	2%	17%	9%	0%	3%	1%	4%
Implantable device defibrillator	163	62%	100%	1%	22%	66%	1%	10%	4%	1%	1%	0%	4%
Otolaryngology													
Nasal endoscopy with treatment	478	2%	100%	4%	55%	1%	2%	38%	28%	6%	1%	0%	2%
Tonsillectomy and adenoidectomy	1,352	2%	100%	6%	66%	2%	1%	26%	14%	9%	2%	0%	1%
Tympanostomy	1,864	0%	100%	3%	60%	0%	2%	35%	15%	12%	5%	0%	0%
Gastroenterology/Hepatology/Endocrinology/Hematology													
Appendectomy	1,209	74%	100%	3%	18%	54%	0%	25%	11%	7%	4%	0%	2%
Cholecystectomy	2,093	26%	100%	5%	45%	22%	0%	27%	15%	8%	3%	0%	2%
GI restrictive procedure	487	92%	100%	1%	5%	64%	0%	30%	21%	7%	1%	0%	1%
Lower gastrointestinal endoscopy with treatment	8,657	0%	100%	3%	55%	1%	2%	40%	29%	2%	2%	0%	7%
Nephrology/Urology/Gynecology													
Conization of cervix	745	0%	100%	4%	56%	0%	1%	39%	21%	6%	2%	0%	10%
Cystourethroscopy with treatment	683	18%	100%	5%	57%	12%	1%	26%	12%	5%	4%	0%	4%
Total abdominal hysterectomy	739	100%	100%	0%	2%	69%	0%	27%	18%	6%	1%	0%	3%
Neurological/Orthopedic Surgery													
Carpal tunnel release, open	818	0%	100%	3%	56%	1%	2%	38%	22%	7%	2%	6%	2%
Decompression, herniated disc, lumbar back	940	57%	100%	3%	18%	38%	1%	40%	26%	6%	1%	5%	2%
Hip replacement	507	100%	100%	2%	4%	73%	1%	20%	13%	3%	1%	3%	1%
Knee arthroscopy with meniscectomy	2,392	0%	100%	3%	55%	0%	1%	41%	22%	8%	1%	9%	1%

