

Analyzing Sources of Variation within Episode Costs: **HEALTH PLAN NAME**

Introduction

The objective of this report is to summarize the results of a comprehensive data analysis and identify opportunities for improvement both in terms of 1) lowering costs and 2) improving quality of care using the unique features of the Prometheus Payment model's Evidence-informed Case Rates (ECRs). After summarizing an overall view of the results of the data analysis, this report will identify areas of opportunity in your data and extract information that will make your data actionable. The prime focus of the report is to understand the sources of variation in your current data, both in terms of cost and quality, and provide recommendations on how to move forward. Sources of potential variation in the total cost of an episode that we can identify from this analysis include:

1. Unit Price per Service – determined by fee schedules or contracted rates
2. Severity of the patient – sicker patients may require more resources for appropriate care
3. Provider Practice Patterns in terms of frequency and types of services provided for routine or typical care
4. Provider Performance in terms of potentially avoidable complications (PACs)

Evidence-informed Case Rates (ECRs)

ECRs are patient-centered episodes of care that include covered services for a pre-determined time window, bundled across providers that routinely treat a condition or procedure. Each ECR is severity-adjusted to create a budget for care of an episode *after* that episode is triggered. It separates costs for *typical* or reliable care that are mostly related to patient factors, from costs associated with potentially avoidable complications (PACs) that can be caused by delivery system failures, lack of care coordination or other gaps in quality. These data provide specific and actionable information for plans, physicians, and hospitals.

There are 21 ECRs divided into four categories: Chronic Medical, Inpatient Medical, Inpatient Procedural, and Outpatient Procedural. Your data was analyzed on all 21 ECRs and a description of each ECR time window can be found below.

Type of ECR	Trigger	Time Window	Examples	# ECRs
Chronic Medical	Outpatient Professional	One year from trigger	Diabetes, CHF, COPD, Asthma, CAD, HTN, GERD	7
Acute Medical	Inpatient Facility	0-day look-back; 30-day look-forward	AMI, Pneumonia, Stroke	3
Inpatient Procedural	Inpatient Facility / Professional	30-day look-back; 180-day look-forward	Hip Replacement, Knee Replacement, CABG, Bariatric Surgery, Colon Resection	5
Outpatient Procedural (i) With either inpt or outpt facility (ii) With no inpt facility (iii) Pregnancy and Delivery	Outpatient or Inpatient Facility/Professional	(i) 60 day look back; 180 day look forward (ii) 7 day look-back; 30 day look-forward (iii) 36 weeks (9 months) look-back period, 8 weeks (2 months) look-forward period.	(i) Angioplasty, Cholecystectomy, Knee Arthroscopy, Hysterectomy (ii) Colonoscopy (iii) Pregnancy and Delivery	6

Data Used

The data included **two years** of claims from your plan's database (**2008 – 2009**). The total volume of data that was processed during the analysis for your health plan represented **516,986** unique patients, for a total of **24,364,348** claims.

Analytic Process

The claims were processed using a standard SAS analytical program developed by HCI3. Claims are filtered through several steps in order to ensure that the episodes analyzed are complete and can be used to build the statistical models needed for severity adjustment.

In particular, the process includes removing claims with outlier costs (under \$10 and over \$1,000,000), removing claims with invalid or missing service dates, and removing claims outside of the study period. Patients also have to meet a continuous enrollment criterion – no enrollment gap greater than 30 days – and age criteria. Finally, patients with complex co-morbid conditions (for example a patient with HIV or cancer) are excluded from the final analysis.

Results

The total relevant allowed costs for 21 Prometheus Payment ECRs included in the final analysis was over **\$313 Million** – or **31%** of the total medical spend in your database.

Health Plan Total Relevant Costs					
	\$	%		\$	%
CHRONIC			Outpatient Procedural		
CHF	\$6,376,430	2%	COLOS	\$39,754,242	13%
COPD	\$15,156,922	5%	GALL	\$12,822,481	4%
DM	\$53,861,054	17%	KNEEAR	\$13,984,985	4%
ASTHMA	\$25,649,766	8%	PCI	\$15,573,491	5%
HTN	\$21,660,615	7%	PREG	\$18,841,639	6%
CAD	\$16,249,942	5%	HYST	\$9,395,357	3%
GERD	\$39,628,536	13%	Total	\$110,372,195	35%
Total	\$178,583,265	57%			
Inpatient Procedural			Inpatient Medical		
HIP	\$2,793,886	1%	AMI	\$4,328,303	1%
KNEE	\$5,371,605	2%	STROKE	\$2,769,316	1%
CABG	\$2,551,649	1%	PNE	\$1,639,174	1%
COLON	\$2,277,713	1%	Total	\$8,736,793	3%
BARI	\$2,786,194	1%			
Total	\$15,781,047	5%	Total Spend	\$313,473,300	

The chronic ECRs represent the largest amount of costs at \$178 million (57%), outpatient procedural are 35%, inpatient procedural ECRs are 5%, and inpatient medical represents the lowest percentage of costs at 3%. These numbers are generally consistent with the distribution found in the national database with the exception of inpatient procedural episodes that are a bit lower in your population.

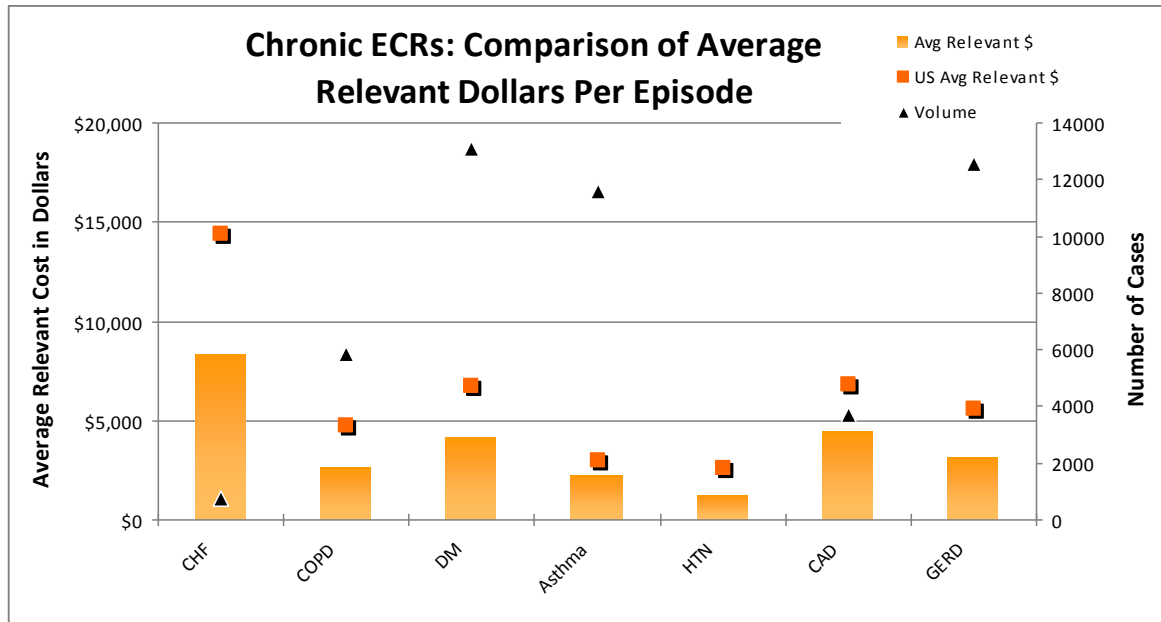
Part 1: Overall PAC Opportunity

Data Source: Validation Template, PAC Type Template

A. Chronic Medical Episodes

Relevant Episode Costs

One of the first steps in examining the results of the ECR analytics is to study average episode costs, relative to the Prometheus benchmark database. In other words, how much does your plan spend on average per ECR compared to the national average? The Prometheus benchmark database is a large nationally representative database of over 4.7 million commercially insured plan members, referred to as CIP. The graph below reveals that your plan spends well below the US average episode costs for the chronic ECRs.



After examining average relevant episode costs, it is important to investigate what is driving these dollars. Since total episode costs consist of both PAC costs and Typical costs, the magnitude of each component within the episode can be studied separately.

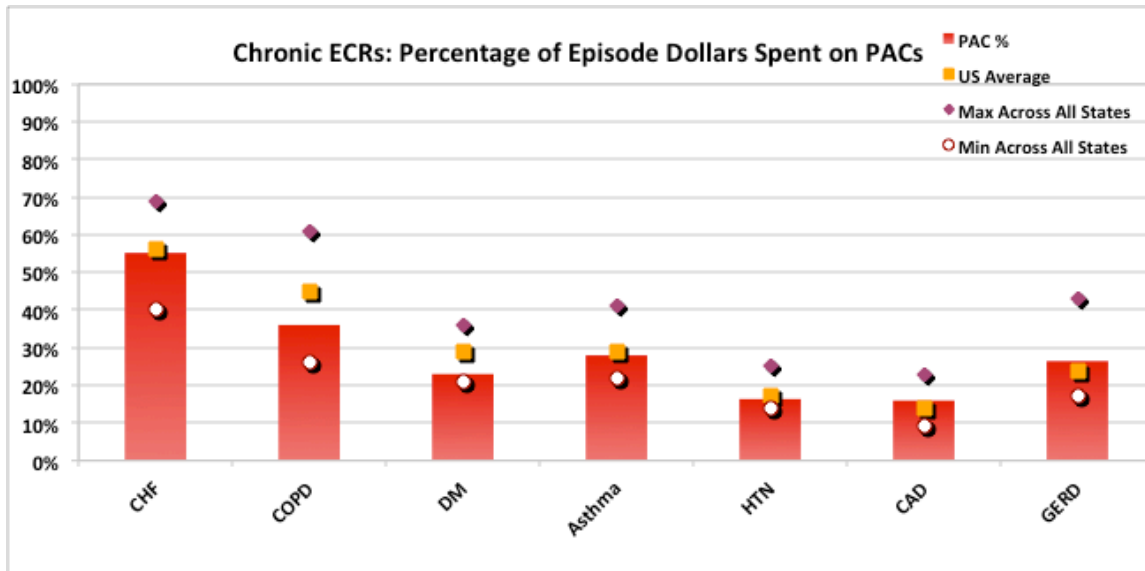
PAC Costs

Potentially Avoidable Complications are the primary target for cost reduction in the Prometheus Payment effort. They result from gaps in quality and include the CMS-defined Hospital Acquired Conditions, readmissions post-discharge, the AHRQ-defined Patient Safety Indicators, and well-researched indicators of ambulatory care problems such as Ambulatory Care-Sensitive Hospitalizations.

The PAC reduction opportunity varies across ECRs not only in terms of the actual PAC dollars but also in terms of their actionability. For example, for chronic ECRs, PAC dollars are significant (\$45 million). This amount can be reduced by engaging the physicians (PCPs and specialists) involved in the care of the patient to improve care coordination, patient activation, and proactive care, which should help to keep the patients out of the ER and hospitals.

