

INGENIX[®]

ETG[®] in Measurement

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Episode Treatment Groups provide a standard unit of measurement for a wide variety of healthcare applications. They provide a consistent and reliable measurement tool for gauging the provision and financing of health care services

The statistical homogeneity of the cost associated with these episodes, augmenting with severity levels and treatment indication provides a sound basis for measurement and healthcare analytics. Also, the flexibility of the ETG grouper software and the available outputs support a wide range of information needs and analytics.

The Role of ETG in Measurement

An important distinction can be made between ETG and the application of ETG outputs to support measurement. Ingenix provides the ETG methodology in the form of a software grouper product that accepts data from administrative claims and member enrollment and outputs details on the clinical episodes observed for a patient and the services involved in their treatment. These outputs include:

- The assignment of each medical and pharmacy service to a unique episode
- Information characterizing each episode:
 - The Base ETG and severity level assigned
 - Episode start and end dates
 - Episode completion status - whether the episode is complete or not
 - Episode outlier status – do the observed costs for an episode fall outside of a reasonable range
- Information supporting use and understanding of the episode results
 - The observed complications and comorbidities
 - The specific treatments provided during the course of the episode
 - The different providers involved in the episode of care and their activity – supporting flexible approaches to attributing episodes to clinicians

These outputs provide a solid foundation for different approaches to health care measurement. However, ETGs identify and characterize the unit of analysis to support the measurement process. A number of important steps are required following ETG grouping to support valid measurement.

The application of ETGs to measuring physician cost of care provides an example. Physician cost of care measurement involves a number of important steps:

- Collecting, standardizing, and integrating complete and consistent information, including enrollment, medical, and pharmaceutical service data, and clinical records from lab results and other sources;
- Selecting the units of measurement, including episodes of care, populations, inpatient admissions, or specific procedures. For ETGs, episodes of care are the relevant unit of measurement;
- Creating units of analysis— applying the ETG grouping technology to define unique episodes of care for a patient and a characterization of those episodes.
- Selecting the individual physicians to be measured and compared and creating “peer groups” —typically defined using attributes such as provider specialty and location.
- Identifying, for each peer group, the list of ETGs to be used in comparing providers. Not all ETGs are appropriate for physician measurement and not all ETGs reflect care provided by each specialty;
- Assigning physician responsibility to episodes of care – attributing individual episodes to physicians.
- Identifying the metrics for use in comparing providers, such as costs (overall or by type of service) or the use of specific services or the sequence of services in patient care
- Risk adjusting for differences in patient morbidity or case mix across providers in a peer group.
- Creating physician cost of care results and identifying approaches for sharing these findings with providers and other stakeholders.

ETG outputs support all these steps in provider measurement. However, the third step in this process, “Creating the units of analysis”, is the direct contribution of the ETG software. In considering using ETG outputs in measurement, you must consider each of these steps.

Ingenix offers guidance on options and best practice around using Symmetry tools in measurement, including ETG. This guidance comes in the form of product documentation, user forums and research and white papers. (See Symmetry white paper on attribution – reference here). Ingenix also offers expert consulting and product offerings that incorporate best practices in measurement and build on ETG outputs. Further, national entities such as NCOA and NQF continue to work

toward creating standards in measuring healthcare cost and quality, including the use of episodes of care. Organizations need to consider these standards and best practices in measurement and the optimal approach to incorporating ETG episodes of care to achieve results.

Applications for ETG

There are a number of measurement applications for ETGs. These include:

Provider Performance Measurement

As noted above, organizations can include ETG results in a process to create measures of the relative cost of care for providers treating patient episodes. The clinical-based units of analysis, including episode severity, support the risk adjustment required for valid comparisons.

Care and Health Management

Care and health management organizations can use ETG results to support care and health management, including:

- Identifying populations for targeted disease management programs;
- A clinically useful unit for measuring health care demand, including the prevalence of clinical conditions and the services and costs involved in their treatment;
- A basis for establishing disease management strategies, including tracking organizational performance and trends around specific diseases and episodes; and
- A basis for understanding how medical treatments compare with treatment guidelines and protocols

Identifying Population Risk

ETGs can identify acute and chronic episodes of care and be used to predict usage for employers and underwriting groups.