Prevalence and Cost for Selected PEG Episodes

Cost Per Episode								Professional Services					
PEG Description	# Epis	% Inpatient Procedures	Total	Ancillary	Outpatient Facility	Inpatient Facility	Pharmacy	Total Professional	Surgery	Anesthesia	E & M	Physical Medicine	Imaging, Lab and Diagnostic Testing
Ophthalmology													
Cataract removal	954	0%	\$3,631	\$214	\$1,839	\$0	\$57	\$1,521	\$1,081	\$332	\$35	\$0	\$26
Closure of the lacrimal punctum	436	0%	\$589	\$14	\$12	\$0	\$55	\$507	\$372	\$0	\$51	\$0	\$1
Destruction of retina	348	0%	\$1,390	\$9	\$102	\$0	\$4	\$1,276	\$1,046	\$5	\$38	\$0	\$2
Cardiology													
Coronary artery bypass graft	205	100%	\$51,041	\$1,108	\$1,494	\$39,815	\$232	\$8,392	\$4,433	\$1,847	\$856	\$57	\$1,164
Coronary artery catheterization (diagnostic)	2,254	29%	\$8,528	\$589	\$3,577	\$2,678	\$164	\$1,519	\$423	\$23	\$412	\$21	\$605
Coronary artery catheterization w/ non-drug stent	286	71%	\$21,488	\$1,536	\$4,953	\$11,012	\$378	\$3,609	\$1,954	\$27	\$664	\$151	\$757
Implantable device defibrillator	163	62%	\$42,120	\$476	\$9,301	\$27,813	\$253	\$4,277	\$1,689	\$463	\$498	\$28	\$1,549
Otolaryngology													
Nasal endoscopy with treatment	478	2%	\$7,688	\$294	\$4,260	\$113	\$122	\$2,898	\$2,159	\$471	\$99	\$1	\$138
Tonsillectomy and adenoidectomy	1,352	2%	\$3,829	\$241	\$2,516	\$63	\$33	\$977	\$521	\$331	\$68	\$1	\$35
Tympanostomy	1,864	0%	\$2,495	\$81	\$1,506	\$2	\$43	\$863	\$386	\$298	\$124	\$0	\$10
Gastroenterology/ Hepatology/ Endocrinology/ Hematology													
Appendectomy	1,209	74%	\$8,725	\$299	\$1,531	\$4,731	\$16	\$2,148	\$968	\$601	\$354	\$0	\$196
Cholecystectomy	2,093	26%	\$8,291	\$427	\$3,766	\$1,817	\$37	\$2,243	\$1,239	\$625	\$218	\$0	\$128
GI restrictive procedure	487	92%	\$15,245	\$141	\$764	\$9,751	\$64	\$4,525	\$3,252	\$1,006	\$110	\$13	\$121
Lower gastrointestinal endoscopy with treatment	8,657	0%	\$2,320	\$62	\$1,278	\$14	\$39	\$927	\$671	\$56	\$35	\$0	\$162
Nephrology/Urology/Gynecology													
Conization of cervix	745	0%	\$2,343	\$103	\$1,320	\$4	\$13	\$903	\$483	\$144	\$38	\$0	\$233
Cystourethroscopy with treatment	683	18%	\$7,223	\$354	\$4,081	\$856	\$63	\$1,868	\$902	\$384	\$282	\$0	\$256
Total abdominal hysterectomy	739	100%	\$9,919	\$49	\$217	\$6,880	\$45	\$2,727	\$1,743	\$630	\$97	\$0	\$252
Neurological/Orthopedic Surgery													
Carpal tunnel release, open	818	0%	\$3,575	\$116	\$1,990	\$26	\$67	\$1,375	\$793	\$262	\$55	\$208	\$54
Decompression, herniated disc, lumbar back	940	57%	\$12,838	\$343	\$2,333	\$4,870	\$110	\$5,182	\$3,372	\$760	\$180	\$603	\$258
Hip replacement	507	100%	\$24,186	\$389	\$955	\$17,767	\$129	\$4,947	\$3,085	\$775	\$166	\$744	\$168
Knee arthroscopy with meniscectomy	2,392	0%	\$5,488	\$186	\$3,005	\$12	\$46	\$2,238	\$1,194	\$417	\$61	\$473	\$66

Table 3: Prevalence and Costs for Procedure Episodes Performed, by Place of Service

Prevalence and Costs for Procedure Episodes Performed, by Place of Service													
Cost Per Episode								Detail on Professional Costs					
PEG Description	Place of Service	# Epis	Total	Ancillary	Outpatient Facility	Inpatient Facility	Pharmacy	Total Professional	Surgery	Anesthesia	E & M	Physical Medicine	Imaging, Lab and Diagnostic Testing
Cholecystectomy	Inpatient	550	\$10,242	\$120	\$578	\$6,859	\$36	\$2,649	\$1,342	\$634	\$444	\$0	\$204
Cholecystectomy	Outpatient	1,543	\$7,596	\$536	\$4,923	\$0	\$38	\$2,099	\$1,202	\$621	\$137	\$1	\$101
Coronary artery catheterization (diagnostic)	Inpatient	662	\$12,797	\$688	\$984	\$8,973	\$205	\$1,948	\$395	\$26	\$812	\$38	\$641
Coronary artery catheterization (diagnostic)	Outpatient	1,592	\$6,753	\$548	\$4,716	\$0	\$147	\$1,341	\$435	\$22	\$246	\$15	\$590
Coronary artery catheterization w/ non-drug stent	Inpatient	204	\$22,164	\$1,202	\$1,381	\$15,434	\$376	\$3,771	\$1,982	\$18	\$808	\$164	\$756
Coronary artery catheterization w/ non-drug stent	Outpatient	82	\$19,805	\$2,365	\$13,852	\$0	\$383	\$3,206	\$1,885	\$51	\$305	\$119	\$760
Cystourethroscopy with treatment	Inpatient	126	\$8,772	\$223	\$1,672	\$4,575	\$89	\$2,213	\$871	\$403	\$557	\$0	\$341
Cystourethroscopy with treatment	Outpatient	557	\$6,873	\$384	\$4,641	\$0	\$57	\$1,791	\$909	\$380	\$220	\$0	\$237
Decompression, herniated disc, lumbar back	Inpatient	536	\$14,600	\$103	\$616	\$8,468	\$133	\$5,279	\$3,430	\$785	\$210	\$579	\$266
Decompression, herniated disc, lumbar back	Outpatient	404	\$10,501	\$661	\$4,707	\$0	\$80	\$5,053	\$3,296	\$726	\$141	\$635	\$249
Implantable device defibrillator	Inpatient	101	\$50,634	\$476	\$362	\$44,855	\$254	\$4,686	\$1,887	\$501	\$583	\$35	\$1,655
Implantable device defibrillator	Outpatient	62	\$28,251	\$475	\$23,913	\$0	\$252	\$3,610	\$1,365	\$401	\$359	\$18	\$1,378

