Thanks for the introduction, Chris. Today, Kathy and I are very pleased to walk you through some product demos and how we see the path to shared savings with Population Health Management.
Poll Question

We're going to start with a quick poll question.

Poll Question: What is your primary functional area of expertise?

[Chris]
What is your primary functional area of expertise? Five options – clinical, IT, financial, quality, or other. We'll leave that up for about 5 seconds and then share the results.
Poll Results

[Chris]
Okay. There are the results. 28% of the audience has a clinical functional area, 22% from IT, 6% from financial, 15% quality, and 28% other.

[Eric Just]
Thank you. It’s great to get to know the audience like that.

Accountable Care Organizations & Shared Savings

- Healthcare provider organizations responsible for providing coordinated care for their patients
- Contract with payers through some form of shared risk payment model
- Most payment models include downside risk to the healthcare providers
- Payment models reward high-quality, low-cost care with shared savings
So just to start out, we'll give a very quick review of Accountable Care Organizations and the notion of shared savings. So, an Accountable Care Organization is a healthcare provider organization that's responsible for providing coordinated care for their patients. They are responsible for providing this care at high quality and low cost and they contract with payers through some form of a shared risk payment model, and what that means is that most healthcare organizations are taking a little bit more of downside risk with their payers. So the way an ACO might work is that a payer organization would provide a payment amount for a particular population of patients. And any care that the provider provides that's above that agreed upon payment would be the cost associated with that. The overruns will be the responsibility, at least in part, from the healthcare providers.

On the other side though, there is the concept of shared savings, where cost under (02:11) organization to provide low cost care that still needs high quality standards, they would actually receive a share of those savings back into the organization. So this new notion of both taking on risk and also being rewarded with lower cost care is part of the notion of it and the business model of Accountable Care Organizations and organizations that can provide that low cost care will be the most successful organizations in this new framework.

Population Health Management (PHM)
The Key to Shared Savings

So the absolute key to being able to achieve these lower costs, higher quality outcomes is Population Health Management. In Population Health Management, we really see these four building blocks of Population Health Management.

The first is a robust provider network, the right combination of inpatient and outpatient facilities, specialty and community care facilities, and providing that framework in a way that keeps patients within that network.
Also, a really good understanding of patient populations within the network. So how many patients of a given disease type do I have and what is the risk profile associated with those patients is the very key part of Population Health Management, especially when it comes to understanding the risks of entering one of these contracts.

The third is quality outcomes. We mentioned before that these organizations are held at very high quality standards. So it's not just enough to reduce costs, you have to reduce costs in a way that keep that quality very high and make their organization have both excellent quality outcomes and improved cost outcomes and improved cost outcomes are lower cost sharing, and we found through our history and through our work at our clients that most of the time higher quality care is actually associated with lower cost outcomes because we're standardizing on processes and there's not as much variation. We'll be talking a little bit today about how we do variation analysis to look for areas that we can improve both quality and cost outcomes.

So when we talk about an Accountable Care Organization, the real asset, the competencies of the organization have to develop in this Population Health Management. And when an organization develops this capability, we see it as the real asset behind an Accountable Care Organization. We likened it to a diamond.

And the Population Health Management is one of the two aspects of Accountable Care Organizations. So another aspect is Accountable Care Financing and Administration. So this is a necessary part of creating contracts that will be favorable for the Accountable Care Organization. And there's a lot of functions involved in this. But once an organization has mastered the competency of Population Health Management, really we see the Accountable Care Financing and Administration as really packaging and marketing that asset. So we use the analogy of a diamond for Population Health Management. The Financing and Administration, we can think of as taking that diamond, putting it in a setting and putting it in a box. So we've got a great organization, we're effective at providing high quality outcomes at low cost, we can
market that asset to the Accountable Care Financing, whether it's a third party payor or other form of payment. And the organizations that master Population Health Management will be the leaders in this accountable care world.

Poll Question

How would you rate your organization's maturity using data to drive population health management?

So we have another poll question. Chris, you want to give us another poll?

[Chris]
That poll is now live. How would you rate your organization's maturity using data to drive Population Health Management? With five options ranging between very mature and very immature. We'll leave that up for another 5 seconds.
Poll Results

Okay. There are your results. 5% list very mature, 8% 2, 33% 3, 29% 4, and 26% 5.

[Eric Just]
Excellent. Thank you for that response.

What Does Health Catalyst Do?
Platform

So, before we get into the demos, we just want to explain very briefly what Health Catalyst does. There's a lot of different types of solutions in the marketplace and we just wanted to set the scene for what Catalyst is all about.
So one of the things that Health Catalyst provides is a platform, and the platform is our data warehouse products and it serves as a single source of truth at our clients off of data. We have a library of data adaptors so we can plug in to most commercial source systems and pull that data directly from those source systems to our data warehouse. And then the data warehouse becomes the information backbone for our clients and all of the analytics you'll see today are based on the data that exist in our platform.

What Does Health Catalyst Do?