The graph below indicates the percentage of dollars, per ECR, spent on PACs by your health plan. The graph also compares your health plan's PACs to the US average and the minimum and maximum dollars spent on PACs observed across all states. These data are derived from the Prometheus benchmark database. By examining the analysis below, we can begin to parse out opportunities for potential compression of PACs. For example, the percentage of dollars spent on PACs for a majority of the chronic conditions appear to be

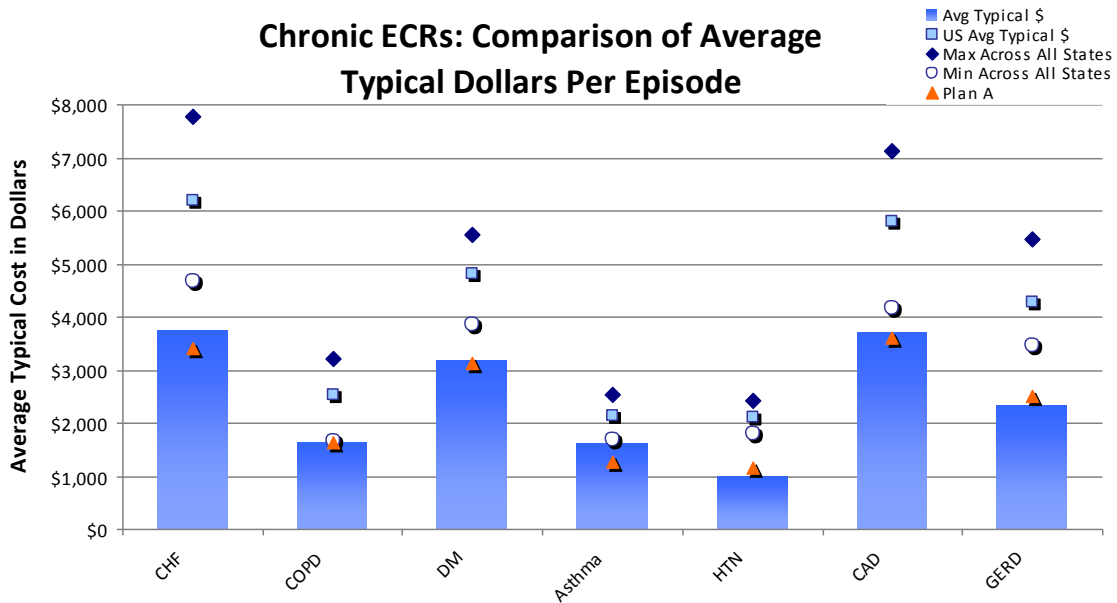
equal to the US average PAC rate. While the PAC rate for COPD is less than the US average, there is still potential to compress PACs to the minimum PAC rate observed across all states. The PAC rate for Diabetes appears to be close to the minimum PAC rate we have seen thus far.



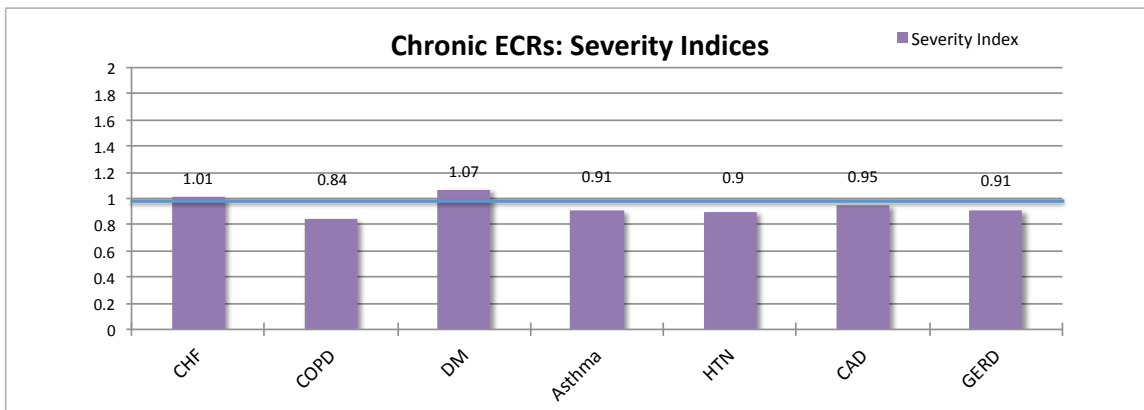
Overall, PACs represent **25%** of the total chronic care dollars analyzed. Extrapolating to the total yearly spend of your health plan, the potential savings by reducing the current rate of PACs to the US minimum across all states would amount to **\$10.4 million** for the chronic conditions alone.

Typical Costs

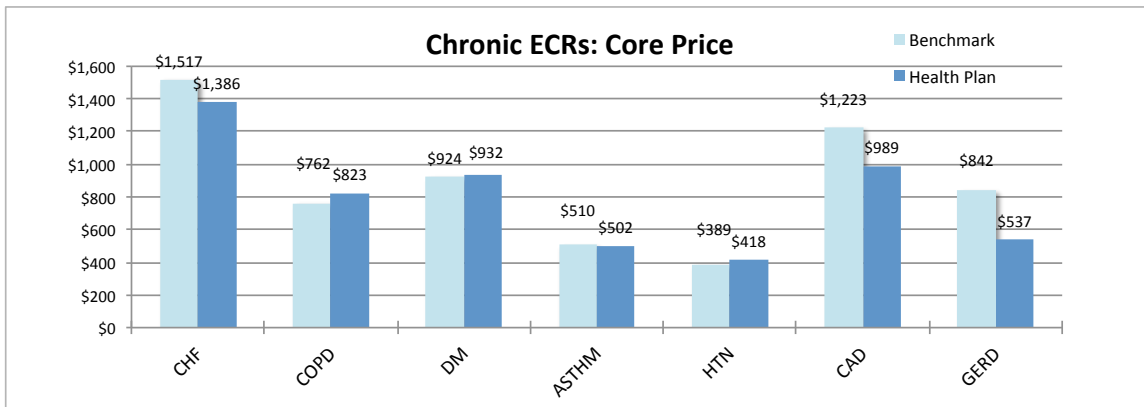
One of the aims of the Prometheus model is to reduce the dollars spent on Potentially Avoidable Complications, but monitoring the dollars spent on Typical care can help to uncover the potential sources of variation within an episode. For example, upon examining the graph below, **your health plan spends less on average Typical costs per episode across the chronic ECRs when compared to the Prometheus benchmark database. In fact, your plan appears to spend less than the minimum average Typical costs we have observed across all states. The differences in the dollars spent on Typical care could stem from a variety of factors.**



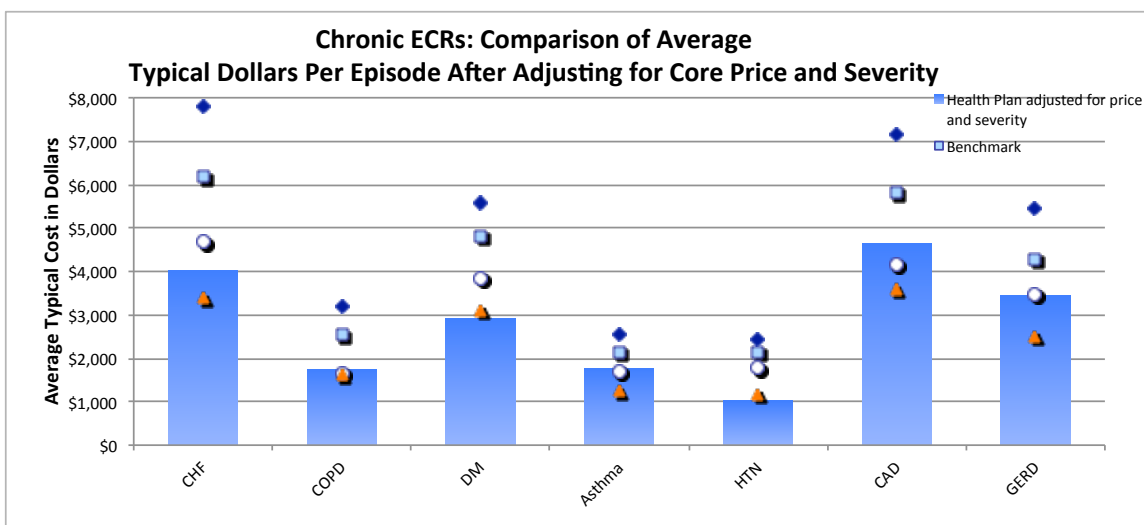
Differences in patient severity may result in increased or decreased resource use. Compared to the Prometheus benchmark database, your plan's severity indices for the chronic ECRs are slightly lower, with Diabetes and CHF being the only exceptions. This may result in lower resource use among some of the chronic ECRs.



Differences in pricing structure and negotiated contract rates may also lead to variation in average Typical costs within an episode. We can compare your plan's core price per chronic episodes to that of the Prometheus benchmark database to determine whether differences in underlying fee schedules may explain the variation in Typical expenses. In the graph below, your plan spends less on core services related to CHF, Asthma, CAD, and GERD and slightly more on COPD, Diabetes, and Hypertension when compared to the benchmark database.



We can adjust average Typical costs for differences in patient severity and core price in order to determine whether variation may be explained by differences in provider practice patterns. Practice patterns may differ in terms of frequency and type of resource use.

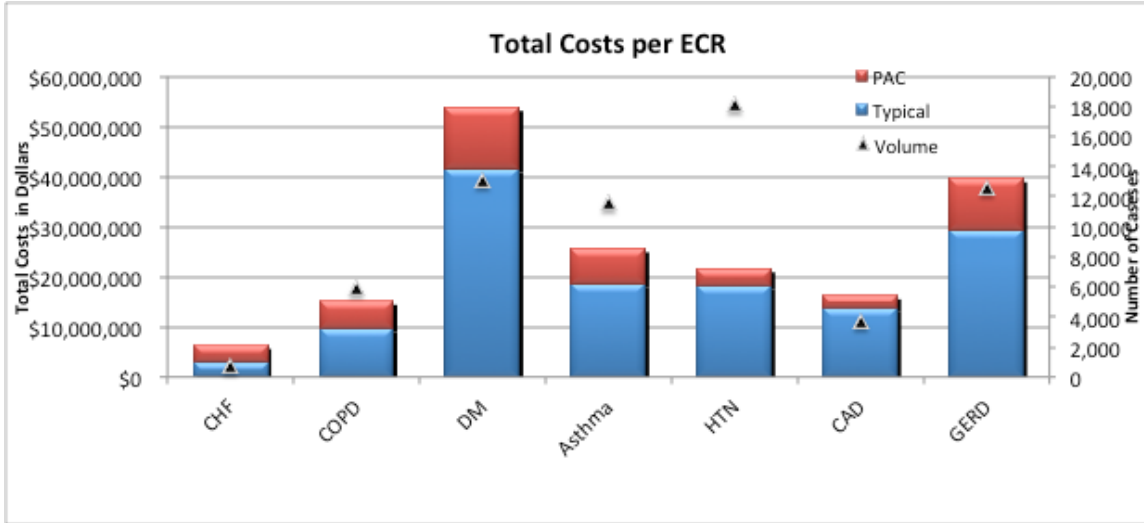


After adjusting for differences in core price and patient severity, your plan still spends less on average Typical cost when compare to the Prometheus benchmark database. These differences likely stem from variation in provider practice patterns.