Financial Trending

Payer organizations and public sector research groups can use ETGs to measure healthcare cost trends over time, in specific regions, metropolitan areas, and for insurance and Medicaid/Medicare plans.

Fraud & Abuse

Organizations can use ETGs to create profiles and trends on service use for an episode of care and compare them with norms to assess areas of investigation for fraud and abuse. ETGs can identify claims as ungroupable, not attributing to specific episodes, for scrutinization for accountability purposes.

Subrogation

Third party reimbursement applications can take advantage of the claims grouped to an ETG episode in order to identify claims that might be eligible for claim recovery.

ETGs in Action

The specific applications that follow provide examples of using ETG in measurement, including:

- Understanding disease-related costs
- Provider performance measurement around cost of care
- Disease specific risk for targeted care management, and
- Financial performance and trends

Understanding Disease-related Costs

You can assess the cost of an episode of care in different ways, including using overall costs or costs by type of service and using the approach used by ETGs to characterize episodes in terms of condition, severity level and treatment. Table 1 includes a summary of overall costs for three Base ETGs, by severity level and treatment indicator. The results were produced using the experience from a large managed care population, with services group using Version 7.0 of ETG. The table shows average overall costs per episode, along with the standard deviation of costs and coefficient of variation. The coefficient of variation represents the ratio of the standard deviation and average cost. The summary of episode costs includes both medical and pharmacy services. The table reports only information from complete, non-outlier episodes.

For diabetes, Table 1 summarizes by base ETG and severity levels. The findings show an appropriate rank order for the average cost per episode across the four severity level for

the condition. Further, the coefficient of variation (CoV) is smaller for each of the severity levels than for the combined (“All”) level, supporting the idea of severity adjustment within diabetes. Cost per episode ranges from approximately \$1,500 for a level 1 diabetes episode to \$4,500 for a severity level 4 episode.

based on severity level alone, costs increase with severity— with costs for severity level 3 more than 4 times greater than that for severity level 1 (\$2,402 vs. \$543). Looking at costs by the presence of surgery, costs for surgical episodes are significantly greater than those for non-surgical for all severity levels – even at severity level 3 where costs for

Table 1.

Base ETG Condition	Severity	Treatment Indicator	# Episodes	Average Cost per Episode	StdDev Cost per Episode	C of V
Diabetes	1	0	181,012	\$1,544	\$1,526	0.99
Diabetes	2	0	31,438	\$2,320	\$2,088	0.90
Diabetes	3	0	18,593	\$2,915	\$2,572	0.88
Diabetes	4	0	20,480	\$4,455	\$3,558	0.80
Diabetes	All	0	251,523	\$1,979	\$2,111	1.07
Malignant neoplasm of thyroid gland, w/o treatment, w/o am	1	0	4,866	\$1,278	\$1,341	1.05
Malignant neoplasm of thyroid gland, w treatment, w/o am	1	1	637	\$11,678	\$5,156	0.44
Malignant neoplasm of thyroid gland, w/o treatment, w am	1	2	612	\$5,565	\$4,537	0.82
Malignant neoplasm of thyroid gland, w treatment, w am	1	3	565	\$18,103	\$6,680	0.37
Malignant neoplasm of thyroid gland	1	All	6,680	\$4,086	\$6,128	1.50
Chronic Sinusitis, Severity Level 1	1	All	235,927	\$543	\$989	1.82
Chronic Sinusitis, Severity Level 2	2	All	40,353	\$946	\$1,522	1.61
Chronic Sinusitis, Severity Level 3	3	All	35,049	\$2,402	\$3,330	1.39
Chronic Sinusitis	1	0	226,353	\$427	\$500	1.17
Chronic Sinusitis, w treatment	1	1	9,574	\$3,274	\$3,226	0.99
Chronic Sinusitis	2	0	37,073	\$673	\$675	1.00
Chronic Sinusitis, w treatment	2	1	3,462	\$3,863	\$3,598	0.93
Chronic Sinusitis	3	0	22,051	\$686	\$668	0.97
Chronic Sinusitis, w treatment	3	1	12,998	\$5,314	\$3,957	0.74
Chronic Sinusitis	All	All	311,511	\$804	\$1,622	2.02

The table shows results by treatment indicator for malignant neoplasm of thyroid gland. Four values for treatment indicator are available: a “0” describes “without treatment”, a “1” describes “with surgery, without active management”, a “2” describes “without surgery, with active management” and a “3” describes “with surgery, with active management”. Active management is indicated based on the presence of chemotherapy or radiation treatment. As shown, significant differences in cost per episode exist between episodes grouped by treatment indicator.