Applications

So in addition to providing just the data framework, we also supply applications and these applications can be anything from registries to readmissions reports, population health, data mining, all sorts of information that consumers and our clients need to see, we have the applications to help serve those. And most of our presentation today will be focused on looking at some of our applications that specifically deal with Population Health Management.
And finally we have services arm, and the services arm includes both technical services – so when we install the platform, we're training people on how to install and configure that platform. But probably more importantly for today, we have a clinical services arm and we realize that creating change in an organization and changing the cost structure is not just about technology, there's a large people aspect to this. And our clinical services arm, which Kathy will be representing today, is about helping our clients to take our products and translate these data analytics into meaningful change in the organization. There's a large organizational piece and we'll be hearing a little bit about that a little bit later in the presentation.
So going back to that application layer, we have three families of applications. We have foundational applications and these are applications that are typically implemented very early on in our engagement and they encourage the broad use of the data warehouse by presenting basic registries, dashboards, reports and present that information across clinical and departmental areas. We also have the notion of discovery applications, and these are applications that are more around data mining, hypothesis generation, prioritization, and helping to define populations for management. And finally, we have advanced applications and advanced applications are applications that are used directly to improve care. We’re looking at details around process and outcome metrics and providing actionable information to improve care delivery through our advanced applications. Just three basic categories of applications.

This slide lists most of our applications. There's actually more than what we show here but you can see our folks drew it line by line. We've got them categorized into foundational, discovery and advanced. And I put a star next to each of the demos that we'll be seeing today, just so you can see that we’re going to be demoing a very small part of our portfolio. We'll be demoing one from foundational, one from discovery, and then we’ll look at two advanced applications, one around heart failure and one around community care.
Demos: How Analytics Drive Shared Savings

So now (10:24) our applications to what we title the presentation 'shared savings' – how do analytics drive shared savings, and this is where our product demos, we'll be demonstrating that.

So the first demo, we'll look at our key process analysis tool or KPA, and we use the KPA to identify areas of the greatest opportunity for quality improvement and savings. So understanding where that shared savings will be and we use variation and cost data to help us hone down on this.

Demonstration #2 is really about understanding potential risks. So one of the elements that we mentioned early on in the population health management introduction was to identify populations and look at the risk profile within those populations, and that’s what we’ll look at in population explorer.

And then we’ll have some introduction with material for demo #3. The introduction with material will highlight the clinical improvement side and the organizational elements that must be in place for creating clinical change through analytics. And then we'll demo our heart failure application, and this is an example of how we achieve quality improvement and cost reductions and using targeted interventions specifically at high-risk patients.

And then the last demo, demo #4, we'll be demonstrating our community care dashboard. And we can think of almost a simplified view that many admissions to an acute setting are a failure of community care. So we should be monitoring these high-risk patients to prevent that expensive acute treatment, and we'll demonstrate our application, our community care dashboard, around that.
Before we get into the KPA demo, I have a couple of slides in the background and then I promise we'll get to the demo.

So with the KPA, and actually many of our products, comes a clinical hierarchy, and the clinical hierarchy was developed by our clinical leadership and it serves to group care and provide stratifications that we can do across an organization and it groups into buckets that really relate care together that share common work processes. So at the top level we have a clinical program, and we're showing one example here, cardiovascular, and there's about 12 clinical programs. And then going one layer down in the hierarchy we have care process families, and there's about 85 care process families, and we're showing the four care process families that fall in their cardiovascular. So it's a finer grain grouping than the clinical program – heart rhythm disorders, vascular disorders, ischemic heart disease, and heart failure. And then each care process family has a number of care processes that fall under that and there's about 1,600 care processes. So under ischemic heart disease, we have four of them – acute coronary syndrome, acute myocardial infarction, PCI, and CABG. So this is one example of one branch of this hierarchy and you'll see the hierarchy in the KPA and I just wanted to give a little bit of background before we show the tool.
KPA: Measuring Opportunity

Now, the next background I wanted to give is how we look at variation and why we look at variation. So, the KPA is the tool for measuring our opportunity for quality improvement and cost reduction. And to illustrate the point, let's just look at this simple chart that I've drawn on the screen here. So down at the bottom, we have cost per case per vascular procedures, more costly procedures are going to be there on the right. And we have a bubble here, and that bubble represents an individual physician, let's say Dr. J, who performs 15 cases of vascular procedures a year. And on average, he performs his these cases at about $15,000 average cost per case. His peers in the same organization, the average cost per case for the organization is about $10,000 per case. So that puts Dr. J at about $5,000 above the mean. And if we multiply that by 15 cases and assume that we can standardize these processes enough to get him down to the near or at least closer to the mean, that results in a shared savings world of about $75,000 opportunity. So take that bubble and move it down to the mean. That physician's cost and move it down to the mean.

And then we perform the same calculation on the rest of the physicians in the organization who are performing vascular procedures. We'll now have one who is doing 25 cases at $4,000 above the mean. That's an additional $100,000 in opportunity. And then we perform this calculation on all of the physicians and come up with a total opportunity for standardization and quality improvement. And it's not necessarily an ROI calculated but it's a great relative yardstick to measure the different areas and where we think we can have the most effect at generating those shared savings and quality improvement.

