Aetna Smart Compare™

orthopedic physician hip and knee designation measurement methodology 2021

Contents

Background on orthopedic physician designations for hip and knee conditions

As one of the oldest and largest national insurers, Aetna® has a unique opportunity to help transform health care. We believe that a better care system is more transparent, consumer focused and recognizes physicians for their clinical quality and effective consumption of health care resources. We are developing provider designations to support reaching this vision.

Orthopedic physician hip and knee designations help us identify those orthopedic providers that provide efficient high-quality care to commercial populations with hip and knee degeneration and derangement with or without surgery. We exclude practices where >50% of the hip and knee conditions managed are for members under the age of 18 years old, as they are most likely the pediatric-only orthopedic specialists. Orthopedic practices will be measured annually for hip and knee designations.

How we evaluate orthopedic physicians

The orthopedic specialist hip/knee designation is organized around two categories of measures:

- **Effectiveness**, which measures the outcomes and efficiency of treatment decisions.
- **Clinical quality**, which measures the quality of facilities where orthopedic specialists perform hip and/or knee replacement procedures. This measure is affected by complication rates and compliance with clinical guidelines.

We measure these categories separately.

1. Effectiveness: Episodes efficiency

1.1. Overview

"Episode of care" is a methodology to assist in understanding medical cost and utilization drivers. An episode of care for a member represents treatment and service utilization across time for an identified health condition. The doctor, hospital, pharmacy and ancillary testing, as well as other costs and utilization relating to an episode of illness, are rolled up into a single entity based on a specific condition. An episode of care spans from the onset of symptoms until treatment is complete.

We use Optum Symmetry® Episode Treatment Group® (ETG®) software version 9.4 illness classification system to build episodes of care data in the Aetna® Data Warehouse.

The ETG technology is distributed in the form of "grouper" software. The software accepts health care claims (service line detail) and returns the ETG value, along with other patient information. The grouper software rolls up all doctor, hospital, pharmacy and ancillary testing claims data together. It then creates episodes of illness or surgery that are clinically defined and identified by ETG codes for analysis purposes.

The Symmetry ETG offer the ability to identify, quantify and compare the total medical costs of a clinically based episode of care spanning hospitalizations, ambulatory visits and all ancillary services, including the use of pharmaceuticals. Medical claims and pharmacy claims are fed into the grouper software, and medical episodes are created from these claims.

There are many variables that can affect the use of health care resources for a condition. There can be variation in resource use to treat a condition that is a direct result of the population differences or level of illness. To adjust for the variation in resource use, a case-mix-adjusted "expected allowed amount" is created for each ETG that is attributed to a physician group. That case-mix-adjusted expected allowed amount is then compared to the actual allowed amount for that episode of care.

There can be variation in efficiency indexes over time analysis. Variation has been noted in physician groups whose episode counts over the given period are low. To evaluate physicians and determine potential for variation, the statistical significance of a provider group's efficiency score is evaluated with a .10 significance level.

We evaluate the efficiency of orthopedic physicians using episode conditions of joint degeneration and joint derangement of the knee and hip, with or without surgery. Only ETG codes that had an episode count of 200 or more for that ETG code and business line combination between January 1, 2018, and December 31, 2019, and were managed by an orthopedic provider were included in the analysis. Orthopedic physicians are evaluated on episodes where they were the responsible provider on that episode. Orthopedic groups must have at least 11 episodes for each business line/knee condition or business line/hip condition combination to be evaluated on episodes efficiency.

We attribute one responsible provider for each episode of care.

- If an episode contains a surgical procedure as defined by Symmetry and it is also a major surgery as defined by Aetna, the episode is attributed to the physician who performed that procedure.
  - If there are two major surgeries, then the episode is attributed to the physician with the most allowed amounts.
  - If there is not a major surgery in the episode, but a minor surgery is found, the episode is attributed to the physician who performed the minor surgery.
  - If there are two minor surgeries, the episode is attributed to the physician with the most allowed amounts.
- If there is no surgery present, the episode is attributed to the physician with the highest number of visits based on management records as defined by Symmetry.

  - For physicians tied for highest number of visits, the episode is attributed to the physician with the most direct treatment provided.
  - If there is still more than one physician with the same number of visits and treatments, the episode is attributed to the physician with the highest allowed amount.

Each ETG has its own clean period. It is defined as the absence of treatment for a specified period. For example, ETG 438300 (Acute Bronchitis) has a 30-day clean period. This means that any claims related to that diagnosis that fall within a 30-day period will be considered a recurrence of the same condition. When an episode is started for this ETG, all clinically consistent claims activity for acute bronchitis group to this episode until the point where 30 days passes without any corresponding clinically consistent treatment. If a claim for this condition is received after 30 days, a new episode is triggered.