included in delivering a procedure or treating a chronic condition and establish a fixed price or budget for the performance of that episode. If providers deliver the required care for less than that amount, they can benefit financially. In the event that actual costs exceed the price, providers may share in the loss.

Bundled payment designs vary in terms of the financial risk placed on a provider or group of providers. However, they all share the concept of a prospective budget or price and a defined set of services covered by that amount. Quality measures are often tied to these arrangements. By rewarding value and providing incentives for successful outcomes, bundled payments may help to enhance the affordability and quality of care.

PEG provides the key information needed to support bundled payment for procedural care, in particular the services included in the episode definition. For example, for a knee replacement procedure, an episode of care can include the procedure itself, an inpatient stay and the imaging, physical therapy, E&M, and other services involved.

Figure 1 provides an example of how PEG outputs can be used to support payment for a knee replacement episode. On average, the total cost for all of the services included the knee replacement episodes analyzed was \$26,565. The majority of these costs (82 percent) were incurred during the inpatient stay where the procedure was performed. Some radiology, physical therapy (PT), and laboratory testing is observed during the pre-surgical periods—although pre-surgical services were responsible for less than two percent of total

costs. Recovery and follow-up services make up 15 percent of total costs, driven primarily by PT and inpatient rehabilitation, along with DME and home health. A similar analysis could be performed assessing the different types of hospital and physician providers delivering care during such an episode.

PROVIDER PERFORMANCE MEASUREMENT

PEG episodes can also serve as a key unit of analysis to assess provider cost and quality for procedural care. By linking all of the services related to a procedure, PEG allows a more complete view of the resources involved in delivering surgical care. The clinical definition around procedure episodes also supports measurement of the processes and outcomes that suggest high-quality care.

To demonstrate the value of PEG in physician measurement, orthopedic surgery was selected for study. Using the same PEG results data described above, physicians in this specialty were identified to create a “peer group” including all orthopedic surgeons observed to have one or more selected PEG episodes. PEG episodes were selected for these physicians using the following criteria:

- PEGs that are typically performed by orthopedic surgeons. For example cervical spine laminectomy, total hip replacement, knee arthroscopy with meniscectomy and open carpal tunnel repair were among the PEGs selected for orthopedics;