So I'm going to jump to the demo now...
So we start the Key Process Analysis or KPA with a Pareto Analysis and we're slightly (15:43) by that clinical hierarchy that we talked about. So every dot on this chart represents one of the care process families, and recall that's the middle part of the hierarchy, there's about 85 care process families. And examples of care process families are things like heart failure, pregnancy, ischemic heart disease, (15:56). So each one of these blue dots represents down here one of these care process families. The first one is heart failure. And the position on the Y axis is the percentage of the total variable direct cost for this care process family relative to all of the care process families added together. So we're looking at variable direct cost here. And pregnancy is the second dot at 6.87% and so on and so forth. We have them arranged from the most costly to the least costly.
And then the red dots indicate the running total of these blue dots, such that we can draw a line up here at 10 and say, okay, for the 10 most costly care process families, we got you account for over 50% of the total variable direct cost for this organization. And this is a great way to start looking at things, though our top 10 from the variable direct cost end point procedures are care process families. They're a great place to start thinking about where we can improve.

We can also look at other metrics, things like total costs, length of stay hours, revenue. And then these metrics over here on the right are those opportunity metrics that we demonstrated in that slide. So we can see that the greatest area of opportunity for this organization is heart failure, followed by ischemic heart disease. A lot of opportunities in cardiovascular for this organization.

![KPA Bubble Chart](image)

I also mentioned that we look at variation, and another way for us to look at variation is through this bubble chart. And this bubble chart is one level down in the hierarchy. So now we're looking at care processes. You see a lot more data points on this chart than you did on the last one because we're looking at one layer down in the hierarchy. The bubble size – so every bubble relates to a care process and the bubble size is the case count for that care process. On the X axis is the total variable direct cost for that process. And then on the Y axis here, we have a measure of variation. We're using a severity adjusted coefficient of variation. Where comparing within a severity group of variation. One of the arguments that we get a lot if we try to compare variations globally is that one physician may have separate patients and this is really correcting for that. You'll see a little more on that in the drilldown over in just a moment here. But the higher up on this chart we go, the more variation there is, and the further out to the right we go, the more costly the procedure is. So we want to focus our attention on the upper right-hand quadrant of this chart, and the upper right-hand quadrant are the variable and costly procedure. So by now, it's over one of these bubbles, I see that this
one is for septicemia and this bubble is for heart failure. Heart failure showed up on the top of the Pareto chart on the previous page.

So let's drill into heart failure and see what this looks like, see what the variation looks like in a little bit more detail.

KPA Bubble Chart

So recall I just drilled down to heart failure, now we're looking at very similar to the slide version that we showed in the intro, every bubble here represents a physician. One of these physicians is Dr. J and the bubble size represents the case count and the physician on the X axis is the (19:25) variable direct cost and the more costly physicians on average are out to the right, and we do have it stratified by severity. So, the more severe cases at up at the top. And these yellow bubbles indicate quite a bit of variation about these higher levels and severity, and this variation is usually ought to be expected. These patients have a lot more comorbid conditions, and they're just more generally complicated cases. So it's harder to standardize those.

But as we move on the chart, we should really start to see the bubbles start to stuck up on top of each other.
And if I zoom in, I don’t necessarily see that here. I still see quite a bit of variation even at the lower levels of severity. So even in these green bubbles we’ve got a cluster here at about $2,000 per case going all the way up to $4,000 and in some instances almost $7,000 per case. There is still quite a bit of variation here in the pink bubbles and also in these gray bubbles.

So this really tells us for this organization the heart failures are really a good place to start. It's got a lot of variation and since it's very costly, there's great opportunity for standardizing and reducing costs.

[Kathy Merkley]
So I'm going to jump in here, I think, and make a couple of points. And to put this KPA analysis in perspective, I think we need to remember that these bubbles represent actual physicians caring for actual patients. So this is important work and we can make a difference. And so, I want you to think about that. And then the second thing is although this tool directs us toward quality improvement and we listen to the voice of data, there's another very important thing and Eric just referred to it as the large people arm, we've got to filter in the subjective elements of the clinicians who are doing the quality improvement. You might have noticed in the KPA list on the previous screen that three of the care process families out of the top 10 were in the cardiovascular clinical group or clinical program. And even though heart failure was at the top, and from a data-driven perspective represents the largest patient numbers, if we don't have physician and nurse leaders who are capable, who can collaborate and work with teams, we might want to consider another care process family such as ischemic heart disease as the one where we want to begin a quality improvement project.

[Eric Just]
That's right. This too brings the voice of the data, (21:52) to balance the subjective voice of the institution with our efforts.
So the next demonstration, that was the KPA, again looking at variations to help us identify opportunity for quality improvement and savings. This demo is population explorer and we used this tool early on in our engagements and we used it to identify patient populations to look at the relative size of those disease populations and also to understand some basic risk profiles associated with those populations.

So I'll start out on this tab here. And one of the first things that we do is we note that with the Catalyst platform, we bring what we call a foundational set of definitions for populations. They're based on our clinical hierarchy and it's largely based on administrative codes and we can identify populations very early on in our engagements.
Population Definitions

So if I want to go back to our example of heart failure, I can just start typing heart failure here and select a heart failure population. And what I see at the top here is the list of rules that we've used to define heart failure patients. Some of them are based on CMS criteria, some of them are for diastolic heart failure patients and some are for systolic heart failure patients.