For chronic sinusitis, results are presented using both severity level and treatment indicator. This example provides an opportunity to view difference across both severity levels and treatment. As shown, when comparing costs per episode

surgical episodes are almost 8 times those for non-surgical (\$5,314 vs. \$686). Finally, when comparing costs for surgical episodes, costs per episode increase with severity.

Provider Performance Measurement Around Cost of Care

ETGs and episodes of care are a key methodology in measuring and comparing providers based on cost of care. Valid measures of provider performance demand recognition of any differences between the underlying morbidity, or case mix, of a provider’s patients and those of their peers. The ETG severity information supports the adjustment of differences in case mix between providers and promotes more valid comparisons.

Organizations typically create, risk-adjusted “expected values” (for cost and utilization measures) to compare a provider’s actual cost and utilization results with those of their peers. The actual results are based on the experience measured from episodes attributed to that provider. The expected amount is what you would expect to see for the provider’s peers if they had the same mix of episodes. The “mix of episodes” and how that is measured is the key to accurate case mix adjustment and valid comparisons.

Assume an endocrinologist who treats only diabetes patients. Four levels of episode severity are available to support the comparison of this provider with their peers. Table 2 provides an example. The observed cost per episode describe those costs for the episodes attributed to that provider. The expected costs are the average cost per episode, by ETG and severity level, for all endocrinologists in the provider’s peer group. The OE ratio is the total observed costs divided by the total expected costs. The result for all diabetes episodes sums these costs across all diabetes ETGs, to create an overall result for the provider for diabetes.

Table 2.

Base ETG plus Severity Level	Number of Episodes	Observed Cost per Episode	Expected Cost per Episode	Total Observed Costs	Total Expected Costs	OE Ratio
Diabetes, Level 4	35	\$4,778	\$4,232	\$167,244	\$148,103	0.89
Diabetes, Level 3	80	\$3,126	\$2,847	\$250,096	\$227,760	1.10
Diabetes, Level 2	110	\$2,149	\$2,120	\$236,379	\$233,142	0.99
Diabetes, Level 1	175	\$1,115	\$1,156	\$195,081	\$202,298	1.04
Diabetes, All	400	\$2,122	\$2,028	\$848,800	\$811,302	0.96

Another feature supported by ETGs is the distinction between treatment and non-treatment episodes for the same base ETG. For some physicians such as surgeons, this approach may support more equitable comparisons. For those physicians, the surgery distinction is supported by the treatment indicator characterizing the episode, noting the presence of a significant surgical treatment, or not. For those physicians, the case mix unit could be: (1) the base ETG and the treatment indicator, (2) the base ETG, severity level, and the treatment indicator; or even (3) the base ETG and severity level for episodes without surgery and the base ETG and treatment indicator for other episodes. The flexible approach in capturing the clinical condition, the severity level and the treatment indicator provide a number of different options for users in applying ETG to provider measurement.

As noted above, the ETG output provides only an initial step in provider measurement. Selecting an attribution approach, the ETGs to be included in measuring a specialty and the approach to risk adjustment remain important steps.