Total Episode Costs

While the goal of the Prometheus model is to reduce the dollars spent on Potentially Avoidable Complications, it is necessary to review both components of total episode costs: the dollars spent on Typical care relative to the dollars spent on PACs within each ECR.

Looking at the plot below, ECRs with the highest total episode dollars and highest PAC dollars are Diabetes and GERD.



Savings Opportunities

The graph below shows an estimated savings potential if the percentage of dollars spent on PACs for the chronic episodes were reduced to the minimum percentage observed around the country, derived from the Prometheus benchmark database. The highest savings potential for your health plan is offered by GERD.



PAC Types

One of the next steps in examining the results of the ECR analytics is to take a deeper look at your data to see which PACs are the most costly and the most prevalent for your health plan.

There are three types of PACs:

- Type 1 PACs are related to the index condition. For example, a Type 1 PAC for Diabetes could be a diabetic patient ending up in the emergency department due to ketoacidosis.
- Type 2 PACs are related to co morbidities. A Type 2 PAC could involve a diabetic patient ending up in the emergency department with exacerbation of asthma.
- Type 3 PACs are due to patient safety failures, and could include such events as a patient having a fall in a hospital, or suffering from an adverse drug event.

Identifying which PAC Types are the most common and most costly within specific episodes can help to determine at what level an intervention can be applied to reduce those PACs. For instance, if Type 1 PACs are found to be most prevalent within the dataset, targeting performance at the provider-level may help to reduce PACs directly associated to the patient's index condition. If Type 2 PACs are most common, transitions of care or increased care coordination among the providers who co-manage the patient may result in a reduction of PACs associated with co-morbidities. Lastly, if Type 3 PACs are found to be the most prevalent, a system level intervention or process redesign may be the most beneficial approach to reducing patient safety failures.

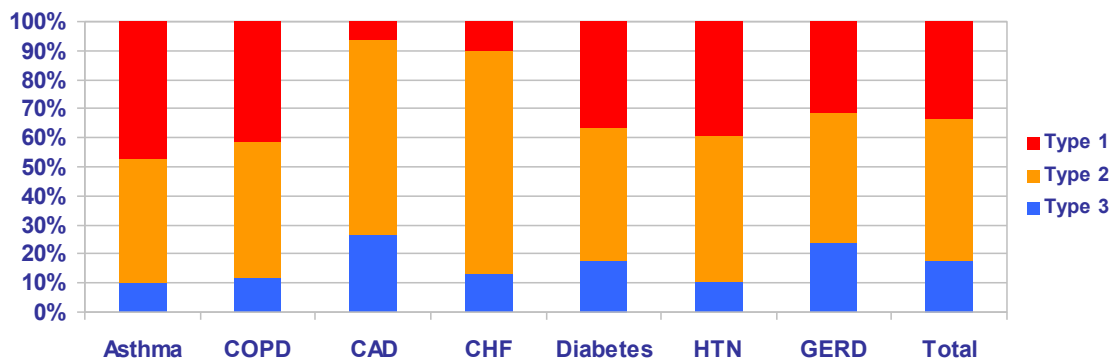
First, we will look at the frequency and average costs of emergency room visits, PAC inpatient stays, and PAC professional and outpatient facility visits compared to the Prometheus benchmark database. Then we will determine which PAC types occur more frequently and are the most costly. Finally, we will look at which specific PACs occur more often and which are the top drivers of costs for select ECRs.

The graph below shows the frequency per 1,000 and average cost per occurrence for PAC inpatient stays, PAC outpatient facility and professional services, and emergency room visits for both the Prometheus benchmark database and your health plan. The frequency per 1,000 occurrences and average cost of PAC inpatient stays were both lower than the benchmark database. For PAC outpatient facility and professional services, the frequency per 1,000 was lower than the benchmark, but the cost per occurrence was slightly higher. For emergency room visits, the frequency per 1,000 was lower than the benchmark and the average cost per occurrence was significantly lower than the benchmark.

	CIP All Chronic ECRs				Health Plan All Chronic ECRs			
	Number of PAC Occurrences	Medical Costs	Frequency per 1,000	Avg cost per occurrence	Number of PAC Occurrences	Medical Costs	Frequency per 1,000	Avg cost per occurrence
PAC IP STAY	48,792	\$563,257,302	728	\$77,937	2,297	\$17,015,394	482	\$49,484
PAC OP FACI/PROF	885,469	\$521,437,366	8,812	\$4,426	53,724	\$32,891,581	6,942	\$4,750
EMERGENCY ROOM	140,853	\$110,963,254	1,494	\$4,217	8,129	\$3,820,830	1,099	\$2,491

The graph below shows the percent of Inpatient Stay, Professional and Outpatient Facility PAC costs for each ECR by PAC type for the chronic ECRs. Within your plan, the Type 2 PACs appear to take up the highest percentage of costs across all chronic ECRs, except for Asthma. For this ECR the percentage of costs are split almost equally between Type 1 and Type 2. For CAD and CHF, the Type 2 PAC costs are especially high. Type 3 appears to incur the least amount of costs.

PAC Cost Percentages by PAC Type

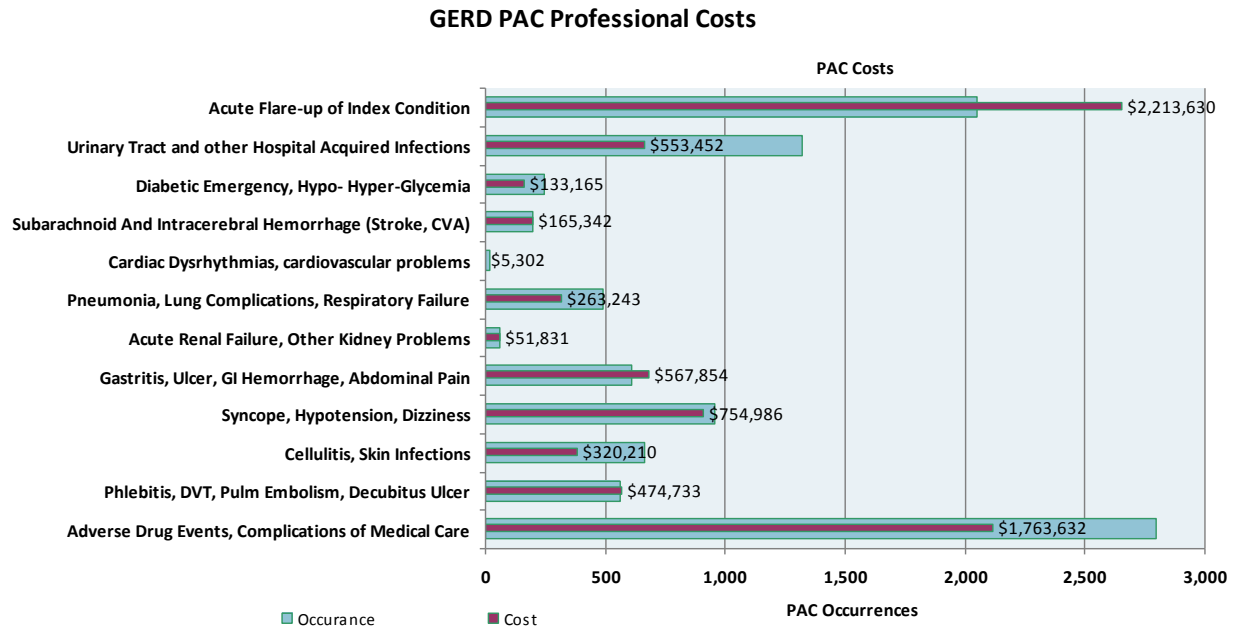


The table below shows the actual PAC costs for Inpatient Stay and Professional Services by PAC Type for the chronic ECRs. It can be seen that the total PAC costs for GERD is the highest.

	Cost in Thousands							Total
	Asthma	COPD	CAD	CHF	Diabetes	HTN	GERD	
Type 1	\$3,486	\$2,345	\$193	\$333	\$4,496	\$1,277	\$4,691	\$16,820
Type 2	\$3,129	\$2,646	\$1,978	\$2,554	\$5,616	\$1,619	\$6,805	\$24,347
Type 3	\$759	\$676	\$784	\$444	\$2,170	\$340	\$3,567	\$8,739
Total	\$7,373	\$5,667	\$2,956	\$3,331	\$12,282	\$3,236	\$15,063	\$49,907

The graph below looks closer at the breakdown of PACs within the GERD ECR. In this graph, it can be seen that 'Acute Flare-up of the Index Condition' accounted for the highest PAC dollars at \$2.2 million, with over 2,000 occurrences during the study period. In addition, the 'Adverse Drug Events, Complications of Medical Care' PAC had over 2,500 occurrences and cost over \$1.7 million. These two PACs occurred frequently, and

were costly. In contrast, some PACs such as ‘Cardiac Dysrhythmias, cardiovascular problems’ had relatively few occurrences and cost just over \$5,000. Examining the top drivers of PACs, both in terms of frequency and costs, can help identify areas for targeted improvement.



Preliminary Findings within the Chronic ECRs

Overall, conservatively, your health plan could achieve a **\$10.4 million** cost reduction if PAC rates for all chronic ECRs were reduced to the minimum observed in the national benchmarks. Targeting chronic conditions could lead to big savings for your health plan, especially focusing **GERD** as it has a high PAC percentage, consumes the majority of the dollars, and offersthe most savings opportunity.

We then looked at the frequency per 1,000 occurrences and average cost per occurrence for PAC inpatient stays, PAC outpatient facility and professional services, and emergency room visits for both the Prometheus benchmark database and your health plan. **Your plan had fewer occurrences and lower average costs for both PAC inpatient stays and emergency room visits. Continuously monitoring frequency of occurrence and average costs of occurrence can ensure that these numbers stay low.**

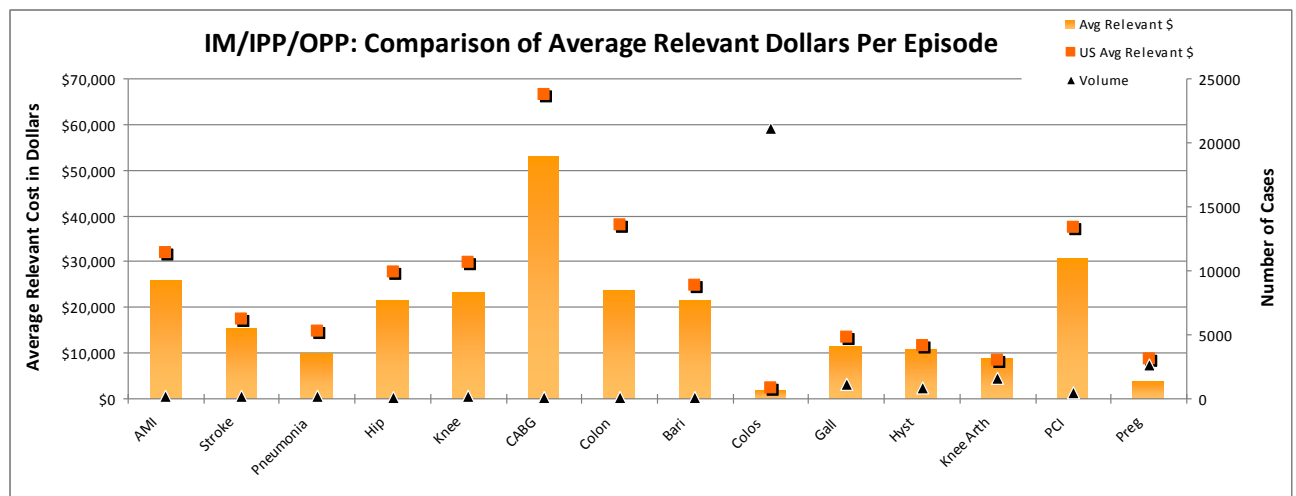
Next we looked at PACs occurring more frequently and those that are driving costs. Within your plan, Type 2 PACs appear the most costly across chronic care ECRs. Type 2 PACs, those related to co-morbidities, can be reduced through practices such as patient-centered care, care coordination, patient education, medication adherence, routine office visits, and more.