And then down below we're looking at the parameters that have been used to define these rules, and in this case we're looking at administrative codes because, again, we're dealing with this foundational definition of heart failure patients, and a starter set really is about administrative codes but it can be augmented with other information.

[Kathy Merkley]
So our clients generally have all these CMS rules as the starting point for heart failure quality opportunities, but we know that those CMS criteria will miss certain people, and so as the team matures, we all like to look at other rules, specifically to clinical rules, that would pull in ejection fraction and that being metric-type measurements as helping that quality to become more robust.

[Eric Just]
Yeah. And it's important to note that our platform does support medications and labs and other clinical observations. And when we do our demonstration of the heart failure application, we'll see what that looks like. But for this application, we're usually ruling out early and it's based on these administrative codes.
So the summary tab shows us some basic information about this population. So again, we're looking at heart failure patients and right out of the box we have these 30-day readmission rates trended over time. We have various financial metrics available, so we're looking at costs. We can also look at charges, payments, and variable costs. And this data depends on how our clients are doing costing but we can usually pull in some level of costing. And this average inpatient length of stay, it's trended over time and we're also showing the average across all the time.

We mentioned understanding the risk profiles underneath each population and this demographics tab shows us that information. So we can look at the various age buckets and we can easily look at all the patients if we want just by drawing a line around this upper part of this chart.
Now we're looking at older patients. We can look at by gender. And we can also look – this is our risk profile. So this Charleson Index is a risk stratifier that's based on diagnoses of comorbid conditions, as well as the age of the patient. And the higher the number, the more risk to the patient there generally is. This comes with one of our products, called the comorbidity analyzer, and it's used as a basic risk stratifier. Again, that's part of our foundational rollout shortly after our platform is installed.

[Kathy Merkley]
So one of our clients have been very interested in reducing disparities in treatment and outcomes of women in (26:07) patients and they are creating a series of AIM statements around this, looking at this goal, and they actually could see the functionality of this application would be crucial if they were attempting to develop their cohort and see if they wanted to study and make interventions toward.
Primary Care Visits

[Eric Just]
It's important to note that we can look at population metrics across the continuum of care. So our first tab, we're looking at primarily inpatient metrics around readmissions and length of stay. The next tab, we're looking at primarily demographic information, and this allows us to look at some metrics around or specific metric around primary care visits. And it's important for us to make sure that patients who have a chronic condition such as heart failure are making regular visits to primary care. And what this shows us is the number of days since their last primary care visit across the bottom here, and the bars indicate how many patients with heart failure on each category.

So on top over on the right-hand side of this chart, we have a large number of patients who haven't been in in over a year for primary care visit and they're diagnosed of heart failure. This is something we want to resolve.

So we can isolate these patients who haven't been in for quite some time in that primary care clinic. And down below here we have an actual listing of the patients – medical record number right down with the phone number and the patient name, with the amount of times since their last visit. And it's important to note that this list is sorted with the highest risk patients at the top. So if we do want to make an intervention to call these patients, the highest risk patients are first on the list.

[Kathy Merkley]
Right. And clients find the ability to sort by risk. Very exciting. They can identify how to prioritize this. So care managers and medical assistants, you can imagine that they would be on this tab all the time.
So another very variable piece of functionality of this tool is being able to compare across the organization. So for instance, we're looking right now at a heart failure cohort. So this is a comparative and it allows us to look at two separate populations. One of the populations, we used blue in our charts and graphs; and one of the populations, we used gray. In this case, we're looking at heart failure showing up in blue here versus the gray, which nothing is selected. So it's looking at the overall population of the organization. So all the rest of the patients compared with heart failure patients. Of course we see a much higher readmission rate for heart failure than the general readmission rate for this institution.
I can do things like compare different facilities in my organization. So if I want to look at heart failure patients across two different hospitals, I can click on this button to copy my heart failure selection from the blue cohort to the gray cohort.

Cross Cohort Comparison

And now I can select an individual hospital here. So let's select Granite hospital.

Cross Cohort Comparison

And for this other one, I'll select Millrock Health. And now I have a comparative view of these two different institutions both in my system that are caring for heart failure patients and I see a big difference in their readmission rates, also a big difference in their length of stay, as well as some financial metrics. And it's important to know that not only can we compare two different heart failure but we could compare heart failure to ischemic heart disease, or any other two populations that we can think of, we can compare through this part of the tool.
[Kathy Merkley]
So as we – perhaps we're looking at readmissions, we could ask, are we seeing, is one facility seeing sicker patients, are they more of a tertiary care facility. And this kind of functionality is very helpful if you work in a hospital system with (30:05) facilities because it will help you be able to compare it here at those different things.

[Eric Just]
Alright. So we don't have time to go through all of the tabs in our tools but we think we've given you a good taste of what you can do in population explorer, again, understanding the risk profiles and some of the details about your populations.

We're going to jump back to the slide deck here and Kathy is going to talk a little bit about the clinical process for our advanced applications.

Demos: How Analytics Drive Shared Savings
Heart Failure Statistics

Heart failure (HF) is one of the most rapidly increasing cardiovascular disorders.

