Thanks, Tyler. And thanks everyone for joining.
Again, we're here to talk about our CORUS Suite, which is our first plan of the cost accounting and cost management world. I'll just go over the topics real quick before diving in. First, we will talk about the need for activity-based costing. So, how cost data is vital for surviving in both fee-for-service and value-based worlds and kind of why Health Catalyst decided to invest in this area. Then we will do some level setting on cost accounting basics just because the understanding may vary, depending on who we have on the call. Talk about healthcare cost accounting pain points. So what has not been working in this market and why was there a need. And then go into some examples of why cost data matters. You know, there is still some misunderstanding in terms of the different methodologies and how they can be used and why they are important. Then, we will dive into the product itself. So we will give a quick overview of the CORUS Suite, what it entails, and do a brief demo, talk about some of the differentiators and why we think Health Catalyst is set for success in this market. And then I will hand it over to the venerable Bobbi Brown to talk about organizational readiness and what you need to be able to implement something like this because that is much harder than the software, is the data governance, the implementation, the buy-in, et cetera. And then we will conclude and answer some questions.
So jumping in, I used to have a slide that would talk about the shifting payor mix, reduced reimbursement, higher patient responsibility, the uncertainty around alternative payment models and going at risk, and what it looks like is that a quote from a CFO is kind of a forefront of introducing cost in other system was more insightful than me spitting out some data point. So, this is from Rob DeMichiei, Executive Vice President, CFO, at University of Pittsburgh Medical Center, and he said that "the only way to be successful in the new world of value-based healthcare and population health is to understand your true costs and manage them. To get there, we need access to massive amounts of data from across the care continuum to identify all of the resources used in delivering patient care." And so Rob feels strongly enough about this and he set his health system on a journey to develop their own cost accounting system because he believes so strongly in it and believes that this is something that everyone should care about and really look into.
Why Would Health Catalyst Do This? [02:41]

And then that leads to why would Health Catalyst do this. They are already incumbent in the market. Cost accounting systems have been around for a long time. And so, I’m just going to kind of show at a very high level how this fits in your strategy and where we felt there was a need. So on the left, on the Y axis, we have millions of dollars at risk. Let us say this is an at-risk contract and these are the levers that are at play that can impact your success financially. This first bar, predicted utilization of population, is something that there is inherent risk and inherent utilization in that population. The little bar at the top is kind of a confidential interval in terms of what you, as a health system or a provider, can actually deal with and what the levels of variation might be and where this bar ends up. So for the most part, this is the real one with enough data, you can get pretty accurate predicting the inherent utilization.

Then there is contracted utilization. So with the payor, how do you actually contract, what is utilization expectation, quality measures, the total dollars at risk, et cetera. And right now, the payors are better at this but I think health systems want to get more experience and our belts will be able to compete in this world but not a ton of room for negotiation, in my mind.

Then there is the third bar of actual utilization. So now you have contracted for it but how many dollars were spent, how did you care for these patients. This could actually be much higher than what you contracted or it could be lower if the risk of the population is lower or your involvement actually reduced to spending of care. And in this bar right here, there is a ton of action in the market, a ton of vendors doing care management, population health. Health Catalyst entered this space with our care management product and our clinical improvement line has always kind of delved into this space. And so, there is a lot of action here and a lot of people focusing on it.
In area that people have not focused as much on is cash received. Extremely important. Even though there is utilization, it does not mean you have got paid for it. So, making your quality measures, capturing risk adjustment, so you pay appropriately for the risk of the population, and then even collecting patient debts and responsibilities because many of these benefit plans are not changing. So even if you are at risk, if it is based on the allowable, you still have to collect money from the patients to get the hard cash in the door.

But one piece that we felt was really underserved and overlooked was the fact that within these at-risk contracts, there is an actual cost to the system to deliver care. And it is extremely important for understanding how much is in the cost of care for you can actually make money or you are just looking at what you are going to be paid versus what you were for making strategic decisions on where to drive patients, which procedures to do, negotiation of types of contracts, are there certain types of populations we should try to carve out because we will never survive in them. And so, it was a piece that we felt was overlooked and it is foundation not just in specific at-risk contracts, but it was a foundational data element in every single one of our applications – clinical process improvement, operations. Everything we did had cost data in it and what we found is that our clients rarely used that. It really drives operational changes. It was normally something that only finance had looked at and rarely exposed. And so, we felt like there was a strong need there.

And the reason it is extremely important in value-based care is that when you look at all these different levers and where you can make mistakes or where you can strive means that the margin of 2.6 percent right now is really really think. And in these contracts, it could go up or down pretty drastically relative to what people are used to. So understanding the cost of care was vital to that.

And so that kind of drove Health Catalyst to looking at the market. We had the visionary physician leader who had cared about this space for a long time and then we saw the market starting to react and be more interested in cost accounting in general.

And so, Tyler, I will hand it off to you for our first poll question to kind of see what everyone else thinks about this topic.
Poll Question

Does your organization consider cost accounting a critical component to succeeding in value-based care?

- Strongly Agree
- Agree
- Disagree
- Strongly Disagree
- I don’t know / Not applicable

[Tyler Morgan]
Alright. Well we have just launched our first poll question. Does your organization consider cost accounting a critical component to succeeding in value-based care?

So we will leave this open for a few moments to give everyone a chance to respond. And in response to a few questions, I would like to remind people, yes, we are recording the session and we will be sending an email with the recording, as well as the slides. Also, the slides have been uploaded to the control panel. You can access them from the handouts pane. We will close the poll now and let us share our results.
We are showing 50 percent strongly agree that their organization considers cost accounting critical component, 37 percent agree, 3 percent disagree, 10 percent are unsure or not applicable.