Only full year or complete episodes are used in the evaluation of orthopedic physicians. Complete episodes are those that met the clean periods before and after the measure or the episode lasted 365 days. We limit chronic episodes (like diabetes or congestive heart failure) to a maximum of 365 days.

There is a claims lag of three months used in the episodes of care measurement. We use 2 years of episodes date to evaluate orthopedic physicians' efficiency.

Episode severity is a term used to describe the severity of a member's condition. ETG methodology takes advantage of the relevant complication and comorbidity factors (indicating a sicker member who may require more extensive treatment for a related condition) when determining an episode's severity. The result is a severity score and severity level for episodes. Typically, the higher the severity score, the more severe that condition is than for other members with a lower severity score for the same condition.

For example, if a member has an episode of diabetes and does not have complications or comorbidities associated with them, it would be expected that this member's severity score is relatively low. For a member with an episode of diabetes that has associated complications and comorbidities, it would be expected that this member's severity score is higher. Severity-adjusting episodes provides a powerful unit of analysis for comparing provider performance when different providers care for members with the same condition and different severity levels.

When comparing the allowed amount to the expected amount of an episode, the expected value reflects the case-mix-adjusted value for the orthopedic physician members' episodes. Outlier logic is applied at the case-mix category level. When case-mix categories are created, episodes are flagged as outliers if that episode is outside of two median absolute deviations away from the median allowed amounts for that case mix category.

1.2. Case mix variables

Variable within each ETG	
Hospital referral region (HRR)	HRR Num level (Appendix A)
ETG code	ETG code level (Appendix B)
Social determinants of health	Identifies variables that impact health care cost in a census tract area: income, poverty, diversity, disability, education, physical inactivity, marital status, public transportation. CDC and US census information used to identify SDOH
Age	Age
Gender	Male or female
Year of episode	Two years January 1, 2018 – December 31, 2019
Severity level	As indicated on the episode based on Symmetry. (Values are 0 to 4)
Business line	Commercial vs Medicare
Pharmacy usage	Whether or not the member has a pharmacy plan
HPD conditions	All conditions (Appendix C)
Concurrent episodes	Episodes that overlap each other by ETG code
Timing of orthopedic physician entry into	% of allowed amount that occurred in the episode before Orthopedic physician first claim in episode

episode	
ICD 10 codes	Frequency by which ICD10 appears in that episode
ERG risk score	Optum Symmetry® Episode Risk Groups® (ERG®). Risk-adjusted episodes of care created by the ETG grouper. This allows for a seamless drill down from an ERG score into the episodes that are contributing to a patient's risk.
Episode days count	The length from the start of the episode to the end of the episode

1.3. Eligible populations

Business lines	Commercial
Ages	All
Continuous enrollment	Complete and full year episodes are included, which means the episode began and came to an end according to the rules of clean periods or were 12-month episodes. Episodes longer than 12 months for chronic conditions are not created by our warehouse to enable comparisons. For example, if a chronic episode for one person is only 12 months long it would not be comparable to an episode for another person with the same condition that is 3 years long.
Measurement time frame	Two full years of episodes where the episode ends within the two-year time frame.
Benefit	Medical (pharmacy if available)
Provider specialty category	Orthopedic

Administrative specification	
Denominator	Denominator is the sum of the expected allowed amounts for the episodes being attributed to the group (Appendix B). The expected allowed amount is the case-mix-adjusted average for each ETG and its combination of variables as described above.
Total allowed $	Episodes must be greater than $0
Numerator	Numerator is the sum of the actual allowed amounts for the same episodes in the denominator being attributed to the group

1.4. Episode efficiency evaluation and scoring

Step 1: Aggregate episode level data for orthopedic practices.

a) Using episode data, identify all episodes for the measurement period. This data is evaluated at the individual episode level for each tax ID attributed to the episode.

Step 2: Determine benchmark.

a) Benchmark allowed per episode is calculated **using a decision tree machine learning model**. Model features include Optum Symmetry® Episode Risk Groups® (ERG®) retrospective risk score, concurrent episodes, member comorbidities and Social Determinants of Health. Model R-Squared is 0.70–0.79 excluding outliers.