- Leading cause of hospitalization in individuals over 65 years of age.¹
- Third leading cause of hospitalization in the U.S. in all age groups.²

HF is the most common cause of readmission.³

Rates approach 30% within 60-90 days of discharge.⁴

Heart Failure Statistics

[Kathy Merkley]
Okay. Heart failure. We're focusing on heart failure today. Why is that? Well, almost every client we work with is interested in reducing readmission rates for heart failure. We know it's the leading cause of hospitalization of individuals for over 65 and the third leading cause of hospitalization in the U.S. And most importantly, it's the most common cause of readmission and rates are approaching 30% within 60 to 90 days of discharge.

CMS and Medicare Readmission Penalties

Nearly 25% of all patients hospitalized for heart failure are readmitted within 30 days.

CMS has labeled HF as an area of excessive readmission.

CMS penalties will ensue to reduce readmission rates

Now, within the first 30 days, 25% of all patients are hospitalized, and so most systems want to focus on that first 30-day. And to incentivize hospital systems, CMS has labeled heart failure as
an area of excessive readmission. And so, they have to look at quality improvement initiatives in this area. We are seeing penalties increasing due to excessive readmissions, and in 2014 systems are paying back 2% of their losses. And in 2015, well actually fiscal year, which is late 2014, they'll be having to be reimbursed 3%.

**Improvement Methodology**

- A **goal** is a desired result the workgroup envisions, plans and commits to achieve an organizational desired end-point by a specified deadline.

- **AIM statements** are written, measurable, and time-sensitive objectives that move the team toward achieving the goal.

**So we borrow from the IHI Improvement methodology and we do this by recommending first defining a goal. And a goal, we like to think of as an umbrella. It's the desired result of an organization's desired endpoint, and we like to put a kind deadline to this as well. And then we work at identifying AIM statements and these are written, measurable, time-sensitive objectives that move the team toward the goal and we usually put 3, 4, 5 AIM statements under the umbrella of our goal.**
Now, I'm going to review for you separate AIM statements that hospital systems have used, our clients, with the goal of decreasing 30-day readmission rates. And the first one, and this is almost routinely, the first AIM statement that clinicians select is they want to validate data and establish baseline. They're so excited to do the data, but still they need to make sure that it's accurate. And so, our first AIM statement usually revolves around this validation.

The next thing we see often is looking at trying to identify high-risk heart failure patients and there are a variety of risk stratification models out there to help predict the return of a patient within 30 days for readmission. And we all know that we have limited resources in healthcare
and they are getting more and more limited as time goes on. And so, why would we not want to spotlight those critical patients, those high-risk patients, and put our interventions towards them as a way to reduce readmission rates.

Next, the next three AIMS that I'm going to review are talking about interventions related to readmissions and kind of the bundled approach. So we know there's no magic bullet to get patients or to keep patients out of the hospital and a single intervention may or may not show modest results in lowering readmission. So a bundle of intervention, so to speak, is what is going to be meaningful and this was actually just demonstrated in a research study published in (34:55) by Elizabeth Bradley where she and her cohorts identified several factors used in combination seemed to help reduce readmission rates. So those are three of these recommendations, the first being making sure that you have a follow-up appointment for heart failure patients after they're discharged from the hospital. And if they're a high-risk patient, should really be seen in 48 to 72 hours after discharge.
CV Heart Failure AIM #4

The next AIM statement revolves around medication reconciliations and tracking compliance to that. And we all know the value of medication reconciliation. It helps us determine that the patient is on the right medications, that they understand what that medication does, and that they'll take it correctly. And so, if we can get a high compliance with medication reconciliation by the nurse before the patient is discharged, this can be crucial to keeping the patient out of the hospital.

CV Heart Failure AIM #5

And lastly, it's been shown to be very helpful that a follow-up phone call from a nurse post discharge to check in on the patient, to make sure that they've obtained their medications from
the pharmacy, that they're going to be able to make their follow-up appointment, and to answer their questions, and this is proven to be very helpful as well.

So in combination, these three AIM statements used together can really help decrease 30-day readmission.

Organizational Teams
It's not just about technology

Now, at Health Catalyst we have a famous truck slide here, we're going to show you, which is an effort to just give you a simple metaphor and we like to compare staffing, quality improvement initiatives to components that are required for a truck here in cargo. So you can't drive a truck if you don't have wheels or a truck bed or transmission, an engine, a driver, and the same principles apply when building the quality improvement team. And I really want to emphasize that there are minimum requirements for success and we've seen over time that if you find a project, you don't get those long-term results and successes like you do when you find a dedicated team.

So we recommend forming permanent teams around a clinical hierarchy, and in this case, our clinical hierarchy, in this case, the cardiovascular clinical program. And you see the drivers of the truck are the physician and the nurse and then the wheels are supported by a data architect, an applications administrator, and a knowledge manager who is generally a nurse with an interest in data, and these are key people in keeping asset gains going and success of the quality improvement initiatives.