We also learned that the GERD ECR had the highest PAC costs. For GERD ‘Acute Flare-up of the Index Condition’ and ‘Adverse Drug Events, Complications of Medical Care’ occurred most frequently and were the most costly. Targeting the reduction of these two PACs alone could translate into substantial quality improvement and cost savings. Additionally, a focused effort to reduce these PACs would likely positively impact the other chronic care ECRs.

B. Inpatient and Outpatient Episodes

Relevant Episode Costs

We can also study the average episode costs for the Inpatient and Outpatient ECRs relative to the Prometheus benchmark database. The graph below reveals that, for the majority of the Inpatient and Outpatient ECRs, your plan spends well below the average episode costs Prometheus has observed across the US.

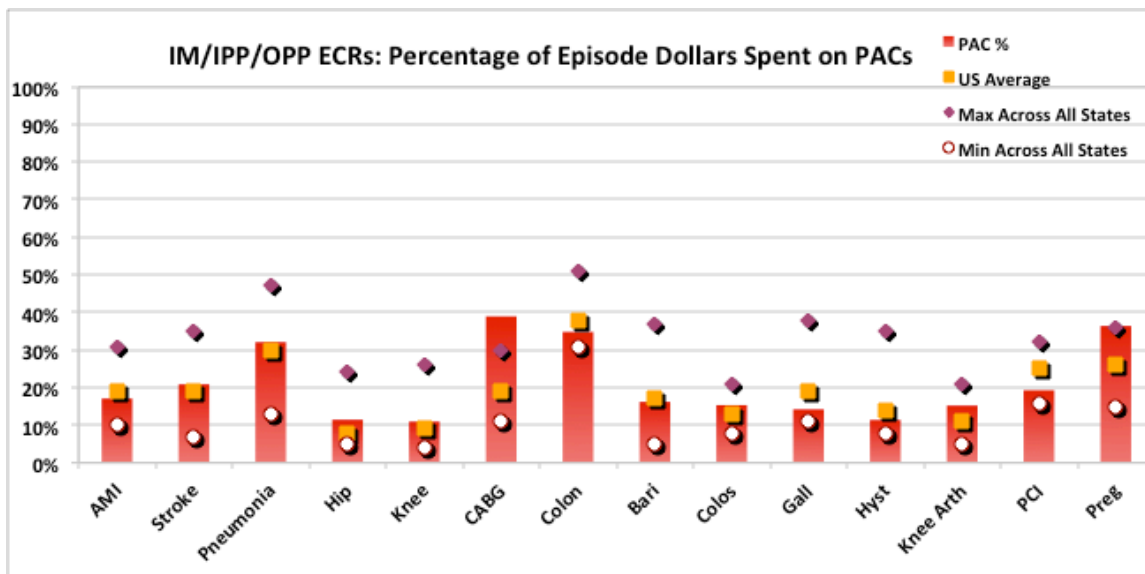


PAC Costs

In order to reduce PAC costs for procedural ECRs, a more focused intervention may be required. For example, targeting procedures with the highest PAC dollars, performing a

root cause analysis to identify the specific PACs that are the cost drivers, and then engaging the providers in clinical process reengineering.

The graph below indicates the percentage of dollars, per ECR, spent on PACs by the your health plan. The graph also compares your health plan's PACs to the US average and the minimum and maximum dollars spent on PACs observed across all states. These data are derived from the Prometheus benchmark database. By examining the analysis below, we can begin to parse out opportunities for potential compression of PACs. PAC rates across the Inpatient Medical and Inpatient Procedural ECRs are right around the US average, the exception being CABG which is above the maximum PAC rate we have observed across all states. The PAC rates for the Outpatient ECRs also appear to be close to the US average, offering ample opportunity for improvement. Lastly, the PAC rate for Pregnancy & Delivery is equal to the maximum PAC rate we have observed across all states. Pregnancy & Delivery may be an ideal ECR to target for quality improvement and PAC reduction.



Overall, PACs represent 19% of the total inpatient and outpatient episode dollars analyzed. Extrapolating to the total yearly spend of your health plan, the potential savings by reducing the current rate of PACs to the US minimum across all states would amount to \$12.3 million for the inpatient and outpatient ECRs.

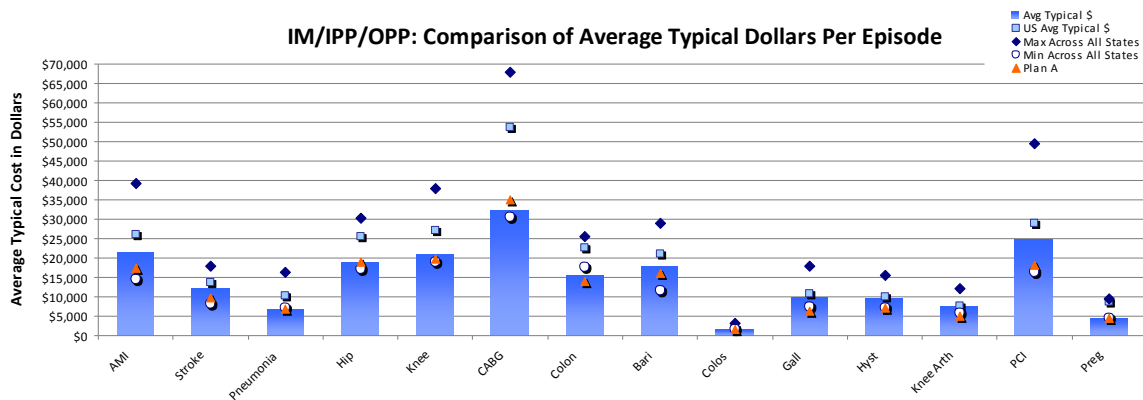
Typical Costs

We can also monitor the dollars spent on Typical care to help uncover the potential sources of variation within an episode. For example, upon examining the graph below, your health plan spends less on average Typical costs per episode for the Inpatient and

Outpatient ECRs when compared to the Prometheus benchmark database. The differences in the dollars spent on Typical care could stem from a variety of factors.

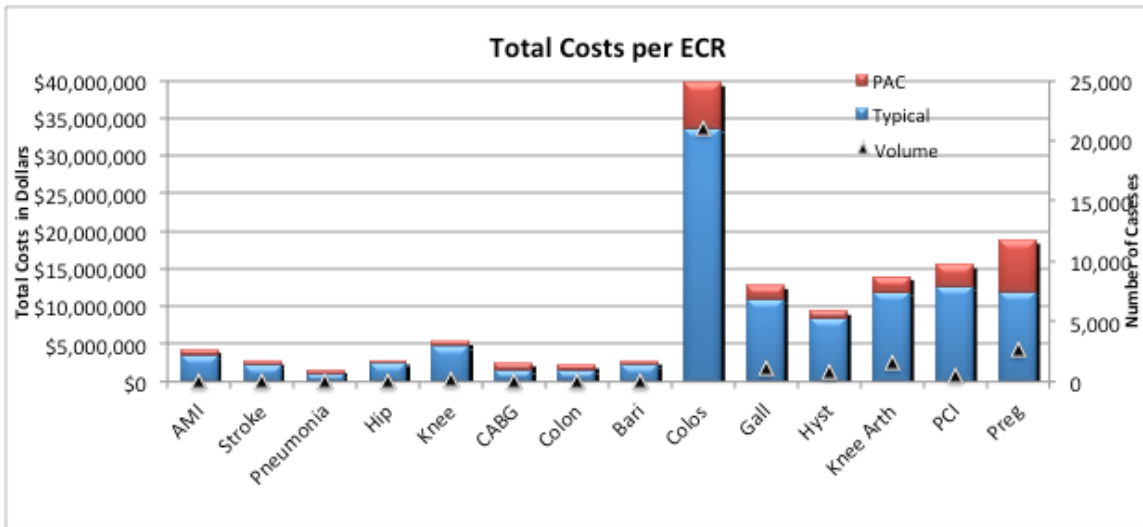
Differences in patient severity may result in increased or decreased resource use. Compared to the Prometheus benchmark database, your plan's severity indices for the Inpatient and Outpatient ECRs are either equal to or slightly higher than those of the Prometheus benchmark database. As such, understanding the variation in average cost for these inpatient procedures and hospitalizations might shed light on the performance of hospitals and physicians, and create opportunities for more effective network management, yielding savings well beyond the scope of these specific medical episodes.

Differences in pricing structure and negotiated contract rates may also lead to variation in average Typical costs within an episode. Similarly, provider practice patterns may differ in terms of frequency and type of resource use.



Total Episode Costs

In the graph below, ECRs with the highest total episode dollars and highest PAC dollars are Colonoscopy and Pregnancy & Delivery.



Savings Opportunities

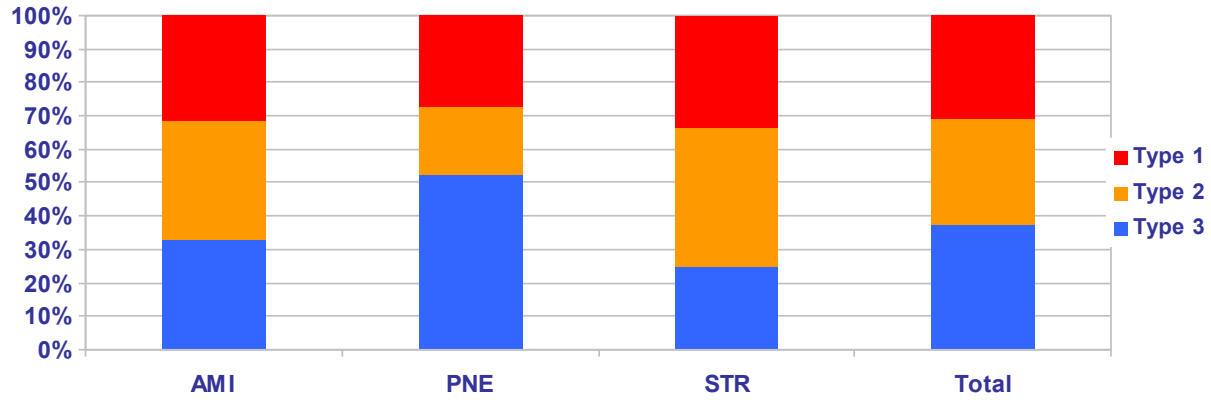
The graph below shows an estimated savings potential if the percentage of dollars spent on PACs for the inpatient and outpatient ECRs were reduced to the minimum percentage observed around the country, derived from the Prometheus benchmark database. The highest savings potential for your health plan are included in two ECRs: **GERD and Pregnancy & Delivery**.