**[Dan Unger]**
That is great. And this is similar to what we have seen recently. And I think we had asked this two years ago. No one was talking about cost accounting and whether it was a big part of this or at least significantly lower than – thus, 80-85 percent agree that it is a critical component. So that is exciting to see.
Cost Accounting Basics [08:17]

So now, just to level set on cost accounting basics, what are we talking about today and what is cost accounting at a really really high level. Costing starts with your general ledger. Everyone has a general ledger and in there is an expense section. These are your costs, and at a high level, your expenses are completely accurate even if they are not, this is the Bible for your cost. You also have services or products delivered in healthcare that is caring for patients. Cost accounting is basically linking the expenses from the general ledger to the services delivered in a way that is accurate and useful for understanding how it costs for delivering those services or products.

And so, the high level is, you know, a pretty simple concept but when you get into the depts. Of healthcare data, it is obviously not that easy.
And so, similar things that we had looked at when we looked at the market was that many people were working off for cost accounting systems that they had purchased 25 years ago. And so, many systems are outdated, even their methodologies had not been updated, if the system allowed for it. And just one comment here is that I am actually really excited to see the space picking out more in terms of reinvestment from some of the incumbent players, new players entering the market, including ourselves and I can get something that is just really good for healthcare overall and I hope we continue to push limits in this space. But for the time being, most of the health systems out there are working with systems that take a ton of time to maintain and update. Really the current cost accounting systems struggled to handle the amount and type of data needed for more accurate costing. So once you step outside of discharge codes and you get into the depths of the EMR departmental sources and start looking at individual staff members and their time in the OR, the data multiplies exponentially and many of them just are not set up to handle that. Additionally, validation and reconciliation of the data is really really tedious and was not easy to do on these systems and it is 20 times more important once you start bringing in log times, badge times, time stamps from MRI machines. So it is something that was a pain point, made the cost accountants complain about how they had no insights and always had to track down data issues.

Additionally, just from a people-perspective and a process perspective within health systems, cost accounting has been historically under-invested in. The picture on the bottom left is Milton from office space and I show this not to be derogatory towards cost accounts because they are actually some of the most knowledgeable and valuable people within the health system, but the way they have been treated is kind of in the basement to just checkboxes and keep their old system running and the reports are just kind of used for financial
reporting and data and I feel confident showing this because we have presented to dozens of health systems and every single time, so much giggle and pointed to the Milton in the room where they raise their hand and they know that they are under-invested in. So from a technology standpoint, from a people's perspective, if you look at the amount of dollars spent on revenue cycle, which from a financial perspective your revenue base is about equivalent to your cost base. So, both of them have a lot at risk but the investment rev cycle has been significantly heavier. And because of that, I think there is a lack of transparency into the data and it limits buy-in from key stakeholders. So, for one, these cost accounts do not have the bandwidth to explore new models and update methodologies and they definitely do not have time to go and evangelize the cost data and help people understand it to gain buy-in. So, these are some of the key areas that we saw that were lacking in the market.

But there are existing solutions. They have been around for a really long time and a lot of them are actually great pieces of software. One of the big gaps that we found in those is that almost all leveraging charge data and averages, either averages of charges or RVUs, which was great for a long time now is the best data that we had, our approaches to leverage, our knowledge, and our access to dozens of source systems and every single data element within those source systems to use actual utilization data. Instead of using charges and RVUs as a proxy, leverage patient utilization in terms of how much time was spent with the patient, which supplies, what machines, whatever data is available, we tried to use it.
And so, why does that matter? What does it matter using actual utilization or a better proxy of utilization as opposed to charges and RVUs? So I will go through an example and this is a personal example because my wife is a pediatrician who has never cared about money. Otherwise, she probably would not have been a pediatrician. But now that she starts getting paid off of RVUs, she started to ask questions. And so, we had some really fascinating conversations at home.

And so, it led me to coming up with this example because it really drives her nuts and it was actually a good crossover into why costing matters. So, real cost of two patients in a clinic under the main costing methodologies of ratio of cost to charges, RVUs or Relative Value Units, and activity-based costing. So, total cost for this "HC Peds Clinic" and the general ledger is $225,000 for the quarter. We had two patients. Patient A is a toddler with an ear infection. In the picture on the right is a shameless plug from my adorable two boys who actually let me sleep for four hours straight last night. So if I seem especially cheaper, that is why. Very refreshed today. But a toddler with an ear infection was scheduled for 10 minutes. The doctors know that an ear infection is one of the fastest things you can do. So my wife says, "Alright. If you are calling in for the schedule, for 10 minutes. During this visit, the physician removed earwax they could see back there, identified the infection and called in antibiotics. The total visit time was 10 minutes and the physician billed a 99214 and a 69210 charge code.

Patient B is a teenager with ongoing "headaches". My wife dreads when a teenager calls in that has not been seen for seven years and has consistent headaches. That usually means there is something else going on. So she knows her scheduled as those for 30 to 45 minutes. This patient came in, the physician performed an extensive evaluation and spoke with the
parents for 20 minutes after that. Total visit time was 30 minutes and the physician billed a 99215.

Costing Example – RCC Method

Costing of two patients in a clinic under the different costing methodologies
- Total cost for the “HC Peds Clinic” department from the General Ledger was $225,000
- Patient A came in for “possible ear infection” and Patient B came in for “headaches”

<table>
<thead>
<tr>
<th>Total Charges</th>
<th>Total Cost</th>
<th>RCC</th>
</tr>
</thead>
<tbody>
<tr>
<td>$500,000</td>
<td>$225,000</td>
<td>45.0%</td>
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So now we will go through, this is going to probably be a little in the weeds but I think it is vital to understanding the importance and understanding variation of cost between patients. So, bear with me as we go through these examples. So, RCC, Ratio of Cost to Charges. You take the total charges, which for the clinic worth $500,000 in this period. The total cost, like we talked about, $225,000 for the quarter, gives you a Ratio of Cost to Charges of 45 percent.