A further case scenario can illustrate comparing providers across multiple ETGs. Assumptions for this scenario include:

- Peer Group: Physicians with a specialty designation of cardiology in the greater Boston area
- Risk (Case Mix) Adjustment Unit: Base ETG, with severity level
- Base ETGs considered for measurement for cardiologists:

Base ETG	Description
164700	Hyperlipidemia, other
386500	Ischemic heart dis
386600	Pulmonary heart disease
386800	CHF
386900	Cardiomyopathy
387000	Aortic aneurysm
387100	Heart failure, diastolic
387400	Valvular disorder
387500	Severe ventricular rhythm
387600	Severe heart block
387800	Atrial fibrillation & flutter
388100	Hypertension

- Attribution Method: episodes were attributed to a provider based on that provider with the largest number of episode visits, who also owned at least 33% of all physician visits observed for the episode.
- Cost of care used in comparing resource use for cardiologists

In summary, the results of an ETG grouping for a population of members were available to support the measurement of providers. The providers to be compared were selected (cardiologists located in greater Boston), and the Base ETGs to be used in the comparison were selected. Using the ETG outputs for complete and non-outlier episodes, episodes were attributed to individual cardiologists using the approach described above, and episode costs were summarized at the Base ETG and severity level – with observed and expected costs and the ratio of the two amounts (O/E ratio) computed.

Table 3 illustrates findings for this case scenario. As shown, the case mix unit is comprised of Base ETG and severity level. As before, the relative cost of care (OE ratio) is the observed cost divided by the expected cost, at each case mix unit level. The table for the example below doesn't display all providers in the Peer group – although the expected amounts were computed based on their experience.

The table also shows the results by ETG base category (family), followed by the overall OE Ratio for the two physicians. The overall results for Dr. Smith and Dr. Jones are obtained by summing the observed and expected costs across all of their episodes and computing the OE ratio. For Dr. Smith, this result is 0.86. For Dr. Jones, the result is 0.71 – suggesting that both providers are using a lesser amount

Table 3

Provider	Base ETG and Severity Level	Number of Episodes	Observed Cost per Episode	Expected Cost per Episode	Relative Cost of Care (OE Ratio)
Dr. Smith	CHF , Level 1	5	\$1,020	\$985	1.04
Dr. Jones	CHF , Level 1	1	\$546	\$985	0.55
Dr. Jones	CHF , Level 2	2	\$205	\$1,295	0.16
Dr. Smith	CHF , Level 3	2	\$1,603	\$2,246	0.71
Dr. Jones	CHF , Level 3	1	\$129	\$2,246	0.06
Dr. Smith	Hyperlipidemia, other , Level 1	10	\$538	\$536	1.00
Dr. Jones	Hyperlipidemia, other , Level 1	3	\$104	\$536	0.19
Dr. Jones	Hypertension , Level 1	5	\$1,267	\$1,220	1.04
Dr. Smith	Hypertension , Level 2	28	\$908	\$1,030	0.88
Dr. Jones	Hypertension , Level 2	7	\$1,374	\$1,030	1.33
Dr. Smith	Hypertension , Level 3	7	\$911	\$1,155	0.79
Dr. Jones	Hypertension , Level 3	6	\$751	\$1,155	0.65
Dr. Smith	Hypertension , Level 4	1	\$504	\$1,229	0.41
Dr. Jones	Hypertension , Level 4	2	\$676	\$1,229	0.55
Dr. Smith	Isch hrt dis , Level 1	47	\$2,921	\$2,769	1.05
Dr. Jones	Isch hrt dis , Level 1	11	\$2,716	\$2,769	0.98
Dr. Smith	Isch hrt dis , Level 2	28	\$2,849	\$4,651	0.61
Dr. Jones	Isch hrt dis , Level 2	3	\$4,799	\$4,651	1.03
Dr. Smith	Isch hrt dis , Level 3	2	\$1,607	\$10,385	0.15
Dr. Jones	Isch hrt dis , Level 3	2	\$432	\$10,385	0.04
Dr. Smith	Isch hrt dis , Level 4	1	\$39,242	\$16,804	2.34
Dr. Smith	Severe heart block , Level 1	1	\$585	\$5,529	0.11
Dr. Jones	Severe heart block , Level 1	1	\$3,644	\$5,529	0.66
	Base ETG				
Dr. Jones	CHF	4	\$271	\$1,455	0.19
Dr. Jones	Hyperlipidemia	3	\$104	\$536	0.19
Dr. Jones	Hypertension	20	\$1,091	\$1,135	0.96
Dr. Jones	Isch hrt dis	16	\$2,821	\$4,074	0.69
Dr. Jones	Severe heart block	1	\$3,644	\$5,529	0.66
Dr. Smith	CHF	7	\$1,187	\$1,345	0.88
Dr. Smith	Hyperlipidemia	10	\$538	\$536	1.00
Dr. Smith	Hypertension	36	\$897	\$1,060	0.85
Dr. Smith	Isch hrt dis	78	\$3,327	\$3,820	0.87
Dr. Smith	Severe heart block	1	\$585	\$5,529	0.11
Dr. Jones	Overall	44	\$1,636	\$2,292	0.71
Dr. Smith	Overall	132	\$2,319	\$2,700	0.86