Now, we add on our cargo initiatives and this can be heart failure or ischemic heart disease, as you can see, and each one of those is supported by this physician and nurse, the knowledge
manager and data architect, and in addition, we pull in physicians, a physician lead who's an expert in that area and in your subject matter expert.

*Eric Just*
Okay, we're going to pull out the application here. Kathy is going to orient us.

*Kathy Merkley*
We're going to show you our heart failure application.

![Heart Failure Readmissions](image)

*Kathy Merkley*
Alright. So I will orient you just a little bit to this. So across the top are the data related to heart failure readmissions. And this data is held responsible by the drivers of the truck. So the physician, nurse, knowledge manager, and the clinical operations lead are the ones who are validating and making sure this is correct data.

And on the left, we have[I guess it's my right] we have 90-day ER utilizations and 90-day observation stays and we call this balance metrics, and these are very very important because what good is it to cost savings is we decrease our readmissions but they're now in the ER or they're now in the observation unit. So they're very crucial.

And then below we have the interventions, and this is where the data architect, using the data warehouse, pulls data to answer all of the clinical questions and develop visualizations around this information. So you can see these different interventions we've identified in the AIM statements are tracked with percentages and an easy way to identify what areas need to be focused on for additional improvement.

*Eric Just*
Thanks. And then on the bottom here we have this kind of trending of readmissions over time. So really what you see on this front page is the baseline for what we described in the AIM statements. You've got the readmission baseline up here, then the specific interventions around those AIM statements. And we have tabs congruent to each one of these but before I get to those tabs, I just want to talk a little bit about further stratification of this heart failure population that we can do in this application. We had a question about some of the more advanced ways to identify a population and by the time we're developing an advanced application, like this heart failure one, we are starting to include a lot more clinical criteria in our definition. We're not just using administrative codes.

Heart Failure Readmissions

So this CHF definition was developed by clinical leadership sitting down with the members of their truck bed team and identifying the criteria that's necessary to track patients, that's heart failure patients, with clinically validated population. In addition to CHF, we have a core measures definition that's more based on the CMS definition. And then we have each of the individual pieces of data that we've used to comply with those rules. So there's ICD-9 codes. We have mappings to ICD-10 but we don't have ICD-10 in our general environment. We see a lot of ICD-9 here, and then other lab and medications that indicate a patient is in a heart failure population.
So if you wanted to look at a truly medication-based population, you could just select their medications and we are now updated and now we're looking at that medication-specific heart failure cohort.

So it's important to know that the Catalyst platform, the data warehouse, holds an infrastructure for defining these populations and the ability to expose these various rules into visualization to create individualized and stratified versions of our populations.

[Kathy Merkley]

And I think of one data manager at one of our clients who as she saw this data, she said, "We're drowning in data and I love it," and that's so important – to be able to provide to providers that information so they can improve care.

[Eric Just]
Excellent. So additionally, in addition to our population stratification, we can stratify by risk, and we've already looked at a little bit of risk stratification in population explorer, but I wanted to show this because it again highlights the flexibility of our platform in supporting multiple risk stratification models.

So some of our clients have a simple flag in their EMR indicating where a physician can indicate whether their patient is high or low-risk. And if that's available, we definitely expose that as a risk filter, it's the manually (43:05) high risk cohort.

Additionally, we have that Charleson Index, the one that's based on comorbidities and age that we looked at in population explorer, so we can identify high-risk patients with our Charleson Index stratifier. We can also look at just a number of comorbid conditions that a patient has.

And finally, this Catalyst HF Risk Index is another level of stratification that's a lot more advanced. This one is specifically targeted for heart failure patients and it's a predictor that gives us a number of between 1 and 100 that indicates the relative likelihood that one of these patients will be readmitted for this condition as based on a number of clinical criteria and other demographic information. It's got about a 90% accuracy rate for predicting risk. So it's the most accurate risk stratifier developed on a training set specifically for individual clients and it's a highly accurate way to identify those high-risk patients.

Heart Failure Medication Reconciliation

So I want go in to some drilldown here with medication reconciliation tab as we're doing a deeper dive into our medication reconciliation AIM statement. I want to just the year here, 2015, and what we see at the top here is our medication reconciliation compliance rates over time. The blue dots indicate whether the med (44:28) within 48 hours, the yellow is whether a pharmacist reduced it.

And down below here we have a block chart as broken up by units. So we can see the units that are doing a better job at medication reconciliation. Most of them are mostly green and that's a good sign. But we do have one outlier unit here that I had immediately drawn to (44:49) Northwest who's doing a particularly poor job of medication reconciliation. So this is
how we kind of get at that root cause and understand where some of the problems may be coming from.

[Kathy Merkley]
And you can imagine how important this information would be to a nurse manager or someone in the quality department. Obviously, there needs to be some serious education in mentoring a leadership and staff on its unit. And so, without this dashboard information, you really would never have had this available to you.

Heart Failure Follow-Up Phone Call

[Eric Just]
So we'll just look at one other drilldown chart here, this phone call metric. So this is tracking that AIM statement that said every patient should have a follow-up phone call, and it's laid out similar to the medication reconciliation. Up at the top here, we have our trending over time of the compliance rate with that metric – so, the number of patients who were called, the number of patients who were called within a certain amount of time, and the number of patients who were reached.