What you then do is you apply that ratio to each of the patient's charges. So with the patient with ear infection that had $220 and the teen with headaches that had $200. When you apply the RCC of 45 percent, you get a cost of $99 and $90, respectively.
Costing Example – RVU Method [15:53]

In the RVU example, instead of using the amount of charges, you use total relative value units and these could be RVUs from the RV, RVSP schedule or it could be a cost accounting or department managers assigning relative value units to charge codes. In this case, in the outpatient setting, many just take what is already attached to it to CPT code. So in the clinic they build 10,000 RVUs and total cost of $225,000 gets you to $22.50 per RVU.

The way that we cost it is we then apply that cost per RVU to each patient's RVUs based on their billing. And so, the patient with the ear infection had 4.42, teen with headaches 4.07 and the cost comes out to $99 and $92 apiece.
Costing Example – ABC Method

Now in the activity-based costing method, the big differentiator is that we are using the best available activities that are more related to utilization or resources. And for the clinic in this example, based on the best available data, we are using the number of visits. So this is probably an appropriate way to sign cost for registration staff and other fixed cost and then scheduled minutes which could be used for variable staff time, utilities, et cetera. And so what we do is we take the total patient activities for that time frame. So 2,500 visits and 50,000 scheduled minutes. You then decide which types of dollars should be allocated to which type of activity. And then we get the amount of allocated cost for each activity and get a cost per activity. So for a number of visits, it is $36 per visit and then $2.70 per scheduled minute.

And then when we go to apply that to this example, we see that the ear infection had one visit in 10 minutes. When you apply the cost per activity, it comes out to $63 for that patient encounter. Teen with headaches had 30 scheduled minutes in one visit. And so, what was drastically higher, the $117.
Why Costing Matters

<table>
<thead>
<tr>
<th>Comparison</th>
<th>RCC</th>
<th>RVU</th>
<th>ABC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Cost</td>
<td>$95</td>
<td>$96</td>
<td>$90</td>
</tr>
<tr>
<td>Ear Infection</td>
<td>$99</td>
<td>$99</td>
<td>$63.00</td>
</tr>
<tr>
<td>Teen with Headaches</td>
<td>$90</td>
<td>$92</td>
<td>$117.00</td>
</tr>
<tr>
<td>Variance</td>
<td>$9</td>
<td>$8</td>
<td>$(54)</td>
</tr>
<tr>
<td>% Variance</td>
<td>10%</td>
<td>9%</td>
<td>-46%</td>
</tr>
</tbody>
</table>

Potential impact on 1 million visits each year = **$54 million** variance.

You cannot make the right strategic decisions to improve care while lowering costs without this kind of data.

Why Costing Matters [18:00]

When we look at this together, it is interesting, I want to call this out because it is not ground-breaking but it is something I have to call up the obvious. But when you look at the average cost for this and if you were to look at the average cost per patient for the entire department across all of this, they would be the same. And even with these two patients, the average cost is very similar across the methodologies. Where you see the difference is in the variation. The cost for the ear infection, RCC and RVU is actually 10 percent, 9 percent higher under those two methodologies and 46 percent lower under activity-based costing.

And when you start looking at this variation across millions of visits, you start thinking about the strategic decisions that could be made using this data. There is just no way that you can do it without getting the actual variation between the care delivered for each individual patient. And just for a strategy example, it might make sense to free up access the teen with headaches oftentimes. This could be done over Telehealth much easier than an ear infection where you would want to actually look into the ear, so the teenager could get to more appropriate form of care, get sent to either a psychology if it ends up being that they are actually depressed or to imaging if they needed a CT or if they just need it to be told that they need to drink more water and less soda. And then it frees up more space in the clinic for hands-on exposure with the physician. So, hopefully that example is useful. This is just one example of, you know, we do this type of example on every single department that a patient touches.
What methodologies does CORUS support?

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Assign true costs to each patient based on their actual utilization</td>
</tr>
<tr>
<td></td>
<td>- Drug, supply and labor costs (when available)</td>
</tr>
<tr>
<td>Step 2</td>
<td>Remove all true patient costs from GL</td>
</tr>
<tr>
<td>Step 3</td>
<td>Allocate remaining expenses to patients using the best available driver(s)</td>
</tr>
<tr>
<td></td>
<td>- Minutes in OR, number of images, scheduled minutes, etc. (currently have 20+)</td>
</tr>
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</table>

And so, our methodology with our CORUS cost accounting system is to start with the patient. The first step that we do is we assign true costs to each patient based on their actual utilization. We try to do that with drugs, supplies and labor costs. So there are plenty of areas where we know exactly what drug, what supply, what person, and for how long was in the room with someone and we know the cost for that activity. We assign those patients directly and then we remove all true patient costs from the general ledger. And what we are left with, we allocate through many expenses using activity-based costing. And we use the best available driver. And in many cases, that might be RVUs or charges but we hope too, depending on the quality of the data and the availability of data, to use actual utilization in the OR in terms of number of minutes, number of images, or time on an imaging machine, scheduled minutes, et cetera. And we have a library of dozens of these activities that we use but the system is extremely flexible to use what is pragmatic and best available.
Poll Question

What costing methodology does your organization use? (Check all that apply) [20:48]

- Ratio of Cost-to-Charges (RCC)
- Relative Value Units (RVU)
- Activity Based Costing (ABC)
- Other
- I don’t know

So now that we have done a little level setting on the different costing methodologies, we will open up for this next poll question.