of overall resources (costs) when compared with their peers – Dr Smith by 14% and Dr Jones by 29%. An assessment of the statistical significance of these differences indicated that both providers were statistically different from peers, at the 90% level of confidence. Table 3 also aggregates findings across severity levels within the same conditions by base ETG.

Disease Specific Risk for Targeted Care Management

The detailed information on the clinical characteristics of an episode provides an understanding of the level, or stage of risk related to a specific condition, supporting applications of ETG for care and health management. ETG outputs describe indicators for complications, co-morbidities and treatments, supporting identification of members with a targeted marker of risk.

For example, to identify members with Ischemic heart disease with myocardial infarction, the key steps would be:

- Identify ischemic heart disease episodes (Base ETG 386500)
- For these episodes, identify those with an indicator in the Complications output file with any of the following complication codes:

Complication Code	Complication Description
70083	Acute myocardial infarction
70084	Subendocardial infarction

- Identify the members for these episodes by using the episode summary output file.
- Compare the members with episodes of Ischemic Heart Disease and a myocardial infarction complication with the remaining patient episodes.

As shown in Table 4 and using a database describing experience for a large number of ischemic heart disease patients, episodes with myocardial infarction represent approximately 7% of all of ischemic heart disease episodes and have considerably higher episode costs and severity.

A second example, to identify members with CHF with and without Renal Failure as a co-morbidity follows. Table 5 highlights these results. The key steps are:

Table 4

Ischemic Heart Disease	# Members	# Episodes	% Episodes	Average Episode Severity Score	Cost per Episode
w/o myocardial infarction	99,894	146,413	93.1%	0.79	\$4,834
With myocardial infarction	10,557	10,843	6.9%	3.69	\$23,756
Total	110,451	157,256	100.0%	0.99	\$6,151

Table 5

Congestive Heart Failure	# Members	% Members	# Episodes	Average Condition Severity Score	Cost per Episode
w/o CRF	17,153	86.6%	21,949	0.83	\$2,381
With CRF	2,610	13.2%	3,359	1.76	\$4,379
Total	19,763	100.0%	25,308	0.95	\$2,646

- Identify CHF episodes (first six digits of ETG number equal to 386800) from the ETG Summary file.
- Identify whether or not the episodes have a Chronic Renal Failure co-morbidity (80377), using the Co-morbidities, by episode, output file.
- Compare and potentially target, for intervention, the 87 percent of the members with CHF without Chronic Renal Failure

As a third example, to identify higher risk Diabetics, having 3 or more ER visits:

- Extract episodes for Diabetes, based on base ETG=163000, from the ETG Summary file.
- By member, using the diabetic episodes, calculate the member's average severity score for their diabetes episodes.
- For the diabetics, identified above, determine which have 3 or more ER visits, using the claims detail for each of these episodes.
- Of the resultant population, compare and potentially target those members in the top percentile, based on their average severity score per diabetic episodes. The average severity score, for these members, at the 99th percentile is 4.72, in comparison with 3.26 for all members with a diabetic episode.

