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DEPARTMENT OF INDUSTRIAL AND  
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According to the American Heart Association, heart disease affects more than 83.6 million Americans. Of those affected with heart disease, around 51.4 million patients undergo in-patient heart procedures each year in this country.

## **NSF funds research to improve health care delivery for heart surgery patients**

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UNIVERSITY PARK, Pa. – The National Science Foundation (NSF) has provided \$299,954 in funding to the research team led by Hui Yang for research focused on improving health care delivery to patients who have had cardiac surgery.

Yang, the Harold and Inge Marcus Career Associate Professor of Industrial Engineering, is one of three researchers on the collaborative two-year project titled, “Sensing, Modeling and Optimization of Postoperative Heart Health Management.”

According to American Heart Association, heart disease affects more than 83.6 million Americans – which is approximately 35.3 percent of the U.S. population – and costs the United States \$448.5 billion annually. Of those affected with heart disease, around 51.4 million patients undergo in-patient heart procedures each year in this country.

“Postoperative care is critical to the quality of life of these patients,” said Yang. “However, once they are discharged from the hospital, there are currently few sensing and decision-support systems that extend to their homes, workplaces and communities, which increases the chance of another cardiac event occurring,” said Yang.

The goal of this research is to develop a collaborative sensing, statistical modeling and decision-making strategy to optimize postoperative cardiac care to these patients.

The research will be collaboratively pursued by faculty and students at Penn State and Texas Tech University, as well as clinicians at the James A. Haley Veterans' Hospital. Dongping Du from Texas Tech received \$99,806 from NSF for her work on the project, while Fabio Leonelli from the James A. Haley Veterans' Hospital has received \$28,148 for his contributions.

As a result of work completed in 2014 by the researchers, they were able to make two concrete determinations. The first is that data after a patient's discharge are extremely limited so in order to improve postoperative care, cardiologists and nurses must have a detailed log of electrocardiograms, as well as variables such as weight, blood pressure, amount of physical activity, medicine usage and sleep activity.

The second finding is that the full potential of collaborative sensing depends to a great extent on the advancement of information processing methodologies. Clinicians and patients need effective decision-support systems to help estimate clinical status and provide optimal management policies.

This research will develop new information-processing methodologies to monitor heart conditions and optimize intervention decisions in order to optimize treatment and patient outcomes.

“Our research focuses on leveraging Health Internet of Things (IOT) and mobile computing technology to improve smart health and the well being of people who are discharged after having cardiac surgeries,” said Yang. “The success of this project will improve the health of our society and will also help create a smart postoperative system that will empower both clinicians and patients.”

Yao Bing, Chen Kan, Pei Shenli and Matenga Zvikomborero, all industrial engineering graduate students, are assisting on the research project.

Support for the initial research for this project was provided by the Entrepreneurship and Innovation Fund within the Harold and Inge Marcus Department of Industrial and Manufacturing Engineering.

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Hui Yang, Harold and Inge Marcus Career Associate Professor of Industrial Engineering

*"The success of this project will improve the health of our society and will also help create a smart postoperative system that will empower both clinicians and patients."*

## **FOR MORE INFORMATION:**

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