[Tyler Morgan]
Alright. What costing methodology does your organization use? Please check all that applies. The Ratio of Cost-to-Charges or RCC, Relative Value Units (RVU), Activity-Based Costing (ABC), other, unsure or not applicable.

And again, we will leave this open for a few moments to allow everyone a chance to respond. While responding, we would like to remind everyone that you can type in questions and comments into the questions pane of the control panel. We will respond to those during our questions and answers time today.

Okay. Let us go ahead and close this poll and share out our results.
Thirty eight percent responded with a Ratio of Cost-to-Charges or RCC, 35 percent RVU, 24 percent Activity-Based Costing, 12 percent other, 26 percent unsure or not applicable.

[Dan Unger]
That is interesting to see. Activity-Based Costing, a quarter people using it. They are at least partially, which is great. The insure or not applicable, I would be interested to see if it is because there is no transparency into the costing. And so, they do not know, or if it is they are in a different organization, but it is good to see that Activity-Based Costing number higher than I think we would have seen in the past.

[Tyler Morgan]
Yes. It looks like we are having quite freeze after this. So Dan, if you will just stop sharing it and then start sharing again, that should clear that issue.

[Dan Unger]
Alright.
[Tyler Morgan]
We apologize. Alright. Thank you.

[Dan Unger]
Alright. Sounds good. Alright.

Agenda Topic – How CORUS works [22:28]

Now, we will move on to the meat of this and why we are here to talk about the product suite and we will do a quick demo and explanation before handing it off to Bobbi.
So, the CORUS Suite starts with the Health Catalyst data operating system in our data warehouse at the foundation. This is critical for bringing in all of the data necessary for this type of costing in healthcare. So, EMR or multiple EMRs, patient accounting systems, general ledger, HR payroll, supply chain, pharmacy, any affiliate data, real time location services, departmental sources, this is why we felt we were able to enter in the space, is because we have this as a foundation and that is one of the hardest things to do.

Then the Activity-Based Costing module for actual transactional system consists of two pieces. We have a web application where you can do system setup and administration. You build and assign cost models, interactively-based costing allocations, as well as monitor data quality and ongoing maintenance within the web application.

The second part of that is the cost engine. So this is where we leverage the analytics platform to build out these patient level driver queries and link those back to the patient activities based on the configuration and the web application.

Then we have a third piece, which is using this data for something actionable. This suit includes cost insights, which is an analytic application focused on exposing clinical and financial measures together and allowing you to drill down to the activity level to understand the resource utilization variants. You know, is it someone spending more time in the OR or the cost per OR and a certain cost center is higher due to overstaffing or it being underutilized. The other critical piece is that this data is now an actual source mart within the analytics platform. So it can be leveraged for a variety of reasons, put into advanced clinical applications into additional financial reporting and contract modelling, ad hoc analysis in Excel or via SQL and
that is one of the things I am most excited about, is that I hope this is a critical piece to almost every decision and every piece of analytics that our client base uses.

Activity-Based Costing: Dashboard [24:54]

Now, we will go into a quick demo of the web application. So this is the cost accounting web interface. On the homepage, over here on the left, we have notifications for when the cost engine was run. We have additional notifications for potential errors. So, configuration errors where you have a new cost center that popped up and has not been assigned on model to use for costing, data quality issues which we will dive into a little deeper, days to close, et cetera. And then we just have some high level visualizations for contribution margin, data quality issues over time and usage of the applications. We will go through some of the key features. For time, we have got a lot in here but I will just talk through some of the high level ones.
In the admin area, this is where you actually build and configure your cost models. And so, we have got pre-built content from our relationship with University of Pittsburgh Medical Center and a couple of our other client partners and we have these cost models pre-built. They can be configured based on the client's available data but we have content out of the gate. And this is where down below you can see the patient activities that are used to assign cost in this area and if you get new data sources or you have time to go re-visit a cost model, the driver can be added and it can be easily configured and added to a cost model using the screen. So if you wanted to add radiology duration to your clinic cost model because you have x-rays or other things within the clinic, that can be done easily.
Then we have our allocation screen. So again, our methodology is to attach the true patient cost wherever we can where we cannot use Activity-Based Costing. And so in here we have the cost models on the left and then you can actually allocate two, each of the processes or activities, based on the models we just saw on the prior page and adjust the allocations accordingly. So you may want to set up your account groupings in a way that allows you to more accurately tie cost to each of the processes and this is where we handle that. This also allows consistency in your allocation methodology across the health system. We have made it so that you can build a specific model for clinic and allocation methodology that can be applied to all of those departments. If needed, you can move away from the standard and assign at a more granular level within specific cost centers but the goal was consistency. So when you are reporting, you are comparing apples to apples.
Another area that we are really excited about and using our dummy data in the demo environment, it does not show as well as I would like but the goal is to expose overhead validation and give transparency into where dollars are going and where there might be issues. So over here on the left we have the different steps. Starting with step 1, it is assigning those administrative cost centers that are overhead. Step 2 would be depending on how your allocation methodology goes within your system would be assigning it down to a business unit. Step 3, the patient supporting cost centers, like radiology administration or nursing administration. And then step 4, allocating those dollars back down to the patient-facing cost centers.
And within each of these, you can drill into the step and identify the cost source. So which types of cost centers is this coming from, which cost models were they using, which specific cost centers, and then you can even go a layer deeper into the account types. So it was salaries and benefits from this specific cost center that started my overhead process. And then you can see where those dollars move throughout the chain.
Another key area is in data quality. As I talked about, this is one of the biggest gripes that we heard, is that it is hard to understand why something did not work. So over on the left here we have built-in configuration quality checks. So if a new cost center pops up and is not configured, we will tell you. Right now, there are 211.
You click on this, it takes you to those cost centers that need to have a cost model assigned, so you can easily work that and get things going.