Step 3: Determine orthopedic specialist performance evaluation result.

a) Calculate the episode-level performance index as total actual allowed amount/total benchmark allowed amount.

b) Calculate the market-adjusted episode level performance index as the episode level performance index/market level performance index for the market the practice being measured is a part of. The market and risk-level performance index is calculated as total actual episode allowed/total benchmark episode allowed with the following combinations of variables for different sub-populations:
- *Commercial hip* - HRR market
- *Commercial knee* - HRR market and TIN risk category

c) Calculate the overall weighted performance index for a practice by taking a weighted average of the market-adjusted episode level performance index scores for that practice weighted by the total benchmark allowed amount.

d) Conduct a two-sample weighted t-test comparing the practice's market-adjusted performance index weighted by the total benchmark allowed amount with the average market-adjusted performance index from the relevant decision tree node weighted by the total benchmark allowed amount. The t-test indicates whether there is a statistically significant difference between the actual and expected episode-level performance indices.
- If the test has a p-value greater than 0.10, the practice results are not statistically significant and the practice outcome will be "Insufficient information."
- If the test is statistically significant and the practice weighted performance index is less than 1, the practice will receive a designation of "Designation earned."
- If the test is statistically significant and the practice weighted performance index is greater than 1, the practice outcome will be "Criteria not me.t"

Note: The weights used in the test are transformed with a degree of freedom correction. Using raw expected amount values for weights makes the tails of the t-test distribution very thin, leading to most test results having statistical significance. The correction standardizes the weights by their mean so that the sum of the weights equals the number of observations and creates a higher bar for statistical significance.

A full calculation example can be found in Appendix D.

2. Clinical quality

2.1. Overview

The clinical quality category looks at the quality of facilities where orthopedic specialists perform hip or knee replacement procedures. Complication rates and compliance with clinical guidelines affect this measure.

The clinical quality designation is awarded based on publicly available external data on facilities where the orthopedic practice performs hip or knee procedures:
- **Two measures from Centers for Medicare & Medicaid Services (CMS) Hospital Compare**:
  - 30-day readmission rate following elective hip or knee arthroplasty
  - Hospital risk adjusted complication rate following elective hip or knee arthroplasty
- **Joint Commission Advanced Total Hip and Knee Replacement Certification**, which is available to hospitals, critical access hospitals and ambulatory surgical centers. The Joint Commission Certification is based on outcomes that include surgical site infections, fall rates, improvement in

patient education prior to discharge, length of stay, early ambulation and pain management. To be eligible for the certification, a facility must have served a minimum of 10 patients.

We only measure orthopedic practices with **at least three complete non-outlier episodes of care** across commercial and Medicare between January 1, 2018, and December 31, 2019. The purpose of setting a low threshold is to be as inclusive as possible, while excluding orthopedic practices with no Aetna® experience in treating hip or knee replacement conditions.

2.2. Clinical quality evaluation and scoring

Step 1: Orthopedic practices are linked to facilities using our claims data
Orthopedic practices are linked to facilities where they performed at least one hip or knee replacement procedure in 2019, across commercial and Medicare lines of business. If an orthopedic practice performs cases at more than one facility, we use a weighted average score based on Aetna case count to determine practice-level performance.

Step 2: Evaluate CMS Hospital Compare-based outcomes
CMS Hospital Compare provides actual facility performance and expected facility performance for both quality measures (that is, 30-day readmission rate and hospital complication rate following an elective hip or knee arthroplasty).

a) Calculate performance index as ratio between actual and expected facility performance for each measure. Measures are scored independently, with the following potential outcomes:
   - Positive performance if practice performance is lower than index average minus 0.5 standard deviations.
   - Negative performance if practice performance is higher than index average plus 0.5 standard deviations.
   - Neutral performance otherwise.

b) Combine individual CMS measure scores into an overall CMS Hospital compare score by selecting the result that is most favorable to the practice, as shown in Table 1. Scoring outcomes include:
   - Positive performance if practice earned a positive performance score on either measure (that is, 30-day readmission rate *or* complication rate).
   - Negative performance if practice earned a negative performance score on both measures (that is, 30-day readmission rate *and* complication rate).
   - Neutral performance otherwise.

Table 1 – Logic to combined measure-level scores into an overall CMS Hospital Compare score

		Hospital risk-adjusted complication rate following elective hip or knee arthroplasty		
		Positive performance	*Neutral performance*	*Negative performance*
30-day readmission following elective hip or	*Positive performance*	Positive performance	Positive performance	Positive performance
	Neutral performance	Positive performance	Neutral performance	Neutral performance

knee arthroplasty	*Negative performance*	Positive performance	Neutral performance	Negative performance

Step 3: Evaluate Joint Commission Advanced Total Hip and Knee Replacement Certification-based outcomes

The Joint Commission Certification category has two possible outcomes:

- Positive performance if the orthopedic practice performed more than 25 percent of its hip/knee procedures at Joint Commission Certified facilities. Facility certification is based on July 2020 data. Volume threshold is based on 2019 Aetna data across commercial and Medicare.
- Neutral performance otherwise.

Step 4: Calculate overall clinical quality designation

The two categories (that is, CMS Hospital Compare and Joint Commission Certification), are aggregated into a clinical quality designation using the following rules:

- Designation earned: orthopedic practice has positive performance on CMS Hospital Compare measures *or* Joint Commission Certification
- Criteria not met: orthopedic practice has negative performance on CMS Hospital Compare measures *and* neutral performance for Joint Commission Certification
- Insufficient information: orthopedic practice has neutral performance on CMS Hospital Compare measures *and* neutral performance for Joint Commission Certification.