Table 6 highlights these results. Over 6% of the members with a diabetes episode had at least 3 ER visits in the same year as the diabetic episode. This population has higher severity scores than the overall diabetic population.

of using two years of experience for a large population and grouping services into year-long diabetes episodes. The analysis shows that although the cost per episode has increased across diabetes episodes, the underlying

Table 6

Severity Level	% of Total Diabetic Episodes	% of Total Diabetic Episodes for Members with 3+ ER visits
1	72.3%	55.7%
2	12.6%	16.5%
3	7.0%	9.4%
4	8.1%	18.4%
Total	100.0%	100.0%

Financial Performance and Trends

You can use ETG results to track plan performance and trends around diseases and episodes. For example, you can monitor changes in the relative severity of a health plan's diabetes episodes over time. Table 7 provides the results

morbidity appears to be the same. The average severity score per episode is similar and there was no marked change in the distribution of the episodes at each severity level. Changes in costs per episode are likely due to changes in fee schedules and contracts, or even general trends in the mix of services used to treat diabetics.

Table 7

Surgical Intervention	# of Episodes	% of Total Episodes
No Intervention	132,496	75.8%
Surgery; cardiovascular; left heart catheterization; diagnostic	29,324	17%
Surgery; cardiovascular; angioplasty; coronary arteries	12,097	7%
Cardiac Pacing and Cardioversion	6,858	4%
Surgery; cardiovascular: CABG	3,748	2%
Surgery; cardiovascular: Endomyocardial biopsy	3,125	2%

Table 7

Severity Level	Year 1				Year 2			
	# Episodes	% of Total Episodes	Avg Cost per Episode	Avg Severity Score per Episode	# Episodes	% of Total Episodes	Avg Cost per Episode	Avg Severity Score per Episode
1	86,949	72%	\$1,531	0.76	94,063	72%	\$ 1,684	0.76
2	14,349	12%	\$2,316	1.18	17,089	13%	\$ 2,432	1.18
3	9,112	8%	\$2,883	1.49	9,481	7%	\$ 2,739	1.49
4	9,571	8%	\$4,419	2.38	10,909	8%	\$ 4,861	2.40
All	119,981		\$1,958	1.00	131,542		\$ 2,109	1.01

As a further example, the table below assesses the number and mix of different surgical interventions for Ischemic Heart Disease episodes. The analysis was constructed using the following steps:

- Extract episodes for Ischemic Heart Disease, Base ETG 386500, from the ETG Summary file.
- For these episodes, identify the corresponding treatment indicators using the Treatment output file
- Determine the number of episodes with each treatment or surgical procedure

Table 7 shows the results. For 168,819 Ischemic Heart Disease episodes, the five most common surgical procedures are

presented. This mix of surgical interventions and their trends over time, including costs are tracked using ETG outputs.

As a final example, costs per episode trends for each base condition can be severity-adjusted to ensure valid comparisons. In this way differences in costs per episode over time due to underlying morbidity can be separated from changes due to other factors, such as service pricing, technology and provider practice patterns. Table 8 shows the results of this type of analysis using diabetes episodes and grouping these episodes into three consecutive year-long time windows.

Table 8 – Diabetes Episodes

Severity Level	# Episodes	% of Total Episodes	Avg Cost per Epi	Avg Score per Epi
Year 1				
1	81,887	71.9%	\$1,597	0.76
2	13,929	12.2%	\$2,360	1.18
3	8,681	7.6%	\$2,997	1.49
4	9,372	8.3%	\$4,487	2.38
All	113,869	100%	\$2,035	1.00
Year 2				
1	80,363	69.9%	\$1,613	0.77
2	15,839	13.8%	\$2,336	1.18
3	8,589	7.5%	\$2,996	1.49
4	10,161	8.8%	\$4,577	2.38
All	114,952	100%	\$2,078	1.02
Year 3				
1	87,751	76.3%	\$1,602	0.76
2	10,351	9.0%	\$2,394	1.18
3	8,510	7.4%	\$3,030	1.49
4	8,396	7.3%	\$4,547	2.38
All	113,869	100%	\$2,035	1.00

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Summary

ETGs were introduced to the market in 1993 and are now widely used for building episodes of care. Healthcare analytics rely on measurements that are accurate and valid definitions of a disease and the services related to a clinical condition. By combining related services into clinically

homogenous units that describe complete episodes of care, ETGs provide the basis of valid comparisons. With valid comparisons, you can employ ETGs in a variety of different healthcare analytics applications. This paper has summarized various uses of ETG measurements. For an introduction to ETGs and the methodology behind them, please see the companion paper *What are ETGs*.

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