We also have data quality issues which we have some pre-built ones but these are configurable based on the client. And so, one of the key things is calling out, you know, where driver volumes went off.

Whether it is something that someone entered the number wrong or, in this example, someone left an MRI machine, we can set parameters to report out when something like this happens. So in this case, we had three specific cases, where an exam in radiology took almost 3,000 minutes. So you can select these three and actually send an email to the cost center manager, whoever might be, to look into it and understand why it was.
Additionally, we wanted to build in a way to say, hey, I do not want poor data quality for a couple of small data elements messing up my costing and stopping the process. So we built in data quality checks, where you can actually build parameters. So for radiology duration, you can set a default and you can actually do it at the imaging-type level if you want to, and in the lower and upper limit. So if an MRI ever goes over 500 minutes, please just insert 45 minutes. Keep the system running but still alert me, so that if there is a process issue, we can fix it. And this was just something that we thought of as critical when we worked with our partners at UPMC or been working with this day and day out and that was when we made a feature that is at the forefront.

So that is the web application. And if anyone wants to look into it deeper, that is something that we can definitely do a separate time. We will leave our contact information for you after the presentation.
We also have cost insights. And for the purpose of saving time, so that I get to let the wonderful Bobbi speak, I will just show a quick screenshot of our cost insights application. Up at the top, you can see we start with service line level and summary, trending, these tabs up here, where you can drill into a specific clinical area, DRG, procedure, diagnosis, and then come with a provider’s tab and understand the cost per case for each of these providers. And so, in this bar chart, we have dollars on the left, provider on the bottom, and then the cost groupings, which are really just the department types rolled up into actionable areas. So, surgical services, nursing, intervention and diagnostic, et cetera.

Down below you can select providers that are high volume, high cost, and look at their length of stay, severity of illness, and other quality measures can be brought in as needed and compare that physician's cost. Then you can go down to a deeper level and look at the actual activities that are driving that cost to get into actionable insights. And so, it is something we are excited about and we think it will be really useful for taking cost data to the next level.
So in summary, costing the Health Catalyst way, we are new to cost accounting but we are not new to healthcare analytics and software development. We think that we are set up for success in this space. Hopefully we continue to work with our partners and build great products in this area. But we think because of our ability to integrate EMR, financial, other clinical and operational data at the patient level, that we can truly deliver the cost to patient care at a grain that is useful for everybody and actionable. We have built in manufacturing style activity-based costing processes, leveraging client partners, leveraging people from outside of the healthcare industry. And so, we did so in a way so it is scalable and maintainable, which I think has been one of the short falls in the past is many of the competitors actually say they do Activity-Based Costing which is true technically, but it has been really hard to start up and maintain for many clients. And so, a lot of them shy away from it, at least in broad scale. We have also developed the embedded costing knowledge that we have learned from University of Pittsburgh Medical Center and our partnership with them, as well as working with other client institutions and the fact that we have been developing and deploying advanced clinical applications, operational applications, and financial applications for years. So we have really deep knowledge that now costing content technologies go along with it.

Given our analytics platform, we can deliver more timely an actionable cost data. So, as opposed to delivering it quarterly or every six months, this is something that we can actually do on a daily basis, if needed. Not that it is useful or that healthcare is there yet, but it is something that we can automate with our ability to bring in over 160 source systems. It is kind of our bread and butter. And so, we think the ability to deliver this detailed actionable data timely will be critical.
And so, with that, we will go to our final poll question before I hand it off to the wonderful Bobbi Brown.

Poll question
How ready is your organization to implement more accurate costing methodologies? [34:39]

[Tyler Morgan]
Alright. How ready is your organization to implement more accurate costing methodologies? Is your organization very ready, moderately, somewhat, not at all, or it is not applicable – our costing is good enough. And we have got this poll question up. This would lead into what Bobbi is going to be talking about.

[Dan Unger]
It is funny because I am already looking and there is zero percent that our costing is good enough and we did a similar – oh there it goes. We got a couple.

[Tyler Morgan]
Okay. Let us go ahead and close that poll now and share the results.
Alright. So 31 percent very ready, 15 percent moderately ready, 38 percent somewhat ready, 12 percent not at all and then 4 percent our costing is good enough. Yes, I think we pitched this when it was just a concept two years and I would say that I heard our costing as good enough 75 percent of the time two years ago. This might be a unique crowd that actually cares about cost accounting and why they are here today. So might be selective but it is really interesting to see that number so low.

Alright. So I am going to now hand it off to Bobbi. And just so you all know, Bobbi is exceptional in this area. She has worked on both the product side selling and implementing cost accounting systems and on the provider side, being a CFO working and developing costing content and evangelizing the health systems. And so, I do not think there is anyone better, maybe in the world, than Bobbi to talk about how important the people process data governance is to making something like this happen because I can deploy software all day but it does not matter if the right pillars are not in place. So, there you go, Bobbi.
Okay. Thanks, Dan. That was a very nice introduction. I hope I can live up to it. I am fortunate enough that I was lucky to be on both the vendor side and the provider side, and when I was on the provider side at hospital, we got into RVUs and we had a lot of management engineers helping us maintain the savvy RVUs, we were able to get some supply cost directly, but it just was not where it really needed to be. So I am just fortunate enough that I work with Dan and Dan is over our product development and develops all of our financial products and he and his team have just done a great job on the design of this, and I like it because you can build. You do not have to start out with everything at a total activity level. You do not have to do tons of times studies. You can build, you can start with what you have. We will talk a couple ways where you can start. So I think it has been great and really good design and I hope you saw a little bit of that in the demo but we would be happy to show you even more.