Table 2 illustrates this logic. We use CMS Hospital Compare data as of July 2020.

Table 2 – Logic to determine whether an orthopedic practice earned a clinical quality designation

		CMS Hospital Compare		
		Positive performance	Neutral performance	Negative performance
Joint Commission Certification	Positive performance	Designation earned	Designation earned	Designation earned
	Neutral performance	Designation earned	Insufficient information	Criteria not met

To be eligible for a clinical quality designation, an orthopedic practice must have:

- Majority of their 2019 surgery spend at facilities are in-network with Aetna
- No 2019 cases at a facility with confirmed fraud cases

Orthopedic practices that do not meet both criteria cannot earn a clinical quality designation. These practices receive an insufficient information designation for clinical quality.

2.3. CMS Hospital Compare measure specifications

Hospital-level risk-standardized complication rate following elective primary THA and/or TKA	
Measure steward *CMS*	**Measure category:** *Outcome measures*
Description: The measure estimates a hospital-level risk-standardized complication rate associated with elective primary total hip arthroplasty (THA) and total knee arthroplasty (TKA) in Medicare Fee-For-Service beneficiaries who are 65 years and older. The outcome (complication) is	

defined as any one of the specified complications occurring from the date of index admission to 90 days post-date of the index admission (the admission included in the measure cohort).
Note: *A lower rate indicates better performance*

Denominator

The target population for the publicly reported measure includes admissions for Medicare FFS beneficiaries who are at least 65 years of age undergoing elective primary THA and/or TKA procedures.

Denominator exclusion

This measure excludes index admissions for patients:

- Without at least 90 days post-discharge enrollment in FFS Medicare
- Who were discharged against medical advice (AMA)
- Who had more than two THA/TKA procedure codes during the index hospitalization
- Fracture of the pelvis or lower limbs coded in the principal or secondary discharge diagnosis fields on the index admission claim (Note: Periprosthetic fractures must be additionally coded as present on admission [POA] in order to disqualify a THA/TKA from cohort inclusion, unless exempt from POA reporting)
- A concurrent partial hip or knee arthroplasty procedure
- A concurrent revision, resurfacing, or implanted device/prosthesis removal procedure
- Mechanical complication coded in the principal discharge diagnosis field on the index admission claim
- Malignant neoplasm of the pelvis, sacrum, coccyx, lower limbs, or bone/bone marrow or a disseminated malignant neoplasm coded in the principal discharge diagnosis field on the index admission claim
- Transfer from another acute care facility for the THA/TKA

Numerator

The outcome for this measure is any complication occurring during the index admission (not coded present on arrival) to 90 days post-date of the index admission. Complications are counted in the measure only if they occur during the index hospital admission or during a readmission. The complication outcome is a dichotomous (yes/no) outcome. If a patient experiences one or more of these complications in the applicable period, the complication outcome for that patient is counted in the measure as a yes.

Complications measured:

Complication	Follow-up period in days
Acute MI	
Pneumonia	During index admission or within 1
Sepsis/ septicemia/ shock	During index admission or within 1
Surgical site bleeding	During index admission or within 3 date
Pulmonary embolism	During index admission or within 3 date

	Death	During index admission or within 30 days of admi date
	Mechanical complications	During index admission or within 90 days of admi date
	Periprosthetic joint infection / wound infection	During index admission or within 90 days of admi date
Product lines & benefit	Medicare Medical during the measurement year.	
Continuous enrollment & allowable gap	Enrolled in Medicare fee-for-service (FFS) Part A and Part B for the 12 months prior to the date of admission; and enrolled in Part A during the index admission;	

Risk adjustment: Statistical risk model
Managing provider attribution Hospital facility
Data collection approach: Medicare FFS

Hospital-level 30-day risk-standardized readmission rate following elective primary THA and/or TKA	
Measure steward: *CMS*	**Measure category**: *Outcome measure*
Description: The measure estimates a hospital-level risk-standardized readmission rate following elective primary total hip arthroplasty (THA) and/or total knee arthroplasty (TKA) in Medicare Fee-For-Service (FFS) beneficiaries who are 65 years and older. The outcome (readmission) is defined as unplanned readmission for any cause within 30 days of the discharge date for the index admission (the admission included in the measure cohort). ***Note:*** *A lower rate indicates better performance*	
Denominator	The target population for the publicly reported measure includes admissions for Medicare FFS beneficiaries who are at least 65 years of age undergoing elective primary THA and/or TKA procedures. ***Denominator exclusions:*** • Without at least 30 days post-discharge enrollment in FFS Medicare • Who were discharged against medical advice (AMA) • Admitted for the index procedure and subsequently transferred to another acute care facility • Who had more than two THA/TKA procedure codes during the index hospitalization