Down below here, we actually have a list of the patients who haven't been reached. So if we need to intervene and start calling these patients, we have the information about them, their medical record number, their name and their age, and it is stratified by risk.

[Kathy Merkley]
So, if I were a nurse and I only had 20 minutes and I needed to make follow-up phone calls, I would know exactly where to focus. This is an exciting tool that helps clinicians greatly.
So I can just go to the number of days since discharge and find patients who were discharged within, let's say, the last 2 weeks. And here's the (46:23).

Alright. That concludes the heart failure portion of the demo.

We have one more section, the community care dashboard. And once again, the community dashboard is really about monitoring high-risk patients within a primary care setting and avoiding the expensive acute treatment altogether. So the last one is really about optimizing the costs once they're in the acute care setting, this is about avoiding those costs in the first place.
We're going to shift here a little bit. We've been talking about heart failure. But we will be focusing a lot of our attention for the (47:00) with this demo on diabetes care. It's more than more common population that we see monitored in our clients and we can look at diabetes, especially with respect to A1c screening, cholesterol screening, nephropathy monitoring, and blood pressure control. We also have cardiovascular population that we're monitoring in this tool and a variety of preventative metrics as well.

And what we see on the screen is a list of the populations and the metrics that we're tracking. And this middle column here indicates the compliance rate at a system level for each of these metrics. The tool allows us to drill into the organizational hierarchy and I'll demonstrate that in a moment. But this gives us the overall system-wide compliance rate. And we also have comparison with National Standards. So the colored gradient on each of these metrics match to a HEDIS standard and it can actually be sourced from anywhere but the first time we implemented it is that we wanted to compare with HEDIS. So the darker blue gradient is from 0 to 25th percentile of HEDIS, lighter blue is 25th to 50th, then 50th to 75th, and 75th to 100, and then the black tick indicates where this organization falls relative to those HEDIS metrics.
So I mentioned that we can do some comparisons here. So I'm going to click on this comparison button down at the bottom here. And what this allows me to do, it allows me to compare service areas. So we have three service areas in this demo data set, and now we're looking at the compliance rate for these service areas compared to one another.

So if I click on one of these service areas, I can drill in and I can see the different locations associated with that service area.

And I can click and select one of these locations as well and either click on it here or use the menu on the left, and now I have a listing of each of the individual physicians in that location. So these are individual physicians and their compliance rates compared to one another.
If I select one of these physicians, I can get that physician's compliance rate compared to his overall peers in their department, location, and service area. So you could see we get a good amount of comparative capability and to drill in to the organizational hierarchy, it's a very helpful tool to see how we're doing overall and again identify problem areas, specific clinics that might be of more help than others.

We can drill into the provider detail. So I have one provider selected here, I can click on this provider tab. And now we're looking at at the top here with just a brief review of what we see here. We saw it in the last screen but I forgot to describe it. So these are composite metrics and composite metrics represent a weighted average for whatever selection we're looking at. It could be for the entire institution. In this case, it's a weighted average for this particular physician and how he's doing across each of these different populations. So overall, he's doing about 51% compliance across these metrics, he's doing about 58% compliance across these specific diabetes metrics, 58% across cardio, and so on. So these metrics are sort of improvers of weighted averages of specific measures.
This table down below lists the provider's patient count. This physician has 1,000 patients, about 1,066 patients, in his panel. And we can filter this patient panel by looking at specific treatment needs. So, a treatment need is when one or more patients is out of compliance with a particular metric. So for example I have an A1c control metric here, so this tells us that there are 13 patients who have high A1c values for this physician.

And if you would like to find out who those are, all you need to do is click on that number and we filtered down to the list of 13 patients who have those high A1c values and we get a summary of other treatments that they might need right here in this table.

We can also look a little bit further out, so we can do a little bit of proactive care. So looking at patients who will be out of compliance if we don't do anything in 90 days or 180 days. This is a chance to get on ahead of patients before they fall out of compliance with the (51:33)

[Kathy Merkley]
A great opportunity for an M.A. in a clinic to say to the patient, we need to reschedule you back in 90 days to do this or that. So, very helpful.

[Eric Just]
So I just selected my 13 A1c patients again. Now, I want to get a little more detail on one of these patients. So I'm going to click on a patient name.

And that allows me to click over to this patient tab. And that allows me to click over to this patient tab.
And now the patient tab gives us the summary of the information about this particular patient. So we can see historical data about blood pressures, A1c values, LDL values, and show their encounters in the last 12 months. If people are making frequent visits to the hospital or ER, I think it’s noted down on the screen as well. And we also highlight overdue treatment such as colorectal cancer screening, then high blood pressure, in addition, so if we click on this patient because they had high A1c value but we can see that there's other treatment that's necessary and the care manager could use this to get out ahead and start scheduling these other overdue treatments while the patient is visiting.

So that concludes the demo portion. I'm going to go back to the slide deck and I think we have a poll question here. And then we'll get to answering some questions.

Poll Question: How precisely does your organization prioritize its areas of care improvement?
[Chris]
So this poll question, how precisely does your organization prioritize its areas of care improvement? It has 5 options – 1 very precisely through very imprecisely as the fifth option.