One other thing today is summer solstice, the story of summer and it means it’s for longest day in the year. And do you know what else that means to everybody in the room? There are people here with me, by the way.

I know. I am nervous though.

Yes. It means you do not do any cost accounting today. It was non-cost accounting today. So we are not going to do any cost accounting. We are just going to tell jokes all day. So, I do want to talk about traits of accountants. I think obviously we are organized, we love detail, a
lot of professional expertise and a lot of creativity. I do not know if you remember that when you used to do this, Myers-Briggs Grids, and you came up with something. Well, 42 percent of these are ESTJ. That is the extrovert. I am definitely not the extrovert. I would fall into the ISTJ category. So I do not know how they did that study but this was a study. And then we are also very much into sensing over intuition, thinking over feeling, and judging over perceiving. And I am sure all of you that have sat in front of the CFO know what judging over perceiving means. So anyway. But one other thing we do not have a study on is do we like puzzles. I think we like puzzles. I think doing this whole cost accounting, to get all of these pieces, putting them back together, coming up with a result that then you can continue to build on, I think it is like a big puzzle and we are going to go through some of the pieces. And just I hope that you all feel that your accountants have these traits and that, like I said, we are going to put this together.

One other thing on Amazon, I was going to tell lots of jokes today, but I did not buy the book. There was a book of accounting jokes on Amazon and it was $295.

[Dan Unger]
Must be really good.

[Bobbi Brown]
It was really good. Those accounting jokes are really good.

So Many Processes, Products to Cost....

Okay. I wanted to take a couple minutes right now and just close your eyes or look around the room and see what all the things are that we could do costing on. If you ever go to any
conferences that are outside of your industry, you would think, oh my heavens. This guy is costing pens and this guy is costing this and this person is doing that. It is kind of a fun thing to think about because we can get some ideas. We are in a very complicated industry with many many pieces. The top one on the left, there is someone that is working in my company right now and he used to work with Flying J and he had to figure out the cost of the sandwich. So he was asking me the cost and you may think that is nothing but a Flying J, that is not their main business. So yeah, they knew the cost of gas but they did not know the cost of the sandwich because there was a lot of spoilage and what its salami really cost. And so, I just see all these different things we have to cost.

If you are looking around the room, I am looking at computer screens, I am looking at chairs, I am looking at shoes, I am looking at shoes. So all those things we have to cost. Dynamite, yes, you may think that is a weird one but yes, I hired someone who was a cost accounting in that industry. My favourite to cost would be fashion, you know, does this go out of style, how long do I keep it, and I do not know another new thing that was in the paper today. There is a Kendall now. There are 15 types of Kendall. So, I was thinking immediately my mind went to a how many, what does it cost to make the Kendall with a puffy hair, what does it cost to make the Kendall with the special outfit. So that is where it might meant. So just think of all the products around you and then think about us. We are both a service. We have products that we use and re-use and we have complication, we have consignment. There is not anything I think that we do not have in our industry. And when you go to cost, you are going to figure all of these out and have to come up with an answer.
Start With the End in Mind

One thing I always like to do is how do I get, where am I going. So let us start with the end in mind. This is – I do not want to underestimate this. This is a big project – where are we trying to go, what are we trying to get. We need a lot of executive buy-in on this. And I would really urge you to take the time to do a stakeholder analysis as you are going to start this project because you will have a lot of people who can hinder us. I cannot tell you my experience of having physicians going into the president of the company, the COO, my boss that was a CFO at the time and saying, you know, this lady costed the screw, the screw cannot cost this much, that she does not know what she is doing, none of her numbers tie, why are you charging this much for an EKG, I know it does not cost you that much. So all of this kind of questions, who are those people going to be, who are the key players that are going to use your system, who do you need to keep informed, who do you think that you need to monitor and get to and work with because working with the physicians will pay off immensely, who do you need to keep satisfied. So, really going down through and figuring out who do I get involved early in this project, who can I get involved more with looking at the output, and really spending the time to do a total project, what data am I going to need. And then there is risk planning, what do I do if I cannot all of the data. And again, the way that this product was designed is you can go back and do ratio cost to charges for a while until you can get the source data that you need for that.

So, some pre-work, starting to look at the data at the EMR. We are going to look at some of the things there and determine your own starting point. Do you want to start small, do you want to start with a complicated area, do you want to start with a simple area like the clinic or more complicated like the OR, are you trying to get looking at your bundles, what was the cost of your bundle, are you doing just replacing your existing system and then you are going to grow. So that is also a very good place to start.
Dan, do you have any other?

[Dan Unger]
I was just going to say it has been really interesting. A lot of our talks, the biggest proponents have been physicians. Now that a lot of the onus, whether right or wrong, has been put on them to reduce costs, when they had handed cost data and they say, how did you get this or what is it, and they do not buy it, it has been pushed up the chain and people are starting to listen. So that has been interesting to me.

[Bobbi Brown]
Yes, it is. It is fun to really work with lots of different people.