	• Who had THA/TKA admissions within 30 days of a prior THA/TKA index admission
Numerator	The outcome for this measure is 30-day readmissions. We define readmissions as inpatient admissions for any cause, except for certain planned readmissions, within 30 days from the date of discharge of the index hospitalization. If a patient has more than one unplanned admission (for any reason) within 30 days after discharge from the index admission, only one is counted as a readmission. The measure looks for a dichotomous yes or no outcome of whether each admitted patient has an unplanned readmission within 30 days. However, if the first readmission after discharge is considered planned, any subsequent unplanned readmission is not counted as an outcome for that index admission, because the unplanned readmission could be related to care provided during the intervening planned readmission rather than during the index admission ***Numerator exclusions planned readmissions***: 1. A few specific, limited types of care are always considered planned (transplant surgery, maintenance chemotherapy/immunotherapy, and rehabilitation) 2. Non-acute readmission for a scheduled procedure
Product lines & benefit	Medicare
Continuous enrollment & allowable gap	Enrolled in Medicare fee-for-service (FFS) Part A and Part B for the 12 months prior to the date of admission; and enrolled in Part A during the index admission

Risk adjustment: Statistical risk model
Managing provider attribution Hospital facility
Data collection approach: Medicare FFS

Appendix A: Hospital referral regions (HRRs)

hrrnum	hrrcity	hrrstate
10	Anchorage	AK
1	Birmingham	AL
2	Dothan	AL
5	Huntsville	AL
6	Mobile	AL
7	Montgomery	AL
9	Tuscaloosa	AL
16	Fort Smith	AR
18	Jonesboro	AR
19	Little Rock	AR
21	Springdale	AR
22	Texarkana	AR
11	Mesa	AZ
12	Phoenix	AZ
14	Sun City	AZ
15	Tucson	AZ
23	Orange County	CA
25	Bakersfield	CA
31	Chico	CA
33	Contra Costa County	CA
43	Fresno	CA
56	Los Angeles	CA
58	Modesto	CA
62	Napa	CA
65	Alameda County	CA
69	Palm Springs/Rancho Mira	CA
73	Redding	CA
77	Sacramento	CA
78	Salinas	CA
79	San Bernardino	CA
80	San Diego	CA
81	San Francisco	CA
82	San Jose	CA
83	San Luis Obispo	CA
85	San Mateo County	CA
86	Santa Barbara	CA
87	Santa Cruz	CA
89	Santa Rosa	CA
91	Stockton	CA
96	Ventura	CA
101	Boulder	CO
102	Colorado Springs	CO

103	Denver	CO
104	Fort Collins	CO
105	Grand Junction	CO
106	Greeley	CO
107	Pueblo	CO
109	Bridgeport	CT
	Hartford	CT
111	New Haven	CT
113	Washington	DC
112	Wilmington	DE
115	Bradenton	FL
116	Clearwater	FL
118	Fort Lauderdale	FL
119	Fort Myers	FL
120	Gainesville	FL
122	Hudson	FL
123	Jacksonville	FL
124	Lakeland	FL
127	Miami	FL
129	Ocala	FL
130	Orlando	FL
131	Ormond Beach	FL
133	Panama City	FL
134	Pensacola	FL
137	Sarasota	FL
139	St. Petersburg	FL
140	Tallahassee	FL
141	Tampa	FL
142	Albany	GA
144	Atlanta	GA
145	Augusta	GA
146	Columbus	GA
147	Macon	GA
148	Rome	GA
149	Savannah	GA
150	Honolulu	HI
190	Cedar Rapids	IA
191	Davenport	IA
192	Des Moines	IA
193	Dubuque	IA
194	Iowa City	IA
195	Mason City	IA
196	Sioux City	IA
197	Waterloo	IA

151	Boise	ID
152	Idaho Falls	ID
154	Aurora	IL
155	Blue Island	IL
156	Chicago	IL
158	Elgin	IL
161	Evanston	IL
163	Hinsdale	IL
164	Joliet	IL
166	Melrose Park	IL
170	Peoria	IL
171	Rockford	IL
172	Springfield	IL
173	Urbana	IL
175	Bloomington	IL
179	Evansville	IN
180	Fort Wayne	IN
181	Gary	IN
183	Indianapolis	IN
184	Lafayette	IN
185	Muncie	IN
186	Munster	IN
187	South Bend	IN
188	Terre Haute	IN
200	Topeka	KS
201	Wichita	KS
203	Covington	KY
204	Lexington	KY
205	Louisville	KY
207	Owensboro	KY
208	Paducah	KY
209	Alexandria	LA
210	Baton Rouge	LA
212	Houma	LA
213	Lafayette	LA
214	Lake Charles	LA
216	Metairie	LA
217	Monroe	LA
218	New Orleans	LA
219	Shreveport	LA
220	Slidell	LA
227	Boston	MA
230	Springfield	MA
231	Worcester	MA