Just another moment for that...

Okay. We're going to close that poll.

Poll Results

Here are the results from audience. 2% selected 1 very precisely, 19% selected 2, 47% selected 3, 22% selected 4, and 10% selected 5.

And we have a second question before we jump back to the slides.
Poll Question: What are your biggest challenges to making more quality improvements?

I think this is very interesting for the audience to the other answers of the other attendees. What are your biggest challenges to making more quality improvements? With four options – finding budget, aligning organizational players, lack of knowledge or insight into improvement options, technology.

We'll close that and we'll turn back over to you, Eric, in just a few more seconds...

Okay. I'm going to close that poll.
And the results, 35% selected finding budget, 61% aligning organizational players, 19% lack of knowledge or insight into improvement options, and 23% technology.

[Eric Just]
Awesome. Great data. Thank you everyone for participating in those polls. And I just want to wrap up before we start answering questions, just a real quick review of the demos that we saw. We saw our key process analysis [I'm not showing it...apologies]

Demos: How Analytics Drive Shared Savings

We saw our key process analysis to help us to identify those areas of greatest opportunity by looking at variation and cost. We saw population explorer and it allows us to understand any one of many populations that come with the Catalyst platform and identify risks by looking at risk profiles of those populations. We saw and we heard from Kathy about our improvement methodology and we looked at an application that's been used to achieve quality improvement and cost reductions, looking at high-risk patients in heart failure. And finally we looked at our community care dashboards and how we monitor those high-risk patients in primary care to prevent that expensive acute treatment.

And all four of these play really nicely into this notion of shared savings and population health management. These are a small part of our product portfolio. There's a lot of great information on our website about other products and also (55:47) population health.

Questions and Answers

[Chris]
Super thank you, Eric and Kathy. We have a handful of questions and only a few minutes to answer them. We'll try and start with the most important questions first. Here's one. "What sort of team does the health system have to your optimal quality improvements?"

[Kathy Merkley]
So just as that poll result just showed, 67% of you have difficulty aligning people. Remember the truck bed and the permanent team based on clinical programs or clinical service lines are really necessary. And initially those include a part-time physician, clinical operations nurse, and knowledge manager and data architect as I said and you might need folks fulltime in a large hospital system. But in a smaller hospital system, a physician might just need to be time and the other three players or truck bed support could be supporting more than one or two clinical programs.

[Chris]
Okay. We're going to have to pick wisely here. Two minutes left. I'm going to show the questions for Eric and Kathy and we'll pick the best one.

[Eric Just]
"So how do you determine cost at a patient or visit level?" That's really dependent on our clients. So many of our clients have good costing systems and costing data that we have access to, here is fine-grained costing data, that helps us to do the types of things that you saw on the KPA. Other clients may not have that detailed costing systems and will use the cost to charge ratio to get started.

[Chris]
Okay. Very good. "How do you check for data validity? The old cliché 'garbage in equals garbage out', how do you minimize this or how much time is spent cleaning data?"

[Kathy Merkley]
Go ahead. And then I can jump in.

[Eric Just]
I'll start. So when we load the data into the platform, we have a number of data checks that we do. So our platform is based on a Late-Binding™ Architecture. We don't have time to go into the details of that. But as we're loading the data, we're validating it against the actual source that we're loading it against to make sure we're getting a complete load. And then as we're implementing these advanced applications, we often encounter data issues.

[Kathy Merkley]
And so, because we have Late-Binding™ Architecture, really the garbage is at that hospital or clinical level. And so, that's when we involve clinicians to do data validation. It's very instructive for them to see what's missing, what's incorrectly documented, and at that point, they are the ones who are going to their colleagues and saying, you need to change your practice. And so, it's very helpful.
[Chris]
Super. We have a handful of questions we can't get to. I promise you we'll answer them by email. Here's one last question and then we'll close. This came in from someone before the webinar started. "I work in statewide behavioral health systems. Any relation you can make to cost savings related to behavioral health will certainly get my attention."

[Kathy Merkley]
So in the KPA we look at in the behavioral health section and we find using the Pareto Analysis that four conditions hit the 80% and those include mood disorders, which is a bucket for depression and bipolar and then there's schizophrenia and neurosis and substance abuse. So it's not hard to know where the focus is, specifically mood disorders are off at the top. I know the healthcare system who identified depression as one of their very high cost, high variability quality issues. And so, they have developed an extensive primary care network for clinicians to the PH29 screening tool on patients who come in who say they're depressed. Then they pulled in rotating social workers and psychologists. They have an APRN, psychiatric APRIN, come in who prescribed some medication and they've seen an impressive decrease in their inpatient admission and also more importantly patient satisfaction off the chart.

[Chris]
Thank you. Thanks to all of those who submitted questions. We have passed the top of the hour. I'd like to thank everyone who has participated. As this meeting closes, you'll have the opportunity to take a short survey. Later today you'll be receiving an email with the link to the recordings of this webinar, as well as the slides.

On behalf of Eric, Kathy and the folks at Health Catalyst, thank you for joining us today. Have a great day. This webinar is now concluded.
Advanced Applications
Architecture Overview