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Data Governance

What existing structures exist in your organization?
- CFO group
- Service line leaders
- Specific working group

Triple Aim of Data Governance *
- Ensure data quality
- Build data literacy
- Maximize data exploitation

* Dale Sanders, Executive VP, Product Development, Health Catalyst

Data Governance [44:25]

And again, I had said that executive buy-in is critical to this. Are you reporting to CFOs, do the CFO can help you, is there a group of CFOs in your organization that you need to present to, are there service line leaders that are going to be critical to using the data, so you want to do a lot of education with them, do I need a specific workgroup, do I need to have a group that meets every week, every other week, to make sure that we are on track and know what is going on. And then you can use these same organization structures to communicate your results and to continue to get the buy-in. One thing that is really important in this effort is the whole idea of data governance. So, you need to talk with your CFO, what is your philosophy going to be in your organization, are you really going to be an open transparent organization that has to do with security. Obviously, there are some things that are not open and we are going to be
digging in. If we are trying to really get cost, we may be digging in to salaries at the employee level. Is that something that your organization is comfortable allowing to go in a cost accounting system or are we going to have to go out it another way? Same with physician data, that data often can be stored in an Excel file somewhere and that is another thing I am an expert, at Excel files, and Dan does a great job of saying no, we want to make this as hands off as possible. We want to get the system to do the work for you, so you are not manually intervening on anything and getting the best data quality that we can get out of it. So you are going to be looking at quality, you are going to be looking at literacy, you are going to be looking at education, what fields do I want to expose to whom. And Usage, you want to maximize data exploitation. You want this data used in your organization to drive change. So, again, like I said, a lot of it is going to depend on the philosophy in your organization.

All of the Data in the EMR, Departmental and Financial Sources

What you can do ahead of time, we do have a library of drivers, of cost models that we can share with you. And then you can start looking in your EMR and deciding, is this data in the EMR, is it right in the EMR, what field is it in, do I need to go to departmental sources. It just so happened that we used a different system for the CAF Lab. We use a different system for the OR. So, that data does not come across. So I need that departmental systems. And you need to get to know the clinical stewards that are over that data and really make sure that there is someone in your organization that knows all this stuff. You just have to find that person, take them to lunch.
I am going to show you two files that as you are doing this data searching and you go into different EMRs and their clinical events, there are tables, there is view, there are all these different places where you can go get data. And again, the more help you can get from the clinical data steward on this will help you immensely. And just at the top, we are trying to look at time and time stamps and we can see this is a cut-down version of all the different time stamps. You can see patient arrived, patient arrived in department. Well, we have got data in both of them, which is the one that I want to use for this. Well, the patient arrived, it is only there 1.5 percent of the time. Then we have different patient in the room, patient out of the room. We are up to 98 percent on the patient coming in in the room. Patient go in and out of the room, not quite as high. I still wonder where this other 2 percent of the people are. But just to let you know that you have got to dig into this data, find out what you have, what looks good to you, and what you feel you can use then as a basis for your costing.

The little chart on the right, again, looking at the percent of time that length of stay was calculated, there is one blank on there, which is not surprising. There was actually a little more garbage but when I cut the file down, I just cut it too much. But you can see that the kind of cases, for five cases, there was a blank person in the room. We have the circulator. We have a vendor representative in there one percent of the time, also kind of interesting. So, again, studying this data, you may find out this is not the file I want to use. I want another. There is another file out there that has even different information. I am going to go to that file and finding out where the right data is in your system, can take a little bit of time and a little bit of searching and again, that speck to that puzzle thing.
So, the data linking, what we have to link together. Okay, we have to be able to go from the general ledger to the EMR. The cost center is the same. Did somebody change the cost center numbers, did you add cost center numbers, everytime you dig into this data, you find a surprise. I always think, oh no, that data is perfect. And then I get in there and it is not.

So, the same on the supply chain. Do I have my expense code in there, can I link it back to the EMR. Generally, we have been charging with this data. So there are generally links in there. You just have to test them. What happens when new things get at it when new supplies get at it. What happens – is there item master code, are the codes consistent and standardized across your whole organization or is it the same supply item in their five different ways. So, lots of work that you have to do and lots of digging that you have to do.

The same on the payroll, can I go back from the payroll to the EMR, is everybody in there. We have one case where everybody is in there as ED physicians. So I know that is not right. So it is just something that has to be fixed in the source systems and we are going to go ahead and we are going to be working on this but we are also at the same time going back to the people who really are working on the source data and fixing that source data.

How do I work on contract employees, where do they show up. Again, physicians – how am I tracking my physicians. And even the patients. Do I have a master patient index – because at some point, you are going to want to do not just the hospital but the physician component to this and maybe you have a sniff and maybe you are trying to get the total continuum. So in order to do that, do I have a master patient index, do I have a way that I can link all this data together, so I can use it.
People Linking [50:59]

The people, then you also need to be thinking about the people, the clinicians, how are they going to use this data, can I use someone as a sounding board as I am going throughout this process or this journey that we are doing. Do I have domain specific experts in my EMR, do I know who in supply chain knows the information and can give me the right answer. What I often find out is somebody gives you an answer, you go into the files that is not the answer and you go back to that again. It is the circular and this constant, trying to refine and trying to get the data so that you can use it for costing. And we have seen it, it does happen, but sometimes it takes a little longer than we think.
Two Final Important Pieces

**Communication**
- Go back to stakeholder analysis
- Advertise your product

**Education**
- Get reports needed by clinical experts
- Constantly champion your product

Okay. Final two important pieces at the end here. Communication – it will be very important that you go back to your stakeholder analysis that you did and really educate people and show people your product, advertise your product. You should be happy because you have done a really good thing by getting this cost at this level of detail. And knowing that you can get reports to clinicians, finally it is not just – you know, you can get them the cost of a case in the OR yesterday and I know, Dan, you had that happen at one of our facilities and it went well, right?

**[Dan Unger]**
Yes. Yes. They really buy in when you show did you see this patient for 82 minutes and show them a cost per minute and they do not push back as much.

**[Bobbi Brown]**
Yes. And like I said, constantly champion your product and really really build yourself and your team up.
So, my journey of costing has been very interesting. I taught with the EMRs that every answer would be there. Every answer is not there but there sure is a lot of information that we can use to improve what we have had before. What just has Dan said, the average is in the RVUs.

