- I'm David Kandzari from the Piedmont Heart Institute in Atlanta, Georgia. I'm the chief of the Piedmont Heart Institute and the cardiovascular services line. I'm the director of interventional cardiology at Piedmont Heart Institute and also the chief scientific officer for Piedmont Healthcare. And this is a welcomed opportunity for me to share with you the results of the OPTIMUM trial, which is a study examining outcomes among patients with complex coronary artery disease who are deemed ineligible for surgical bypass.

Rationale of the Study

Patients with complex coronary artery disease, and specifically multi-vessel coronary disease and/or left main disease, and yet who are determined to be ineligible for coronary artery bypass surgery represent an increasing patient population. And the prevalence of which is estimated to include at least one in five individuals who are identified with left main and/or multi-vessel coronary artery disease. And nevertheless, the reasons for determination of surgical ineligibility are not routinely or systematically captured in surgical risk models. Moreover, societal guidelines, rarely if at all, address decision-making for revascularization when bypass surgery is not an option for such patients, and patients who are surgically turned down are systematically excluded from clinical trials. And there are no contemporary data with regard to the outcomes of these complex patients undergoing percutaneous revascularization, and there are no data whatsoever with regard to health status outcomes when PCI is selected. And finally, when PCI is selected for these very complex patients, there is no consensus regarding the goals for interventional revascularization. For example, the ambition to achieve completeness of revascularization versus more targeted or directed PCI. So with the recognition that, worldwide, these patients are becoming increasingly prevalent and increasingly commonplace in the cardiac catheterization labs and in the context of this momentum for more complex interventional procedures and expanding skillsets, we found a dire need to better examine the outcomes for these patients and inform clinical decision-making.

Study Design and Eligibility Criteria

The OPTIMUM study was an investigator initiated prospective multicenter study conducted at 22 centres in the United States, and it included up to 750 patients who were deemed by the site heart team, so the individual site principal investigators that constituted both an interventional cardiologist and a cardiothoracic surgeon, who after heart team reviewed, were determined to be surgically ineligible. The study initially intended to include a group of patients who had no revascularization options, namely patients treated with medical therapy alone, but given the increasing prevalence in the study of patients undergoing PCI, we later modified the protocol to include only those patients who underwent high-risk percutaneous revascularization. And we therefore presented recently at the TCT Scientific Sessions the outcomes of the 726 patients. The primary objective of the study was to compare the actual or observed rate of mortality with PCI for these patients at 30 days or in hospital to the surgical predicted risk models of the Society of Thoracic Surgery's STS risk score, and key secondary objectives were to compare the actual or observed mortality at 30 days with PCI to the EuroSCORE II model, as well as, interestingly, the site surgeon's predicted risk as well. We also examine patient reported health status outcomes at six months. We plan to also survey these at 12 months, and we'll be assessing survival through 12 months and then through five years in total in the study. The enrollment criteria for the study were intentionally broad to reflect real world clinical practice, namely patients with left main and/or multi-vessel coronary artery disease who were determined by the site heart team to be ineligible for bypass surgery. And similarly, exclusion criteria were also intentionally limited to only patients with acute or recent ST elevation myocardial infarction, patients with cardiogenic shock or hemodynamic instability, patients with ventricular arrhythmia or any patients who could not complete expected survival through one year of followup. Other than that, the patients were largely, as I shared, representative of real-world clinical practice of a survey of common patients encountered routinely in today's cath labs.

Key Results

So we have a number of principle results from the study to, for the first time in many years, characterise these patients in such a broad patient population. Specifically, expectedly, they're very high risk patients. The average age is 70 years. Roughly a third of the study population was female. Roughly half of the patients had experienced prior myocardial infarction. Diabetes mellitus was prevalent in 57% of the patients. Presentation with class three or four heart failure representing a quarter of the study population. More than a third of the patients also having chronic kidney disease, and roughly a third of the study population presenting with acute coronary syndromes. Similarly, what was also interesting are the reasons for surgical ineligibility. And notably, a third of the reasons that the site cardiothoracic surgeons declined at the opportunity for bypass surgery for these patients are, again, not captured in systematic risk models like STS or EuroSCORE. And these reasons included poor distal arterial targets for bypass, poor conduits for bypass surgery, frailty, advanced stage, severe left ventricular dysfunction, aortic calcification, prior stroke, among other high risk features. We observed in the study as a primary result though that through 30 days, the mortality rate for these patients undergoing PCI after determination of ineligibility for bypass surgery was 5.6%. And this fared very similar to the predicted risk models of both STS in EuroSCORE, but interestingly, it was 40% lower. The actual mortality rate was 40% lower than that predicted, at least with surgery, by the site surgeons. We also observed significant improvements in the reduction in the disease burden by the residual syntax score with PCI. These patients have very complex coronary disease. Nearly 40% of the procedures were unprotected left main disease, 20% of the procedures involved chronic total occlusion PCI. Hemodynamic support was utilised in 27% of all the cases as well. So very complex procedures, and yet we observed substantial reductions in the residual disease burden, and again, assessed by an independent core laboratory. But more importantly, we also observed significant improvements in patients' health status, self-reported health status. Specifically, we observed significant meaningful improvements in patient self-reported measures of the Seattle Angina Questionnaire quality of life, and angina frequency and heart failure through the Kansas City Cardiomyopathy Questionnaire as well. Moreover, we also observed that among the roughly 60% of patients, whom at the beginning of the study, presented with some degree of angina, either daily, weekly, or monthly, this was reduced to about 18% by six months, and more than 80% of the patients reported no angina symptoms through six month follow-up.

Take-Home Messages

So patients deemed ineligible for coronary artery bypass surgery represent a very complex patient population with very high disease burden whose reasons for surgical ineligibility are not routinely captured in standardised surgical risk models. That said, when undergoing complex PCI, the STS and the EuroSCORE risk models intended for surgical prediction actually predict fairly well the risks of mortality with high-risk PCI, but the actual mortality is 40% lower than that expected by or predicted by the surgeons at those participating sites. PCI is associated with very meaningful improvements in patient self-reported quality of life, physical function and angina burden, and it demonstrates the opportunity of PCI to improve patient's health status even when surgery is not an option. And finally, these decisions, these outcomes rather, inform decision-making for shared decision-making process with patients and their family with regard to high-risk PCI when surgery is not an option, with regard to procedural strategies, and the completeness of revascularization with complex PCI.

Next Steps

So the next steps are really to delve into this very extensive database to further identify which patients truly do benefit with regard to health status and clinical outcome, and in which patients have such disease complexity or a co-existing illnesses where revascularization may not provide such benefit. In addition to that, it further perhaps leads us to defining additional risk models where we can identify those patients who are turned down for surgery, but may be more appropriate, at least, in a predictive model for predicting the outcomes of mortality as well as improvements in health status. And finally, it perhaps may lead to potential discussions around the randomised trial, although how that randomised trial might be designed, whether it's high-risk PCI versus medical therapy alone, perhaps less likely, or if we could revisit with surgeons, perhaps thinking about surgery for these patients. I mean, those are exploratory discussions.