223	Baltimore	MD
225	Salisbury	MD
226	Takoma Park	MD
221	Bangor	ME
222	Portland	ME
232	Ann Arbor	MI
233	Dearborn	MI
234	Detroit	MI
235	Flint	MI
236	Grand Rapids	MI
238	Kalamazoo	MI
239	Lansing	MI
240	Marquette	MI
242	Muskegon	MI
243	Petoskey	MI
244	Pontiac	MI
245	Royal Oak	MI
246	Saginaw	MI
248	St. Joseph	MI
249	Traverse City	MI
250	Duluth	MN
251	Minneapolis	MN
253	Rochester	MN
254	St. Cloud	MN
256	St. Paul	MN
263	Cape Girardeau	MO
264	Columbia	MO
267	Joplin	MO
268	Kansas City	MO
270	Springfield	MO
273	St. Louis	MO
257	Gulfport	MS
258	Hattiesburg	MS
259	Jackson	MS
260	Meridian	MS
261	Oxford	MS
262	Tupelo	MS
274	Billings	MT
275	Great Falls	MT
276	Missoula	MT
309	Asheville	NC
311	Charlotte	NC
312	Durham	NC
313	Greensboro	NC

314	Greenville	NC
315	Hickory	NC
318	Raleigh	NC
319	Wilmington	NC
320	Winston-Salem	NC
321	Bismarck	ND
322	Fargo/Moorhead MN	ND
323	Grand Forks	ND
324	Minot	ND
277	Lincoln	NE
278	Omaha	NE
281	Lebanon	NH
282	Manchester	NH
283	Camden	NJ
284	Hackensack	NJ
285	Morristown	NJ
288	New Brunswick	NJ
289	Newark	NJ
291	Paterson	NJ
292	Ridgewood	NJ
293	Albuquerque	NM
279	Las Vegas	NV
280	Reno	NV
295	Albany	NY
296	Binghamton	NY
297	Bronx	NY
299	Buffalo	NY
300	Elmira	NY
301	East Long Island	NY
303	Manhattan	NY
304	Rochester	NY
307	Syracuse	NY
308	White Plains	NY
325	Akron	OH
326	Canton	OH
327	Cincinnati	OH
328	Cleveland	OH
329	Columbus	OH
330	Dayton	OH
331	Elyria	OH
332	Kettering	OH
334	Toledo	OH
335	Youngstown	OH
336	Lawton	OK

339	Oklahoma City	OK
340	Tulsa	OK
341	Bend	OR
342	Eugene	OR
343	Medford	OR
344	Portland	OR
345	Salem	OR
346	Allentown	PA
347	Altoona	PA
350	Danville	PA
351	Erie	PA
352	Harrisburg	PA
354	Johnstown	PA
355	Lancaster	PA
356	Philadelphia	PA
357	Pittsburgh	PA
358	Reading	PA
359	Sayre	PA
	Scranton	PA
362	Wilkes-Barre	PA
363	York	PA
364	Providence	RI
365	Charleston	SC
366	Columbia	SC
367	Florence	SC
368	Greenville	SC
369	Spartanburg	SC
370	Rapid City	SD
371	Sioux Falls	SD
373	Chattanooga	TN
374	Jackson	TN
375	Johnson City	TN
376	Kingsport	TN
377	Knoxville	TN
379	Memphis	TN
380	Nashville	TN
382	Abilene	TX
383	Amarillo	TX
385	Austin	TX
386	Beaumont	TX
388	Bryan	TX
390	Corpus Christi	TX
391	Dallas	TX
393	El Paso	TX

394	Fort Worth	TX
396	Harlingen	TX
397	Houston	TX
399	Longview	TX
400	Lubbock	TX
402	McAllen	TX
406	Odessa	TX
411	San Angelo	TX
412	San Antonio	TX
413	Temple	TX
416	Tyler	TX
417	Victoria	TX
418	Waco	TX
420	Wichita Falls	TX
421	Ogden	UT
422	Provo	UT
423	Salt Lake City	UT
426	Arlington	VA
427	Charlottesville	VA
428	Lynchburg	VA
429	Newport News	VA
430	Norfolk	VA
431	Richmond	VA
432	Roanoke	VA
435	Winchester	VA
424	Burlington	VT
437	Everett	WA
438	Olympia	WA
439	Seattle	WA
440	Spokane	WA
441	Tacoma	WA
442	Yakima	WA
446	Appleton	WI
447	Green Bay	WI
448	La Crosse	WI
449	Madison	WI
450	Marshfield	WI
451	Milwaukee	WI
452	Neenah	WI
456	Wausau	WI
443	Charleston	WV
444	Huntington	WV
445	Morgantown	WV
457	Casper	WY