The revenue curve is being defined for us. It is being reshaped for us. I do not think we are going to have that much choice on the revenue curve. But on the cost curve, there are many areas that we need to improve on and to give data to clinical people in better ways where they can actually take actions on it. There is a book that I saw, I just read it last week. And if you Google it, there is a little PDF out there on it. So it will give you some highlights too. So, I will just get this off here plugged, but really focusing on investment. We are making an investment in cost accounting, so that we will be able to really focus on what differentiates us, we will be able to align our cost structure. We want to—you know, it is fit for growth. It is a reorganization. There are going to be some areas that are going to grow on the inpatient side, some areas are going to grow greater on the outpatient side, what are those, how do we know what their margins are and how do we know where to invest, where you know where to invest by combining the revenue assumptions that you are going to make with your cost data. And so, all of this is going to cost, I think, a great amount of change in our industry but it is change for the good and it will really help us long term.

So, anything else you want to add, Dan?

[Dan Unger]

No, that was spot on.
“The only way to be successful in this new world is to understand costs and manage them — if you can't manage your costs you won't survive.”

Robert A. DeMichiei, EVP and CFO, UPMC

"The only way to be successful..." [54:14]

The only thing I like is just this strong quote, another one from Rob DeMichiei. The only way to be successful in this new world is to understand your cost to manage that. If you cannot manage your costs, you will not survive. It is a little dooms day-dish but I think it is true for many organizations. And so, hopefully it is something that people start caring about more and hopefully we can help promote that in healthcare.
And then thank you for coming and listening to us talk about our product. We are really excited about in mentoring the space and being able to help our clients more. If you want to chat about it or just costing in general, please reach out to Bobbi or I directly. You will get access to these slides and have our email address. So, please do.
Tyler Morgan

We would also like to – we do have our summit giveaway to go through. Before we go into that, we would like to note some of these quotes came from Rob DeMichiei and you will notice on here that he actually will be presenting, he is a keynote presenter at our Healthcare Analytics Summit here this September 12th through the 14th at Grand America Hotel in Salt Lake City. Having an executive vice president and CFO, having gone through all these pain points, this is going to be very very insightful. So we are very excited that he is participating to us.
What do you think?
Feedback / Questions [55:35]

We do have some questions coming in. We have got some time to get to those.
Are you interested in attending the Healthcare Analytics Summit in Salt Lake City? (single registration) [55:38]

Before we get to those, we do need to ask, are you interested in attending the Healthcare Analytics Summit in Salt Lake City? This is our single registration giveaway. So if you like to be entered into that drawing, please select yes.

And while they are responding to this, we have a quick question here. What does LOS stand for?

[Dan Unger]
Length of Stay.

[Tyler Morgan]

[Dan Unger]
Yes.

[Bobbi Brown]
Yes, it is how long somebody is in the hospital. Usually it is an inpatient term but I have not seen it used. You can use it back for hours on the outpatient side and observation.

Are you interested in attending the Healthcare Analytics Summit in Salt Lake City as a team? (team of three registration) [56:15]

[Tyler Morgan]
Okay. And with that, we will open up for the drawing for the team of three registration, give everyone a chance to be able to respond to that as well. And while they are responding, we have got another question. It asks, is CORUS a Health Catalyst created product or has it been licensed with UPMC or any other sort of arrangement? Are you open for other collaborations with integration partners?

[Dan Unger]
So on the first part, it is interesting. We actually had started development on our own with one of our internal partners who had reviewed the market and felt like they did not see a product out there that met their needs for the future challenges. And so, we had begun developing the software and UPMC had, at the same time, started looking to commercialize their home-grown system. And so, when we met, it did not make sense to just commercialize UPMC specific
product. We had already gone down the path. And so, it is an interesting arrangement where we acquired the intellectual property from UPMC, as well as their cost accounting team. So, they are actually Health Catalyst-employees delivering cost management services to UPMC and we have embedded their knowledge, know-how, and some of their pieces from their old costing system into our software. And in terms of integration partners, that is something we could take offline and reach out to me directly for.

Would you like someone from our sales organization to contact you for a follow-up on CORUS? [57:37]

[Tyler Morgan]
Okay. Thank you. And we do have one last poll question. If you are interested in having someone from Health Catalyst reach out to you to follow up on CORUS, please answer this poll question.

So we will leave this up here for everyone to respond if they want me to follow up.
Our next question is, does the system allow for capturing cost across an integrated network, such as from acute to post-acute care?

[Dan Unger]
Yes, great question. It does. We have not done it in any of our client sites. They have not had the data or the access to the data that we needed to. But again, given our ability to take in new data sources, it is another data source and another cost model to us. So it is something that we plan on doing at UPMC that is on the roadmap. Once things settle down, they are going to start working in that area. So, definitely the capability is there.

[Tyler Morgan]
Okay. It looks like we are right out of time. We have got time for just one more question, if we can handle. Do you do physician and hospital costing?

[Dan Unger]
Yes. So similar to that last question, yes, we can cost across the care continuum post acute physician, inpatient, and we have done physician multiple times. That is all the size that we have worked with so far.

[Tyler Morgan]
Alright.

[Dan Unger]
Those are easy ones.

[Tyler Morgan]
Well we would like to thank everybody for joining us today. Thank you, Bobbi. Thank you, Dan. And we would like to remind everyone, shortly after this webinar, you will receive an email with links to the recording of the webinar, the presentation slides, and the poll question summary results, as well as the summit giveaway winners. Also, please look forward to the transcript notification we will send you once it is ready.

On behalf of Dan Unger and Bobbi Brown, as well as the rest of us here at Health Catalyst, thank you for joining us today. This webinar is now concluded.
Appendix

Why Costing Matters: OR Use Case
Why Costing Matters: OR Use Case (cont'd)

[END OF TRANSCRIPT]