Figure 1: Knee Replacement Procedure Episode Group

Average Commercial Population Costs¹

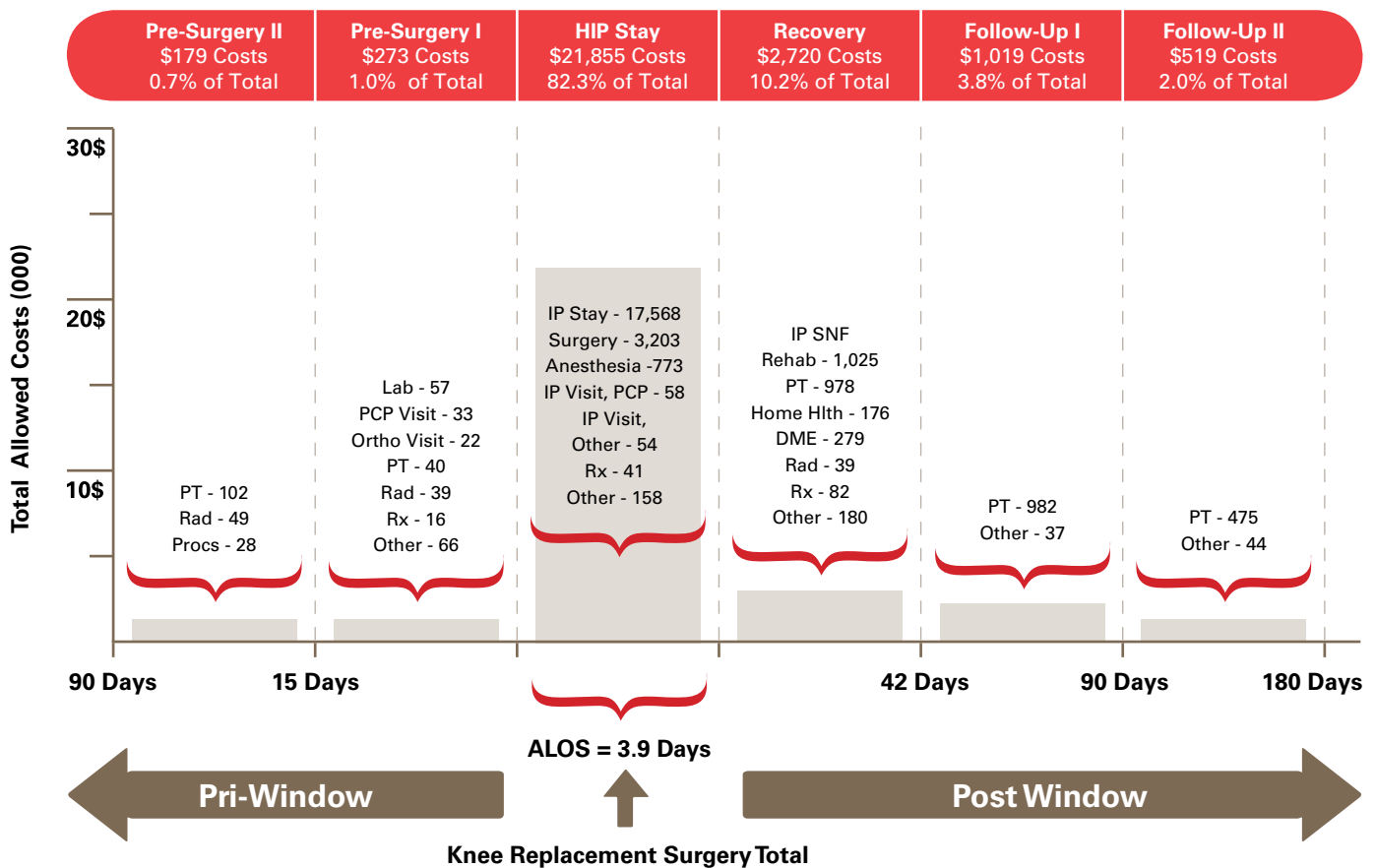


Table 4: Provider Performance Measurement - Comparing Procedure Episode Cost of Care