PAC Types

Within the Inpatient Medical ECRs, **Type 3 PACs are the most costly overall and particularly within the Pneumonia ECR. A system-wide approach to reducing patient safety failures could impact Type 3 PACs across all Inpatient ECRs.**

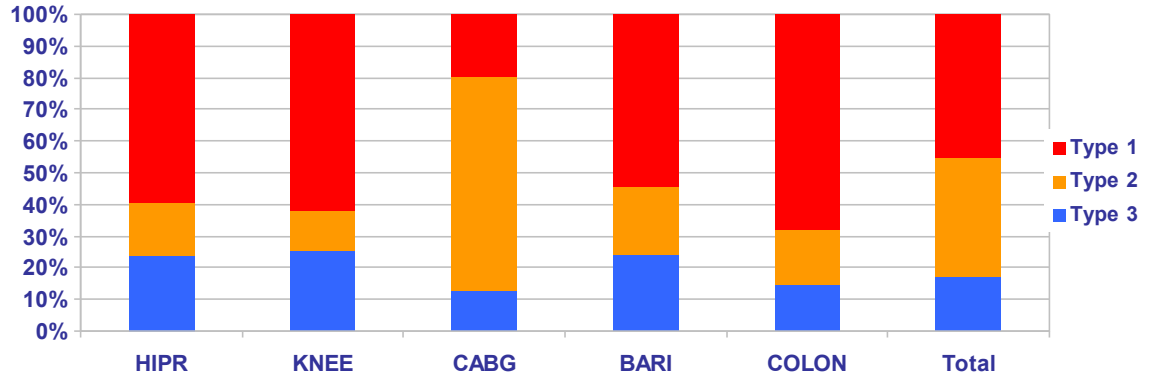
PAC Cost Percentages by PAC Type



PAC Costs by Type Summed Across IP STAY, PROF, and READMIT				
	AMI	PNE	STR	Total
Type 1	\$684,845	\$515,372	\$472,718	\$1,672,935
Type 2	\$767,236	\$379,661	\$584,671	\$1,731,568
Type 3	\$713,886	\$971,950	\$349,732	\$2,035,568
Total Costs	\$2,165,967	\$1,866,983	\$1,407,121	\$5,440,071

Within the Inpatient Procedural ECRs, Type 1 PACs are the most costly overall. Type 1 PACs make up the majority of PAC costs for Hip and Knee Replacement, Bariatric Surgery and Colon Resection, whereas for CABG Type 2 PACs are the most costly by far. Reducing complications directly related to the index surgery would impact a bulk of the PAC costs among these ECRs. For CABG, targeted care coordination and reducing gaps in the transitions of care for these patients may help to impact Type 2 PACs.

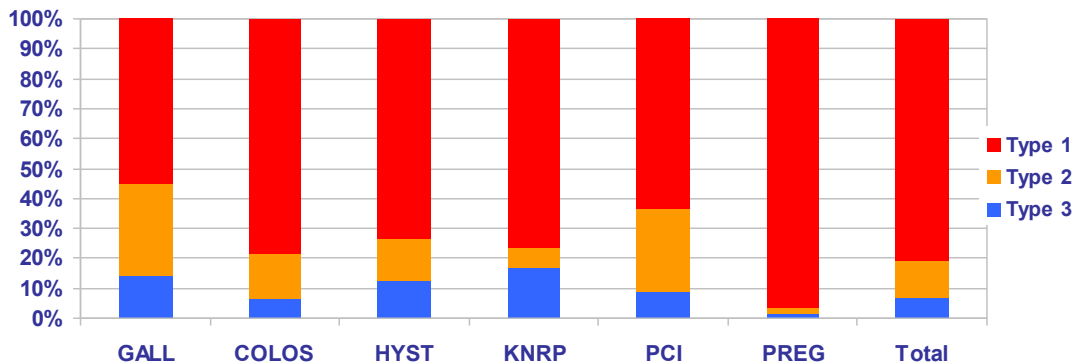
PAC Cost Percentages by PAC Type



	HIPR	KNEE	CABG	BARI	COLON	Total
Type 1	\$576,680	\$899,425	\$765,326	\$535,799	\$1,680,960	\$4,458,190
Type 2	\$164,450	\$185,494	\$2,652,659	\$206,942	\$418,139	\$3,627,684
Type 3	\$228,614	\$362,163	\$501,821	\$239,522	\$361,642	\$1,693,762
Total Costs	\$969,744	\$1,447,082	\$3,919,806	\$982,263	\$2,460,741	\$9,779,636

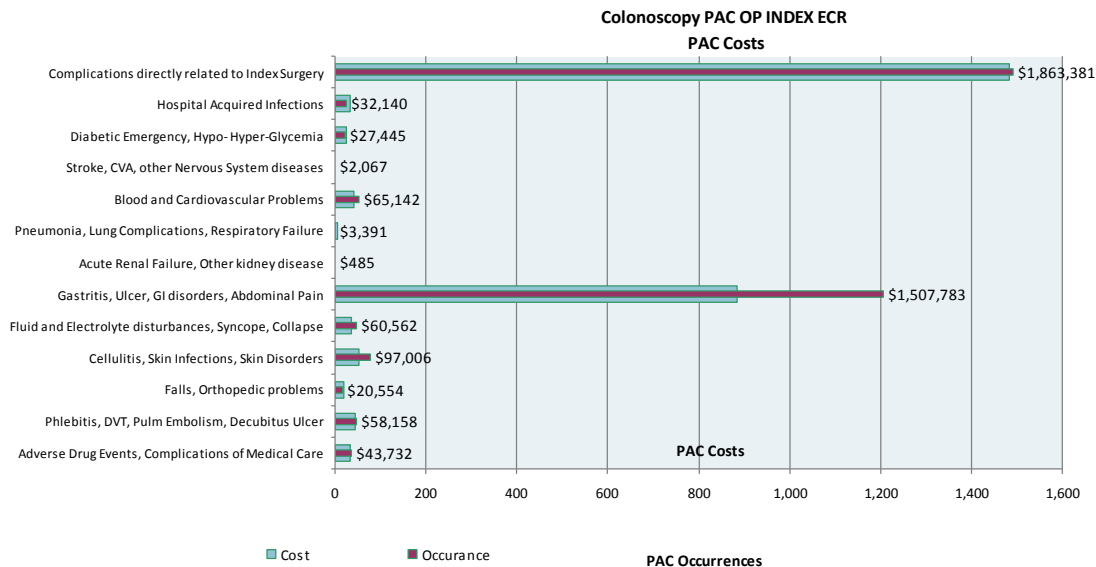
Within the Outpatient Procedural ECRs, Type 1 PACs are the most costly overall accounting for \$30.7 million. Particularly within the Colonoscopy and Pregnancy & Delivery ECRs, reducing PACs directly related to the index procedure or event would have a large impact on overall PAC costs.

PAC Cost Percentages by PAC Type



PAC Costs by Type Summed Across IP STAY, PROF, READMIT, IP and OP ASSOC ADMIT							
	GALL	COLOS	KNEE ARTH	HYST	PCI	PREG	Total
Type 1	\$1,973,464	\$7,089,026	\$1,799,330	\$2,414,516	\$3,442,739	\$14,061,998	\$30,781,073
Type 2	\$1,078,076	\$1,395,162	\$338,274	\$211,530	\$1,470,650	\$251,333	\$4,745,025
Type 3	\$510,276	\$579,685	\$306,921	\$536,741	\$484,803	\$224,469	\$2,642,895
Total Costs	\$3,561,816	\$9,063,873	\$2,444,525	\$3,162,787	\$5,398,192	\$14,537,800	\$38,168,993

The graph below looks closer at the breakdown of PACs within the Colonoscopy ECR. In this graph, it can be seen that ‘Complications directly related to the index procedure’ accounted for the highest PAC dollars at \$1.8 million, with roughly 1,500 occurrences during the study period. In addition, ‘Gastritis, Ulcer, GI disorders, Abdominal Pain’ had about 900 occurrences and cost over \$1.5 million.



Preliminary Findings within the Inpatient and Outpatient ECRs

Overall, conservatively, your health plan could achieve a \$12.3 million cost reduction if PAC rates for all inpatient and outpatient ECRs were reduced to the minimum observed in the national benchmarks. Your data also suggest that there may be some opportunity with Colonoscopy and Pregnancy & Delivery. The PAC rate for Colonoscopy is slightly higher than the US average and the PAC rate for Pregnancy & Delivery is equal to the maximum we have observed thus far.

Within the Inpatient Medical ECRs, Type 3 PACs should be targeted for reduction via system and process improvements. Type 1 PACs are the most costly PACs for the Inpatient and Outpatient Procedural ECRs; reducing complications during the index procedure could lead to substantial savings.

Part 2: Medical Management

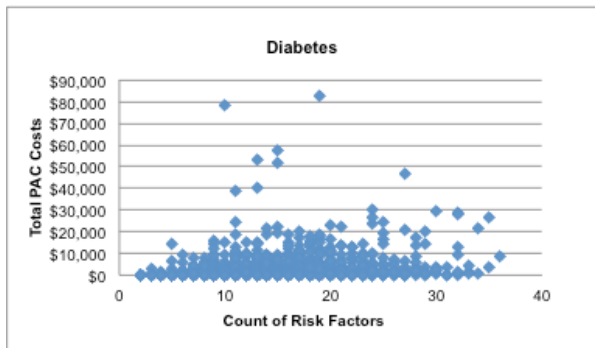
Data Source: RF Severity Adjustment Templates

A. Chronic Medical Episodes

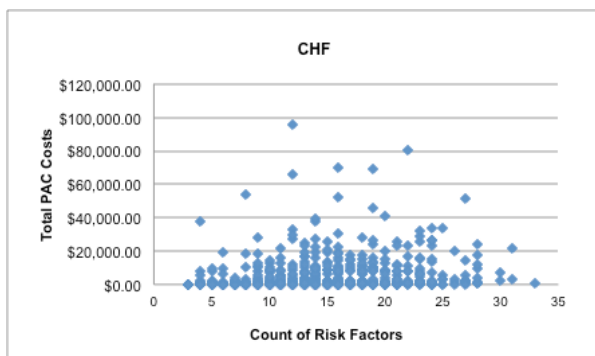
PAC Costs and Patient Severity

First we examine various relationships between PACs and patient severity, in an attempt to determine which patients incur the most PACs.