Appendix B: ETG code list with condition category

ETG_CD	ETG_FUL_LONG_DESC	Commercial
712202000	Joint degeneration, localized - knee & L leg, w/o complication, w/o comorbidity, w/o surgery	Knee
712202001	Joint degeneration, localized - knee & L leg, w/o complication, w/o comorbidity, with surgery	Knee
712202010	Joint degeneration, localized - knee & L leg, w/o complication, with comorbidity, w/o surgery	Knee
712202011	Joint degeneration, localized - knee & L leg, w/o complication, with comorbidity, with surgery	Knee
712202100	Joint degeneration, localized - knee & L leg, with complication, w/o comorbidity, w/o surgery	Knee
712202101	Joint degeneration, localized - knee & L leg, with complication, w/o comorbidity, with surgery	Knee
712202110	Joint degeneration, localized - knee & L leg, with complication, with comorbidity, w/o surgery	Knee
712202111	Joint degeneration, localized - knee & L leg, with complication, with comorbidity, with surgery	Knee
712203001	Joint degeneration, localized - thigh, hip & pelvis, w/o complication, w/o comorbidity, with surgery	Hip
712203010	Joint degeneration, localized - thigh, hip & pelvis, w/o complication, with comorbidity, w/o surgery	Hip
712203011	Joint degeneration, localized - thigh, hip & pelvis, w/o complication, with comorbidity, with surgery	Hip
714303000	Joint derangement - thigh, hip & pelvis, w/o surgery	Hip
714303001	Joint derangement - thigh, hip & pelvis, with surgery	Hip

Appendix C: Health profile database (HPD) conditions

Health Profile Monitor Disease Code List
ADHD and other Childhood Disruptive Disorders
Alcoholism
Allergy
Anxiety
Asthma
Atrial Fibrillation
Attention Deficit Disorder
Autism
Benign Prostatic Hypertrophy
Bipolar
Bladder Cancer
Brain Cancer
Breast Cancer
Cataract
Cerebrovascular Disease
Cervical Cancer
Cholelithiasis/Cholecystitis
Chronic Fatigue Syndrome
Chronic Obstructive Pulmonary Disease
Chronic Renal Failure
Chronic Thyroid Disorders
Colorectal Cancer
Congenital Heart Disease
Cystic Fibrosis
Dementia
Depression
Diabetes Mellitus
Diverticular Disease
Down's Syndrome
Eating Disorders
Endometrial Cancer
Endometriosis
Epilepsy
Esophageal Cancer
Female Infertility
Fibromyalgia
Glaucoma
Head/Neck Cancer
Heart Failure
Hemophilia/Congenital Coagulopathies
Hepatitis
HIV/AIDS

Hodgkin's Disease/Lymphoma
Hypercoagulable Syndrome
Hyperlipidemia
Hypertension
Inflammatory Bowel Disease
Iron Deficiency Anemia
Ischemic Heart Disease
Kidney Stones
Leukemia/Myeloma
Low Back Pain
Low Vision and Blindness
Lung Cancer
Lyme Disease
Malignant Melanoma
Maternal Hist of Low Birth Weight or Preterm Birth
Menopause
Metabolic Syndrome
Migraine and Other Headaches
Multiple Sclerosis
Neurosis
Nonspecific Gastritis/Dyspepsia
Obesity
Oral Cancer
Osteoarthritis
Osteoporosis
Other Cancer
Otitis Media
Ovarian Cancer
Pancreatic Cancer
Pancreatitis
Parkinson's Disease
Peptic Ulcer Disease
Periodontal Disease
Peripheral Artery Disease
Post-Partum BH Disorder
Prostate Cancer
Psychiatric Disorders related to Med Conditions
Psychoses
Rheumatoid Arthritis
Sickle Cell Anemia
Skin Cancer
Stomach Cancer
Substances Related Disorders

Systemic Lupus Erythematosus
Ventricular Arrhythmia

Appendix D: Orthopedic specialist effectiveness (episode) performance evaluation example

This provides an example of the evaluation of practice performance for the episode-based effectiveness metric.

Below is a fictional example for ABC Medical Group to illustrate how the calculation works. This example will walk through the scoring process for ABC Medical Group's commercial adult population.

