Conflict of Interest Statement
Authors have nothing to disclose with regard to commercial support.

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Key Words: value-driven outcomes, CABG, value, cost effectiveness

Discussion

Moderator: David T. Cooke

Moderator: Murray G. Kwon

Moderator. This is Dr Jason Glotzbach with ''The new paradigm of value-driven care in cardiothoracic surgery: defining and achieving ''perfect care'' for patients after coronary artery bypass surgery to promote cost-effectiveness.''

Dr Jason P. Glotzbach *(Salt Lake City, Utah)*. Thank you. Good morning. And thank you to the Association for allowing us to present our data here today. We have nothing to disclose. First, I will provide a little background for this study. I think most of us have heard that CMS has announced they are going to start bundling reimbursement for CABG care in the United States. This represents a deliberate move away from the fee for service model that we've all been traditionally operating under for decades, the first phase is rolling out July 1, so this is coming and we all have to learn how to deal with it. Basically the concept is an episode-based or episode payment model, looking at the entire episode of care for a given patient with a given disease. For coronary disease, this includes primary care physicians, cardiologists, interventional cardiologists, cardiac surgeons, all sharing the care of a certain patient in an episode model. The key with this is that it's all one big pool of payment, of bundled reimbursement for this one disease in one

patient, and so we have to work within this to provide a procedure for these patients, or we're taking care of these patients, we need to work within this larger framework, and then… sorry if this doesn't project well… but down on the bottom, they mention that value-based decisions are going to be key for this effort so this brings up the concept of value. Value as we're talking about it in this setting has a very specific definition. This is not just a kind of fluffy term.

Michael Porter, who is a Harvard Business School economist, is one of the thought leaders in this area. In the *New England Journal* of 2010, he defines value as neither an abstract ideal nor a code word for cost reduction, so this is a very specifically defined term in this setting. At the University of Utah we've done a lot of work on this. This is a paper published from our institution last year in *JAMA*, looking at value and describing our value-driven outcomes program which we've been developing has an institution-specific proprietary system to try to effect value, defined by this equation. On the top is quality, which is what we would traditionally think of as outcomes and service, divided by cost. Defined in this very specific way, we sought to design a study to look at modifiable clinical metrics in CABG patients at our institution that could be modified to improve value in the postoperative period. This is an observational study. We used our value-driven outcome tool, which I'll be talking more about as we go along, which allowed us to collect data prospectively and retrospectively throughout this study. We looked at just isolated CABG patients, all comers over the period, at our institution, Our goal was to define metrics that might affect value or cost. We started with the 7 process measures that we're all very familiar with in the STS database, and we defined successful achievement of these 7 metrics as achieving perfect care. Perfect care is a term we're using very specifically in this context to mean achieving these arbitrary metrics that we've designated, so this is not meant to be a global term. To improve compliance with the metrics we chose, we implemented clinical protocols in our practice in the ICU and the wards, and then we looked at prospectively collected data linking cost to clinical outcomes using our VDO tool. Here are the metrics, these are all familiar to us, antibiotics given, antiplatelet, antilipid, β-blocker at discharge, use of a mammary, and avoiding reintubation. So, using these 7 metrics we started looking at our compliance and we saw that we actually were doing pretty well, and I think that most programs in the modern era are something like this where we're basically hitting all of these milestones most of the time.

You can see on the bar graph on the left, 90% of patients had 7 of 7 metrics, so 100% compliance, and then another 9% only missed 1, so 99% of patients were getting most of these accomplished and then if you look on the right side, you see over time our compliance rate, there's very minimal variability in cost, in this graph the cost is the red line and the blue line is the percentage of perfect care with these 7 metrics. So even with a little bit of variability in the rate of achieving perfect care, we're still not seeing that much variability in cost. Frankly, we were a little bit disappointed that applying these metrics didn't really do anything with cost in this patient population, so we thought, okay, we need to add something else. We need to find some more metrics, so going back to this, one signal we noticed here was in the reintubation rates, which is in the middle column there on the right. There is some variability there so we focused on mechanical ventilation and tried to drill down on that as a driver of costs. We added another metric to track discontinuation of mechanical ventilation within 24 hours. We also looked at length of stay in our ICU and saw that some patients were lingering on inotropes for 24-48 hours, which would keep them in the ICU and so another metric we added was to focus on discontinuing inotrope use within 24 hours. Finally, we noticed that we were using a lot of albumin for routine resuscitation, which is, of course, more expensive than crystalloid, so we added albumin usage as a third metric. So at that point, we added more protocols, focusing on these 3 additional metrics, trying to increase compliance. This probably doesn't project well, but this is just an example of one of our protocols and these are designed to empower the nurses, the respiratory therapists, the overnight house staff to function autonomously within these protocols to move care along for these patients, so trying to get people extubated and wean the inotropes and do that without having to run it all the way up the chain to the attending physician. When we looked at these metrics, the dashed line represents the implementation of these protocols. This is when we started focusing on these 3 additional metrics, and then we retrospectively collected data from the electronic medical record (EPIC), going back to the beginning of the study. Before we started really focusing on this, there was quite a lot of variability and then after we implemented the protocols, we tended to get a little bit better compliance with these 3 metrics, and you see some more variability on the left hand with the bar graphs that we actually have some room to improve compared with the STS metrics where we were doing very well. So, here's our results.

We looked at 400 patients total. There was no difference in age. There was an interesting, higher percentage of male patients in the group that did get perfect care. The rest of the demographic characteristics were not different. Ethnicity and insurance status were the same, notably. In terms of comorbidities or medical history, the group that ended up without perfect care had a higher incidence of heart failure, pulmonary hypertension, previous stroke, and COPD preoperatively. That was significant, in addition to a higher STS score as you would predict from all those comorbidities, and a lower percentage of patients with a normal EF. So, all those things were real differences between the 2