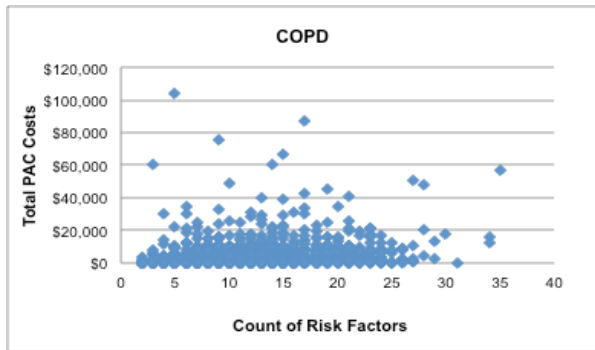
The graphs below plot each patient, looking at the number of risk factors for that patient and the cost of incurred PACs, if any. The calculated correlation indicates that there is very little, if any, relationship between the number of risk factors a patient might have and the occurrence and cost of a PAC. These graphs are for illustrative purposes only and do not reflect your plan's data.



Diabetes: Correlation = 0.17



CHF: Correlation = 0.19



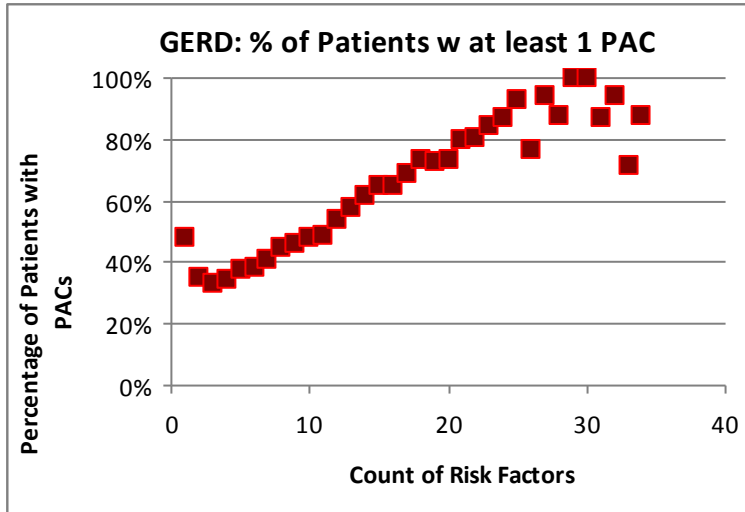
COPD: Correlation = 0.24

As you can see in the graphs above, patients with very few risk factors can incur high, moderate, or very low PAC costs, as can patients with several risk factors. At the individual patient level, we cannot predict whether a patient will experience a PAC based on patient severity. However, when we group patients in cohorts according to number of risk factors, we see a different pattern. Such an analysis may help to indicate whether there is a potential to target certain cohorts of patients for more intense disease management or care within a Medical Home setting.

The graph below plots a cohort of patients according to their risk factor count against the percentage of patients in each cohort that had at least one PAC. From this graph it can be seen that, for GERD, there appears to be a relatively high correlation, .93, between risk factor count and the number of patients who have at least one PAC.

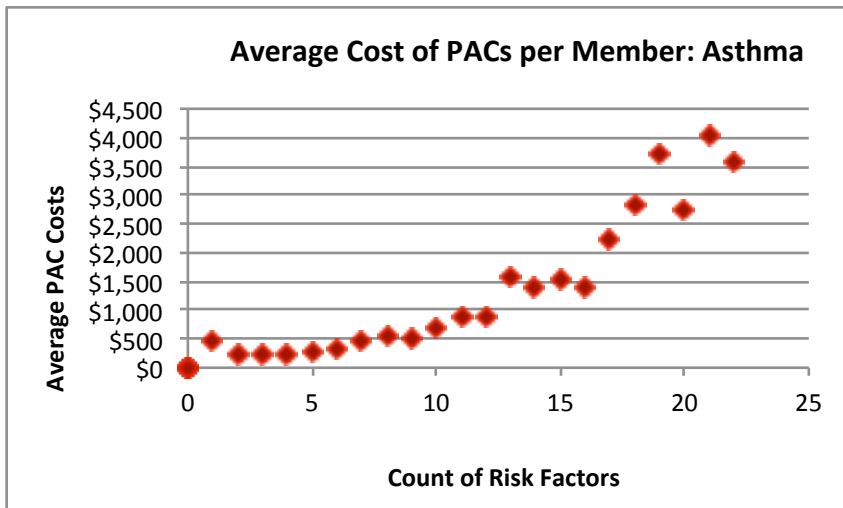
In addition, it can also be seen that PACs may occur in up to half of all patients, even those with very few risk factors. For instance, this graph shows us that 30-40 percent of patients with GERD with 0-5 risk factors still have at least one PAC.

However when we look at patients with 20+ risk factors, 70-100 percent of these patients will have at least one PAC. As such, while the occurrence of a PAC in a population of patients with GERD might seem random (as per the graphs in the prior analysis), we see here that grouped into cohorts by number of risk factors, the pattern is different. We can hypothesize that patients with many risk factors see many physicians and have a far higher likelihood of ending up in the ED or being hospitalized because of a lack of care coordination.

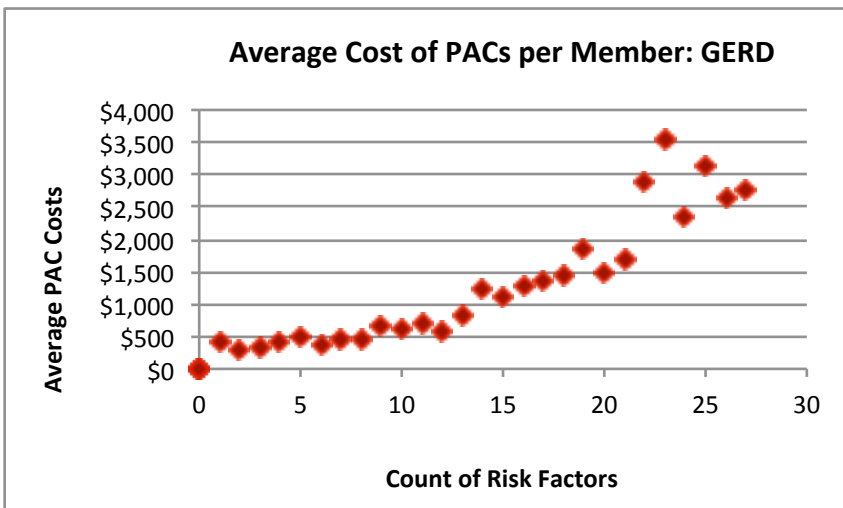
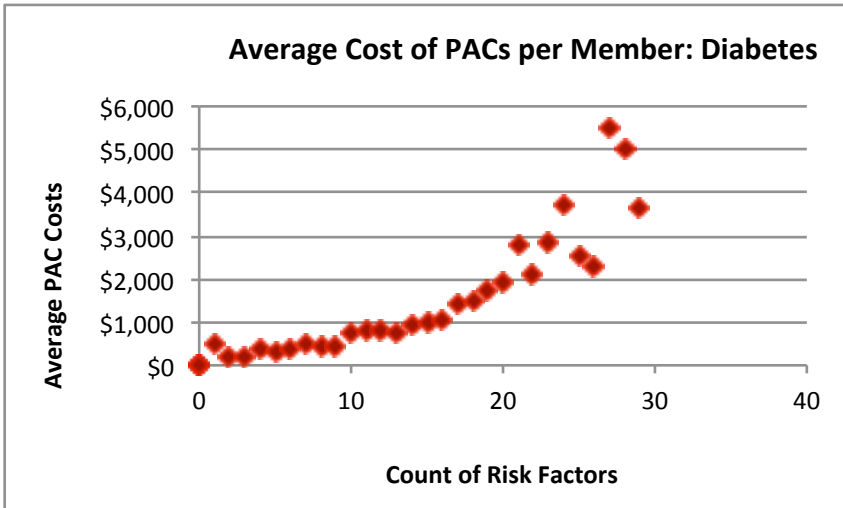


Correlation= .93

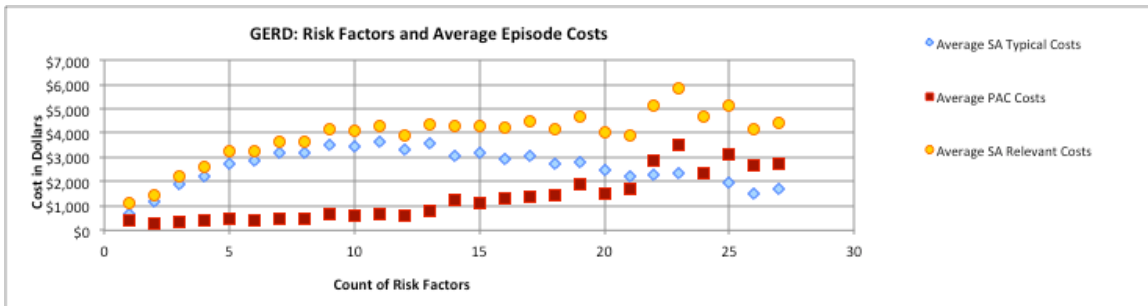
In your data, we observe a clear relationship between the average cost of a PAC and the patient cohorts. For Asthma, Diabetes, and GERD the correlations are 0.97, 0.97, and 0.93, respectively. This implies that when PACs are incurred, they are likely to be more expensive, on average, among patients with more risk factors. Targeting these high risk factor patients for disease management may help to avoid future PACs.



Correlation= .97

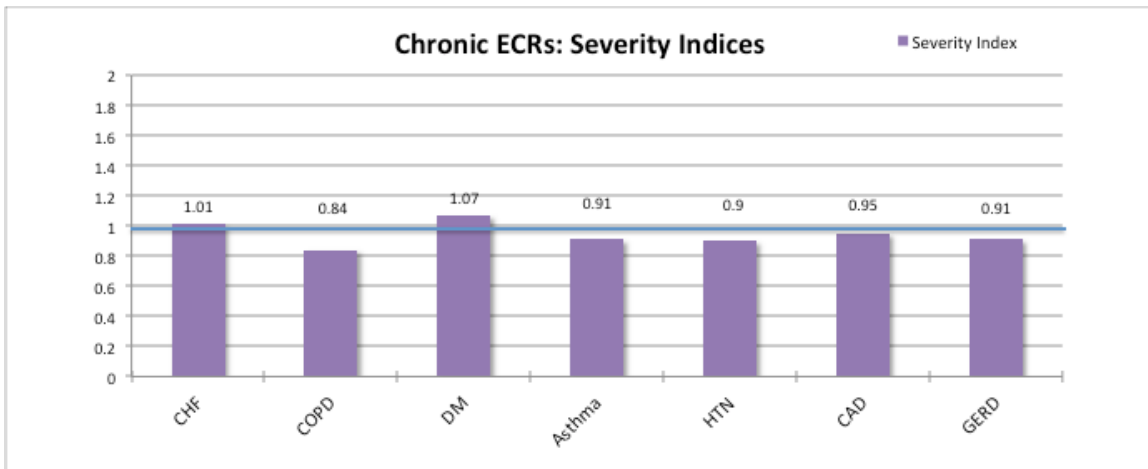


As the count of risk factors among these patient cohorts increases, we observe that the cost of PACs increase on average as well. In the graph below, the average PAC cost per member is shown again (in red), but we can also examine the average severity-adjusted typical cost (in blue) and the average relevant cost per episode (in yellow) per risk factor cohort. As you can see, average PAC costs appear to increase as the count of risk factors increases, whereas average severity adjusted typical costs appear to decrease.