Provider Performance Measurement—Comparing Procedure Episode Cost of Care											
Cost Per Episode and Index							Professional Services				
PEG Description	Measure*	# Epis	Total	Inpatient Facility	Outpatient Facility	Ancillary and Pharmacy	Total Professional	Anesthesia and Surgery	E & M	Physical Medicine	Imaging, Lab and Diagnostic Testing
Dr. Jones											
Knee arthroscopy with cruciate ligament repair	Observed	27	\$14,211	\$0	\$9,324	\$632	\$4,255	\$2,596	\$73	\$1,384	\$202
	Peers		\$14,555	\$85	\$7,401	\$1,077	\$5,993	\$3,241	\$57	\$2,418	\$258
	Index		0.98	-	1.26	0.59	0.71	0.80	1.27	0.57	0.78
Knee arthroscopy with meniscectomy	Observed	50	\$6,220	\$0	\$3,714	\$66	\$2,440	\$1,515	\$46	\$745	\$131
	Peers		\$5,881	\$13	\$3,162	\$238	\$2,468	\$1,616	\$61	\$534	\$231
	Index		1.06	-	1.17	0.28	0.99	0.94	0.76	1.40	0.57
Other knee arthroscopy, with treatment	Observed	24	\$6,322	\$24	\$3,441	\$120	\$2,737	\$1,546	\$86	\$955	\$141
	Peers		\$7,383	\$72	\$3,643	\$346	\$3,323	\$2,102	\$72	\$873	\$256
	Index		0.86	0.33	0.94	0.35	0.82	0.74	1.19	1.09	0.55
Arthroscopic repair, rotator cuff or slap shoulder	Observed	7	\$10,370	\$0	\$6,170	\$66	\$4,133	\$2,893	\$48	\$1,123	\$70
	Peers		\$13,016	\$109	\$6,515	\$355	\$6,036	\$3,803	\$58	\$1,964	\$203
	Index		0.80	-	0.95	0.18	0.68	0.76	0.82	0.57	0.34
All Episodes	Observed	125	\$8,539	\$92	\$5,080	\$229	\$3,138	\$1,898	\$65	\$1,022	\$151
	Peers		\$8,996	\$176	\$4,535	\$474	\$3,811	\$2,284	\$65	\$1,207	\$233
	Index		0.95	0.52	1.12	0.48	0.82	0.83	0.99	0.85	0.65
Dr. Smith											
Hip replacement	Observed	7	\$22,336	\$16,146	\$1,205	\$681	\$4,304	\$2,936	\$198	\$928 \$231	
	Peers		\$24,269	\$17,779	\$992	\$524	\$4,974	\$3,782	\$167	\$815	\$201
	Index		0.92	0.91	1.22	1.30	0.87	0.78	1.19	1.14	1.15
Knee replacement surgery	Observed	24	\$27,683	\$19,411	\$1,519	\$790	\$5,963	\$3,753	\$151	\$1,870	\$190
	Peers		\$26,537	\$18,652	\$1,437	\$722	\$5,726	\$4,004	\$206	\$1,307	\$190
	Index		1.04	1.04	1.06	1.09	1.04	0.94	0.73	1.43	1.00
Knee arthroscopy with meniscectomy	Observed	28	\$6,934	\$195	\$3,591	\$220	\$2,929	\$1,602	\$28	\$1,123	\$148
	Peers		\$5,881	\$13	\$3,162	\$238	\$2,468	\$1,616	\$61	\$534	\$231
	Index		1.18	15.10	1.14	0.92	1.19	0.99	0.46	2.10	0.64
Other knee arthroscopy, with treatment	Observed	16	\$8,322	\$0	\$4,197	\$263	\$3,862	\$1,856	\$50	\$1,884	\$72
	Peers		\$7,383	\$72	\$3,643	\$346	\$3,323	\$2,102	\$72	\$873	\$256
	Index		1.13	-	1.15	0.76	1.16	0.88	0.70	2.16	0.28
All Episodes	Observed	85	\$15,007	\$7,041	\$3,147	\$484	\$4,335	\$2,466	\$88	\$1,620	\$150
	Peers		\$14,317	\$6,838	\$2,924	\$492	\$4,063	\$2,702	\$114	\$1,007	\$219
	Index		1.05	1.03	1.08	0.98	1.07	0.91	0.77	1.61	0.68
Dr. Olson											
Hip replacement	Observed	34	\$24,766	\$18,223	\$1,403	\$482	\$4,657	\$3,449	\$156	\$906	\$139
	Peers		\$24,269	\$17,779	\$992	\$524	\$4,974	\$3,782	\$167	\$815	\$201
	Index		1.02	1.02	1.42	0.92	0.94	0.91	0.93	1.11	0.69