Table 1 – ABC Medical Group commercial adult episode data

		A	B	C	D	E
Row number	ETG code	HRR market	Total actual allowed amount	Total benchmark allowed amount	Episode-level performance index	Market-adjusted episode-level performance index
1	164800000	119	$360	$383	0.94	0.94
2	164800000	119	$82	$153	0.54	0.54
3	164800000	119	$82	$165	0.50	0.50
4	164800000	119	$227	$165	1.37	1.37
5	164800000	119	$223	$230	0.97	0.97
6	164800000	119	$82	$230	0.36	0.36
7	164800000	119	$332	$327	1.02	1.01
8	164800000	119	$239	$327	0.73	0.73
9	164800000	119	$292	$327	0.89	0.89
10	164800000	119	$101	$327	0.31	0.31
11	164800000	119	$221	$327	0.68	0.68
12	164800000	119	$468	$333	1.40	1.40
13	164800100	119	$297	$313	0.95	0.94
14	164800100	119	$309	$435	0.71	0.71
15	164800100	119	$122	$435	0.28	0.28
16	164800100	119	$302	$390	0.78	0.77
17	164800100	119	$250	$390	0.64	0.64
18	164800100	119	$277	$390	0.71	0.71
19	164800100	119	$528	$390	1.35	1.35
20	164800100	119	$366	$390	0.94	0.93
21	164800100	119	$893	$603	1.48	1.48
22	164800100	119	$942	$470	2.00	2.00
23	164800100	119	$414	$529	0.78	0.78
24	164800100	119	$108	$803	0.13	0.13
25	164800100	119	$594	$348	1.70	1.70
26	239800100	119	$178	$209	0.85	0.85
27	387400110	119	$1,465	$854	1.72	1.71
28	388100010	119	$261	$266	0.98	0.98

29	388100010	119	$158	$290	0.54	0.54
30	388100010	119	$336	$512	0.66	0.65
31	388100010	119	$312	$283	1.10	1.10

Table 2 – Market reference data

HRR Market	Market-level performance index
119	1.24

Step 1: Aggregate episode level data for orthopedic practices.

a) Using episode data, identify all episodes for the measurement period. This data is evaluated at the individual episode level for each tax ID attributed to the episode. **For ABC Medical Group, this data is represented in Table 1. Each row signifies a distinct episode attributed to the practice. In this example, there were a total of 31 unique episodes adding up to $10,820 in total actual allowed (Column B).**

Step 2: Determine benchmark.

a) Benchmark allowed per episode is calculated **using a decision tree machine learning model**. Model features include Optum Symmetry® Episode Risk Groups® (ERG®) retrospective risk score, concurrent episodes, member comorbidities and Social Determinants of Health. Model R-Squared is 0.70–0.79 excluding outliers. **In this example the benchmark used for ABC Medical Group can be found in Column C in Table 1.**

Step 3: Determine orthopedic specialist performance evaluation result.

e) Calculate the episode-level performance index as total actual allowed amount/total benchmark allowed amount. **For ABC Medical Group, this is represented as B/C and the result is found in Column D. For example, the episode-level performance index for Episode 1 is ($360/$383) = 9399 (~.94).**

f) Calculate the market adjusted episode level performance index as the episode level performance index/market level performance index for the market the practice being measured is a part of. The market and risk-level performance index is calculated as total actual episode allowed/total benchmark episode allowed with the following combinations of variables for different sub-populations:

- *Commercial hip* - HRR market
- *Commercial knee* - HRR market and TIN risk category

ABC Medical Group is in HRR 119. The market-level performance index for HRR 119 is 1.0024 in Table 2. The market-adjusted episode-level performance index is calculated a D/1.0024 and the results are found in Column E of Table 1. In this example, the market-adjusted episode-level performance index for Episode 1 is .94/1.0024 = .937 (~.94).

g) Calculate the overall weighted performance index for a practice by taking a weighted average of the market adjusted episode level performance index scores for that practice weighted by the total benchmark allowed amount. **For ABC Medical Group this would be**

the sum product of Column C and Column E in Table 1. ABC Medical Group's overall performance index is 0.93.

h) Conduct a two-sample weighted t-test comparing the practice's market-adjusted performance index weighted by the total benchmark allowed amount with the average market-adjusted performance index from the relevant decision tree node weighted by the total benchmark allowed amount. The t-test indicates whether there is a statistically significant difference between the actual and expected episode-level performance indices.

- If the test has a p-value greater than 0.10, the practice results are not statistically significant and the practice outcome will be "Insufficient information."
- If the test is statistically significant and the practice weighted performance index is less than 1, the practice will receive a designation of "Designation earned."
- If the test is statistically significant and the practice weighted performance index is greater than 1, the practice outcome will be "Criteria not met."

Note: The weights used in the test are transformed with a degree of freedom correction. Using raw expected amount values for weights makes the tails of the t-test distribution very thin, leading to most test results having statistical significance. The correction standardizes the weights by their mean so that the sum of the weights equals the number of observations and creates a higher bar for statistical significance.

Using this methodology and assuming that the average of the relevant market-adjusted performance index values are 1, the p-value of ABC Medical Group is 0.44. Thus, the practice is designated as NSS.