Comparison of Severity Indices

We can compare the plan-wide severity index within each ECR to the reference severity index within the Prometheus benchmark database (reference = 1.0). In the graph below, you can see that within each of the chronic ECRs, your plan's severity index hovers right around the average of 1.0.



Similarly, we can compare the severity indices of different provider groups within an episode. Using GERD as an example, you can see that provider groups 1 through 4 have very different severity indices.

Provider Group	GERD Severity Index
Provider 1	0.66
Provider 2	0.84
Provider 3	0.74
Provider 4	1.03

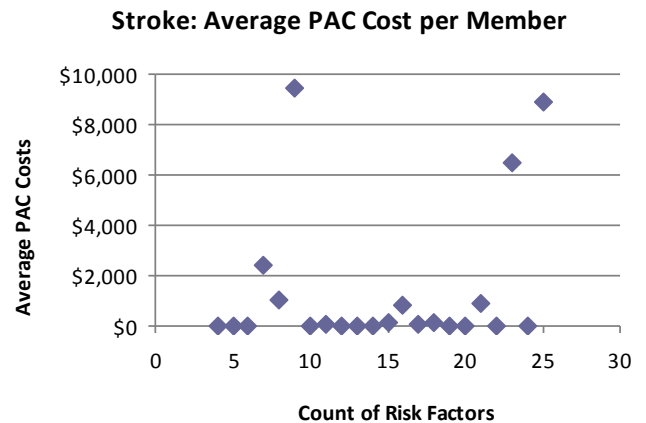
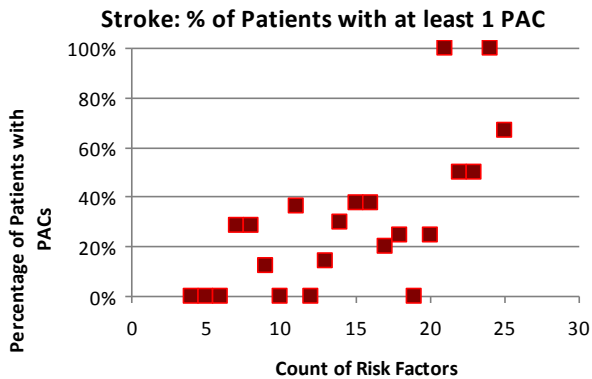
In order to make an appropriate comparison of average GERD episode costs among these four provider groups, we need to adjust for differences in patient severity. If possible,

adjusting for differences in underlying fee schedules for the provider groups, in addition to adjusting for patient severity will help to shed some light on the source of variation within episode costs. Variation could be a result of differences in PAC costs or differences in provider practice patterns.

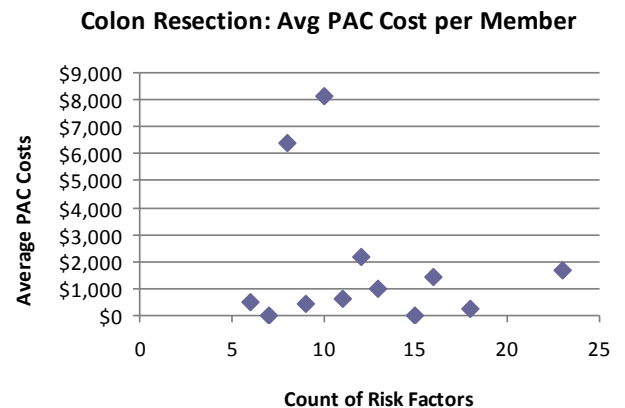
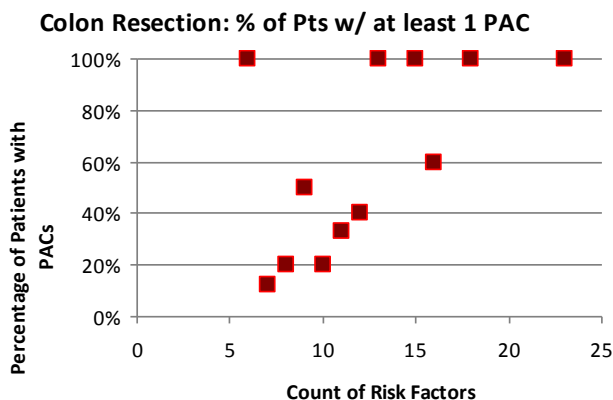
B. Inpatient and Outpatient Episodes

Consistent with the Chronic ECR analyses, we investigated the relationship between risk factors and PACs for the Inpatient and Outpatient ECRs. Risk factor count is less of a predictor in Inpatient Medical and Inpatient Procedural ECRs, which can be seen in the graphs below for Stroke and Colon Resection. Among these ECR types, most of the PACs occur in hospitals and are often due to infections or other systems failures that affect patients.

Inpatient Medical Risk Factor Analysis

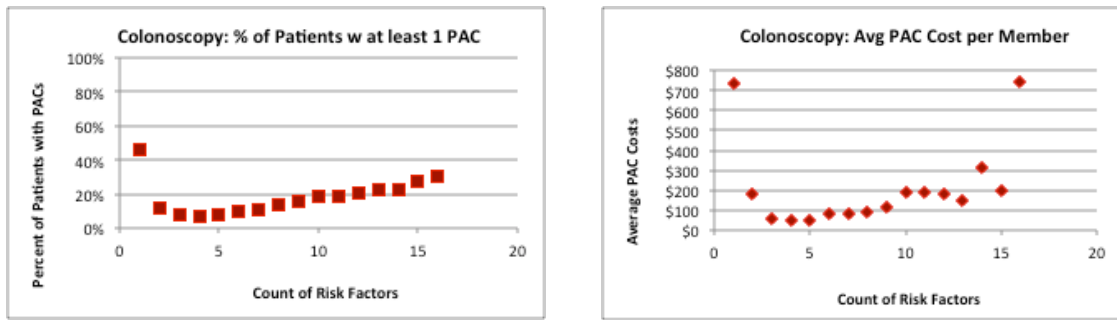


Inpatient Procedural Risk Factor Analysis

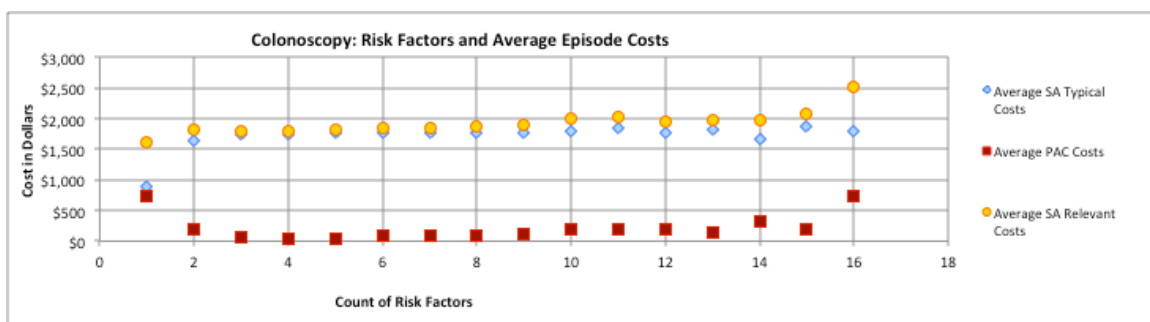


Outpatient Procedural Risk Factor Analysis

Risk factor count may be slightly more of a predictor in Outpatient Procedural ECRs. In the graph below for Colonoscopy, the percentage of patients with at least one PAC appears to increase as the count of risk factors increases, though not as drastically as in the chronic ECRs. Anywhere from 5-20% of patients with 10 or fewer risk factors experience at least one PAC, whereas 20-40% of patients with more than 10 risk factors experience at least one PAC. There does not appear to be much of a relationship between risk factor count and average PAC costs within Colonoscopy.

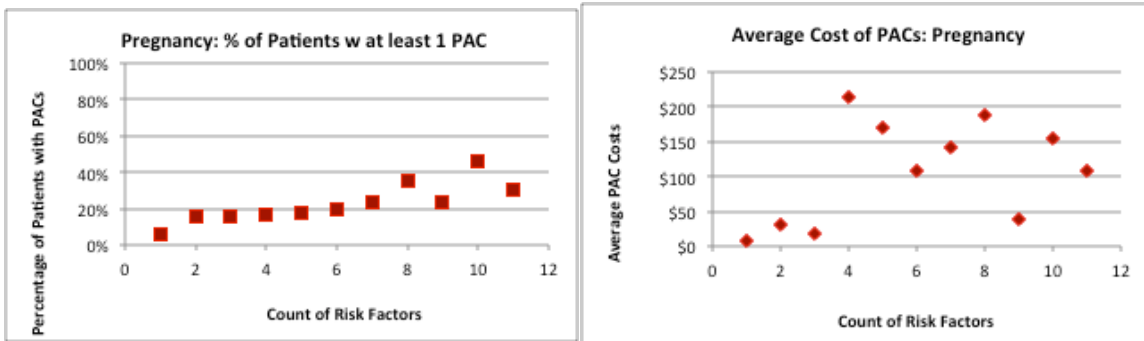


Similarly, we can examine average PAC costs, average severity-adjusted Typical costs, and average relevant costs per risk factor cohort. In the graph below, there is a slight increase in average PAC costs as risk factors increase, but there does not appear to be much variation in severity-adjusted typical costs.



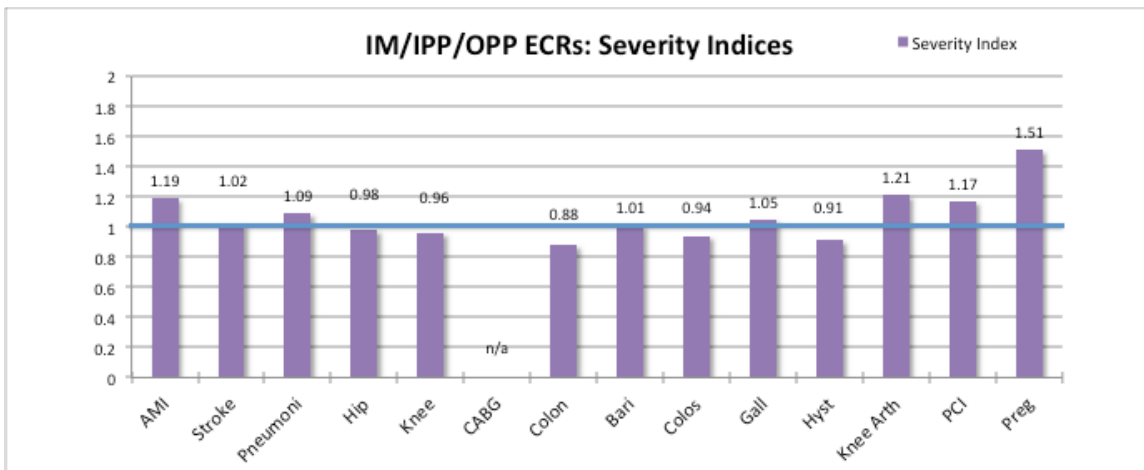
Pregnancy & Delivery Risk Factor Analysis

Risk factor count is less of a predictor in Pregnancy & Delivery, which can be seen in the two graphs below.