Provider Performance Measurement—Comparing Procedure Episode Cost of Care (continued)

Cost Per Episode and Index							Professional Services				
PEG Description	Measure*	# Epis	Total	Inpatient Facility	Outpatient Facility	Ancillary and Pharmacy	Total Professional	Anesthesia and Surgery	E & M	Physical Medicine	Imaging, Lab and Diagnostic Testing
Knee replacement surgery	Observed	18	\$29,185	\$20,975	\$2,504	\$769	\$4,937	\$3,845	\$301	\$636	\$155
	Peers		\$26,537	\$18,652	\$1,437	\$722	\$5,726	\$4,004	\$206	\$1,307	\$190
	Index		1.10	1.12	1.74	1.07	0.86	0.96	1.46	0.49	0.82
Knee arthroscopy with meniscectomy	Observed	8	\$6,243	\$0	\$3,276	\$78	\$2,888	\$1,576	\$93	\$1,130	\$80
	Peers		\$5,881	\$13	\$3,162	\$238	\$2,468	\$1,616	\$61	\$534	\$231
	Index		1.06	-	1.04	0.33	1.17	0.98	1.52	2.12	0.35
All Episodes	Observed	61	\$23,355	\$16,347	\$2,035	\$513	\$4,461	\$3,288	\$191	\$841	\$136
	Peers		\$22,250	\$15,417	\$1,451	\$542	\$4,840	\$3,536	\$163	\$924	\$202
	Index		1.05	1.06	1.40	0.95	0.92	0.93	1.17	0.91	0.67

- Episodes where the physician was the primary surgeon for the anchor procedure⁴; and;
- Complete episodes that were also not a clinical or financial outlier.

For each episode, the observed and peer (expected) costs were computed—overall, for all services, and by type of service (using the type of service categories highlighted in Table 2). The observed costs represent actual episode costs. Peer costs were computed as the average cost for all episodes assigned to the peer group with that same PEG.

The results were aggregated across episodes to produce observed and peer costs for each physician, by PEG, and across all PEGs. The ratio of observed to peer costs (the Index) was used to describe the physician's average use of resources relative to their peers. When combining results across PEGs, the peer costs for a physician can be interpreted as the average result for the physician's peers—if they had the same mix of PEG episodes as the physician. In this way, case mix adjustment is applied to the results and reflected in the Index. Case mix adjustment is a key consideration in supporting valid comparisons across physicians. A physician with an Index greater than 1.0 uses more resources relative to peers whereas an Index less than 1.0 indicates use of fewer resources.

In addition to comparisons based on episode costs, measures that describe the sequence of care around a

⁴ The PEG Episode Summary Output file contains a "responsible provider" field, identifying the primary surgeon for each procedure episode.

procedure were also constructed. These measures provide insights into the outcomes and processes of care a physician uses to perform a procedure. A measure for orthopedics can be used as an example; the use of conservative care prior to back surgery. In particular, compliance with conservative care was defined as physical therapy or an injection preceding lumbar back surgery. The following steps were used to assess sequence of care:

- Patients with one of the following PEG episodes were identified:
 - Fusion, lumbar back
 - Decompression herniated disk, lumbar back
 - Percutaneous decompression herniated disk, lumbar back
- For each of these patients, if more than one procedure was observed, the procedure occurring first was selected
- For each patient and episode, the presence of conservative care within the 6 months prior to the anchor procedure was noted
- For a physician, the number of patients with conservative care divided by the total number of patients with these selected episodes is the rate of conservative care⁵

The observed rates for these quality metrics for a physician were compared with those of their peers.

⁵ Only episodes where the procedure anchor date was 6 or more months after the beginning of the member's eligibility were considered. Both complete and incomplete episodes were used for this calculation.