Comparison of Severity Indices

Again, we can compare the plan-wide severity index within each ECR to the reference severity index within the Prometheus benchmark database (reference = 1.0). In the graph below, you can see your plan’s severity indices for a majority of the ECRs are right around the average of 1.0. AMI, Knee Arthroscopy, PCI, and Pregnancy & Delivery appear to be higher or more severe than average.



Similarly, we can compare the severity indices of different facilities within these episodes. Using Colonoscopy as an example, you can see that facilities 1 through 4 have slightly different severity indices.

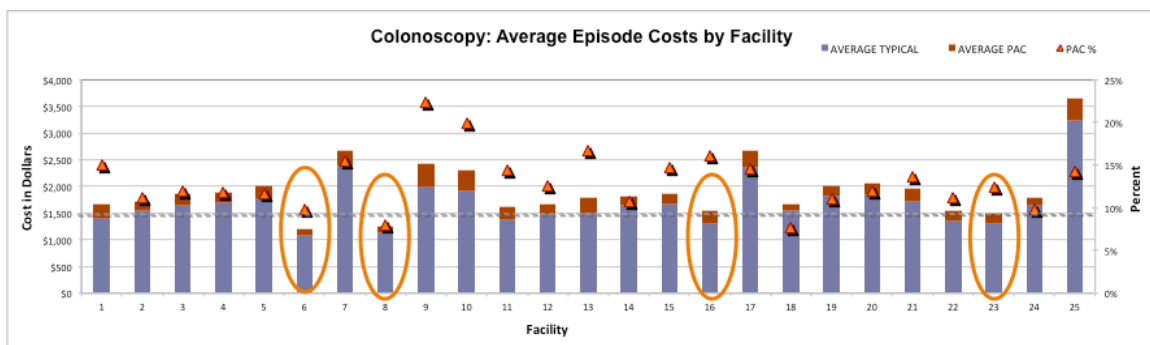
Facility Name	Colos Severity Index
Facility 1	0.86
Facility 6	0.88
Facility 12	0.9
Facility 20	1.14

In order to make an appropriate comparison of average Colonoscopy episode costs among these four facilities, we need to adjust for differences in patient severity. Then, we will be able to determine whether any variation within episode costs is a result of differences in PAC costs, pricing, or provider practice patterns. Such provider level analysis can help to parse out differences in performance based on the relative severity of patients and can also help to inform decisions around network management and contracting.

Part 3: Network Management:

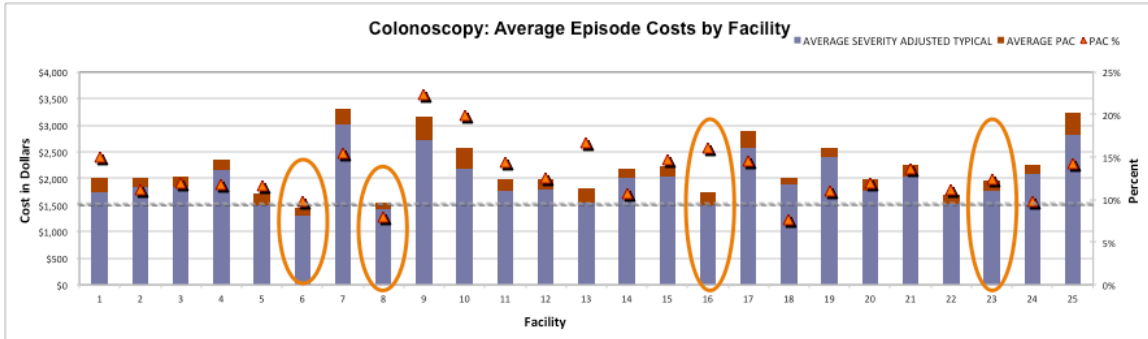
This chapter focuses on the next layer of analysis at the provider level. Provider level analysis can be performed at the facility, specialty, or individual physician level provided that there is enough of a sample size and can help to identify sources of variation in cost at a more granular level. Ultimately, such analysis can lead to improvements in the quality of patient care, network management, and contracting.

Facility level analysis

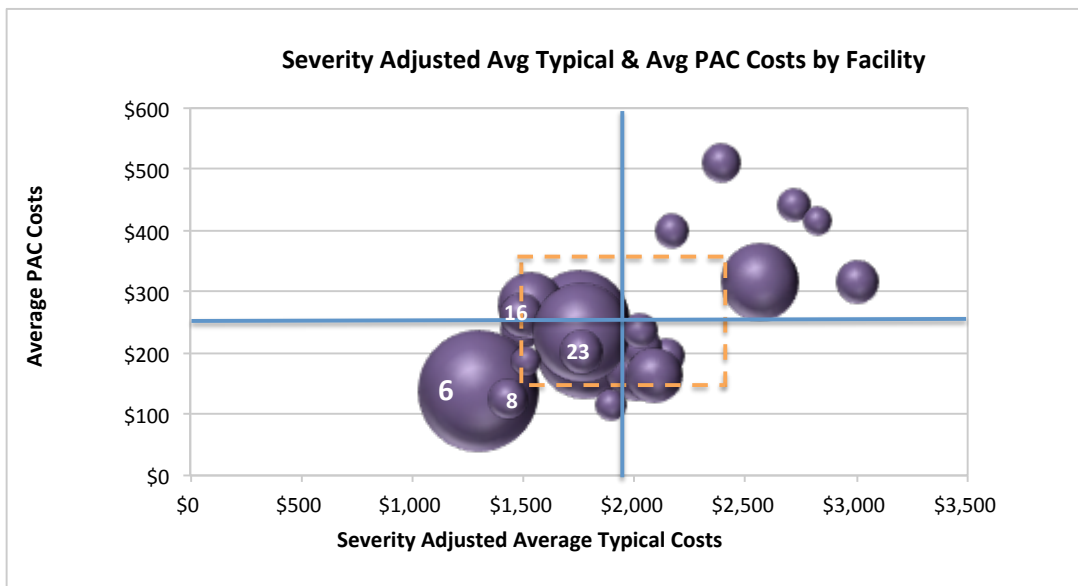


The graph above compares the average PAC costs, average typical costs, and percentage of dollars spent on PACs among a series of facilities performing Colonoscopies. Facility 8 stands out as it appears to have the lowest Average Typical costs and spends the least on Potentially Avoidable Complications. Additionally, several other facilities spend equal

to or less than \$1,500 per episode. However, we can adjust for patient severity and explore which facilities are “ideal” and which have room for improvement.



After adjusting average Typical episode costs for patient severity, Facilities 6 and 9 still stand out as having low Typical and PAC costs. We can plot the average severity-adjusted typical costs and average PAC costs of each facility into four quadrants for comparative purposes. The graph below illustrates that, even after adjusting for severity, Facilities 6 and 8 still spend less on average Typical and average PAC costs for colonoscopy episodes. Facilities that lie within one standard deviation of the mean are considered undifferentiated, whereas facilities outside of the orange box below may be considered outliers – particularly those in the upper right hand quadrant.



Identifying providers with high PACs would help to further address the source of savings opportunities. In the four-quadrant analysis above, we classify providers into four types: 1) those with low PACs and low Typical costs – the ideal providers, 2) those with high typical costs but low PACs – these could be ideal providers with improvements to their

contracting structures, 3) those with high PACs but low typical costs – these could be high value providers if they could reduce their PACs, and 4) those with both high PACs and high typical costs – these are outliers whose market share of the studied ECR may need to be reduced.

Providing drill down PAC reports to providers with high PACs but low typical costs and those with both high PACs and high typical costs could help them to identify the most important drivers for PACs encountered in their patients. This would make their data actionable and help them improve the quality and cost of care.

This chapter utilized the **Colonoscopy** ECR as an example of the facility, specialty, and provider level drill downs that are available to your health plan. However, these types of analyses can be performed for any ECR provided that there is enough volume.

Part 4: Summary, Conclusions & Next Steps

Conservatively, your health plan could achieve a **\$22.7 million** cost reduction if PAC rates for all ECRs were reduced to the minimum observed in the national benchmarks. There appears to be a big savings opportunity if **GERD, Colonoscopy, and Pregnancy & Delivery** ECRs were targeted for PAC reduction. Additional provider-level drill down analysis may reveal other opportunities in these ECRs for improving quality and reducing overall episode costs.

Within the **GERD** ECR, or other chronic ECRs, targeting patients with high risk factor counts for disease management could help to avoid future hospitalizations and ED visits. Our analysis shows that although we cannot predict the occurrence or magnitude of a PAC based on patient severity, patients with higher risk factor counts have a higher likelihood of experiencing at least one PAC. Similarly, patients with higher risk factor counts, on average, incur more expensive PACs. **Type 2 PACs, related to patients' comorbidities, are the most costly across the chronic conditions. Initiatives targeting increase care coordination and the reduction of gaps in transitions of care could lead to substantial savings across all chronic ECRs.**

Within the **Colonoscopy** ECR, we performed some provider level analyses that were revealing in terms of medical management and contracting/network management. **The facility level analysis identified areas for improvement for each facility relative to the stand-out Facilities 6 and 8.** The goal of the provider level analysis is to uncover the sources of variation within episode costs among facilities and provider groups and to ultimately help determine the extent to which this variation can be compressed.

The provider level analyses aid in revealing “ideal providers” and those who are ripe for clinical intervention to reduce PACs. For those providers for whom there is an

opportunity to reduce PACs, we can provide further drill down analyses to reveal which PAC Types are the most frequent and most costly as well as the top drivers of PACs. Also, the provider level analysis highlighted outlier providers or facilities for whom pricing structure may be a driver. If these providers are true outliers, there will likely be a consistent pattern in high PACs and high episode costs across ECRs. The plan may benefit from pushing for price transparency among providers with low PAC rates, but high episode costs. Chances are episode costs are high because those particular providers have the market share and price transparency can help to take that market power away.

Overall, this analytic report is designed to highlight opportunities within your data both in terms of lowering costs and improving quality. The objective is to showcase the results of a comprehensive data analysis, study the PAC opportunity within your data, and provide additional drill down analyses that can help lead to recommendations around medical management and network management. There appear to be some actionable opportunities in your data, particularly with regard to reducing PACs **within GERD, Colonoscopy, and Pregnancy & Delivery** episodes. Prometheus would be happy to facilitate further discussions around these episodes or others that may be of interest within your health plan.