Table 5: Provider Performance Measurement -Comparing Use of Conservative Care Prior to Back Surgery

Provider Performance Measurement -Comparing Use of Conservative Care Prior to Back Surgery						
Physician	# Episodes	Episodes with Conservative Care Observed	Episodes without Conservative Care Observed	Physician % with Conservative Care	Peers % with Conservative Care	Ratio of Physician to Peers
Dr. Hastings	22	15	7	68%	68%	1.00
Dr. Brady	20	14	6	70%	68%	1.03
Dr. Main	16	15	1	94%	68%	1.38
Dr. East	14	9	5	64%	68%	0.94
Dr. Sanborn	12	7	5	58%	68%	0.86
Dr. Bay	11	10	1	91%	68%	1.33

* Conservative care is defined as the presence of physical therapy or pain injection within 6 months prior to lumbar back fusion, decompression herniated disk of lumbar back, and percutaneous decompression herniated disk or lumbar back procedures.

Table 4 summarizes the cost of care comparison for three higher-volume orthopedic surgeons. For each surgeon, results are shown for their most prevalent PEG episodes, all episodes, observed and peer costs, and the Index. In addition, results are shown for all services observed for a PEG and by type of service.

As shown in Table 4, the number of PEG episodes for these providers ranged from 61 to 125. The mix of PEGs also varied across providers, underscoring the importance of case mix adjustment when comparing results across providers.

The results by PEG describe the physician's performance for procedure episodes around a specific surgery. For example, Dr. Jones was observed to have 50 episodes for "Knee arthroscopy, with meniscectomy." The observed cost for Dr. Jones' episodes was \$6,220 for all services. This amount compares to \$5,881 for peers, 6 percent higher than peers for a cost of care index of 1.06. Outpatient facility and physical therapy (PT) services appear to be the most important drivers of this difference.

The cost of care Index for "All Episodes" summarizes the provider's overall result, aggregated across the selected episodes. As shown, the Index results for "Total" services range from 0.95 for Dr. Jones to 1.05 for Dr. Smith and Dr. Olson. The result for Dr. Jones indicates observed costs at 5 percent less than peers after adjusting for differences in the mix of PEG episodes between Dr. Jones and peers.

Costs for Dr. Smith and Dr. Olson are five percent higher. A closer look at the results suggests that a key driver of the

difference observed for Dr. Smith is the use of PT services for knee arthroscopy procedures while for Dr. Olson it the use of outpatient facility services as part of knee and hip replacement services.

Finally, as noted above, the "Peers" cost for All Episodes describes the average cost for a provider's peers if they had the same mix of episodes as that provider. In this way, this value reflects a case-mix adjusted comparison for the provider, overall, and by type of service adjusting for the provider's mix of PEG episodes. Across the providers shown in Table 4, Dr. Olson has the highest cost case mix (\$22,250 per episode), reflecting a greater mix of hip replacement and knee replacement procedures. Dr. Jones has the lowest cost case mix, reflecting a greater mix of lower cost knee arthroscopy repairs.

Table 5 presents the results for the use of conservative care prior to back surgery. As noted above, the measure assesses the presence of physical therapy or injection within six months prior to lumbar back fusion, decompression herniated disk of lumbar back, and percutaneous decompression herniated disk or lumbar back procedures.

For each physician, Table 5 describes the number of back surgery episodes evaluated, the number of those cases where evidence of conservative care is observed, the physician's percent conservative care and a comparison with the average result for peers. Dr. Main and Dr. Bay show the highest compliance with conservative care, both with compliance rates exceeding 90 percent of their episodes. The average compliance for all physicians evaluated was 68 percent.



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Summary

PEG introduces a powerful approach to assessing the cost and quality of the services involved in delivering a surgical procedure. By leveraging the same methodological platform as ETG and other Symmetry tools, PEGs provides a consistent approach to episodes of care and contributes to a more complete solution in health care measurement. While consistent with ETG, PEG offers important added value with its unique focus on procedural care that provides important insights and better understanding regarding the comprehensive cost and quality of a surgery.

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