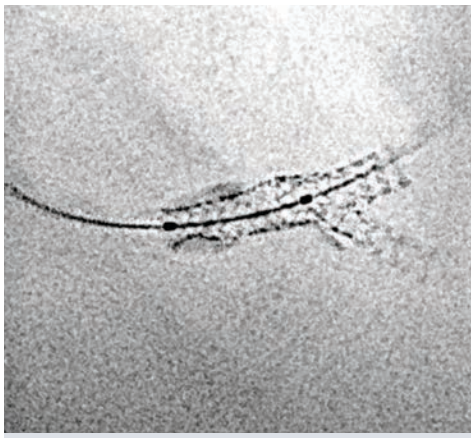
# Cath Lab Digest

A product, news & clinical update for the cardiac catheterization laboratory specialist

IMAGING CORNER

## Using Imaging to Improve Stent Visualization in Complex Bifurcation Disease

A 53-year-old male with chest pain and shortness of breath was diagnosed with complex bifurcation disease. Coronary angiography revealed a 99% bifurcation stenosis of the distal right coronary artery (RCA), with significant disease extending into the right posterior descending artery (RPDA) and right posterolateral artery (RPL) (Figure 1). Intravascular ultrasound (IVUS) revealed a 4.0 mm distal RCA and RPL, and a 3.0 mm proximal RPDA. Using the double kissing crush (DK crush) technique, .014-inch coronary wires were placed in both vessels. A 3.0 mm x 15 mm drug-eluting stent was placed in the RPDA, with 1-2 mm protrusion into the distal RCA.

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In This Issue

## Shared Decision-Making for the Cath Lab

*Morton J. Kern, MD, et al*

There are several definitions of shared decision-making (SDM), but as I understand it, SDM is an information exchange between the physician and the patient, usually with the family, discussing the underlying problem (eg, aortic stenosis), and current clinical status, followed by recommendations for treatment options (medicine, surgery, transcatheter aortic valve replacement [TAVR], etc.). In some cases, a heart team may be convened to get the best consensus for this patient. I asked my colleagues their thoughts on the SDM for our cardiology patients.

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JOURNAL OF Invasive Cardiology

## Selected Abstracts From *The Journal of Invasive Cardiology*

*April 2024 – June 2024*

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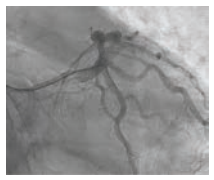
CASE REPORT

## Advanced Radial Access Techniques for Complex Coronary Interventions in Challenging Anatomies

*Ahmed Hassaan Qavi, MD; Prasanna M. Sengodan, MD*



The American College of Cardiology/American Heart Association guidelines recommend radial artery access as a Class I indication for most percutaneous coronary interventions (PCIs).[1] The Society for Cardiovascular Angiography and Interventions also endorses the radial approach as the standard of care for coronary angiography and intervention when feasible.[2] Radial access is critically important in PCI, as it significantly reduces bleeding complications and vascular site complications compared to femoral access.

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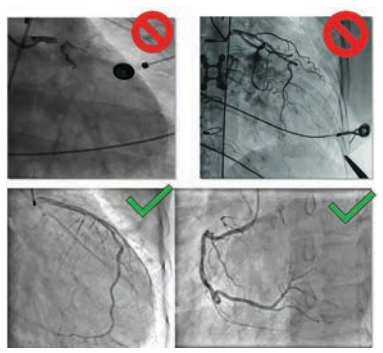
QUALITY IMPROVEMENT

## Improving Cardiac Imaging Quality at the Long Beach VA Cardiac Cath Lab: Results of a Nurse-Driven QI Project

*Autumn Baldwin, BSN, RN, RCIS; Miles Mesina, BSN, RN*



At the Long Beach VA Cardiac Catheterization Lab, we recently faced a critical challenge: our coronary angiography imaging quality was not meeting the high standards necessary for optimal patient care (and for useful images in the CathWorks FFRangio system). Through an extensive interdisciplinary discussion involving radiologic technologists, nurses, and other healthcare professionals, we identified that the primary issue affecting our imaging quality was the presence of artifacts producing suboptimal results. We know that high-quality images are crucial for making correct clinical decisions (Table). When these images are degraded or obscured by artifacts, they can be uninterpretable or confusing.

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# Improving Cardiac Imaging Quality at the Long Beach VA Cardiac Cath Lab: Results of a Nurse-Driven QI Project

*Autumn Baldwin, BSN, RN, RCIS; Miles Mesina, BSN, RN*

The clinician, by necessity, then must repeat part of the procedure, leading to additional radiographic contrast administration impacting renal function, as well as having increased radiation exposure to both the team and the patient.

## Identifying the Problem

Artifacts in radiographic medical imaging are any unwanted elements or conditions that obscure the clarity of the images. Foreign objects in the image field can compromise the quality of the cardiac structures and may overlap with coronary vessels, making for an inaccurate interpretation. In the cath lab, some of these artifacts include wires or patches from electrocardiogram (EKG) leads, metal objects from gowns, underwear or jewelry (or metal prostheses), oxygen tubing, $CO_2$ cables, and defibrillator pads (Figures 1-4). Some imaging artifacts were out of our control; that is, they were due to problems related to the operator's technique of coronary arteriography and the activities performed by the physician operators. Proper angiographic techniques are designed to reduce or eliminate artifacts due to contrast streaming, vessel or branch overlap, image foreshortening, poor contrast injection, or any x-ray function (eg, underexposure or overexposure), any or all of which can reduces adequate image opacification. There are patient-related artifacts from implanted devices, like pacemakers, loop recorders, implantable cardioverter defibrillators (ICDs), coronary artery bypass graft (CABG) sternal wires, or orthopedic metal joints that may obscure or degrade image quality. Again, any physician-directed or patient-related artifacts, such as positioning, angiographic setup, and contrast injections were not part of this quality improvement project.

## Action Plan for Improvement

To address the issue, we conducted a thorough review of our past cases and found that an overwhelming number (92%) of our cardiac structural images contained some form of artifact. This alarming statistic prompted our immediate action. We developed a comprehensive educational initiative aimed at all staff members involved in cardiac imaging.

## Components of the Educational Initiative

We proposed a 3-step approach.

**Step 1: Creating Educational Materials.** We developed a series of visual aids and sample materials to clearly demonstrate the types of artifacts and their impact on imaging quality.

**Step 2: Implementing Staff Training.** Educational material, in the form of a PowerPoint presentation (example shown as part of Figure 5), was delivered to every staff member involved in the cath lab and imaging process. The training sessions emphasized the importance of removing potential artifacts before imaging and provided practical tips on how to do so effectively.

**Step 3. Validating Results With Annual Competency Retraining.** To ensure sustained improvement, we instituted an annual competency assessment. This involved tracking the frequency of necessary adjustments or retakes due to artifacts, and provided a metric for continuous improvement.

**TABLE. The Importance of Producing High-Quality Cardiac Imagery**

| |
|---|
| **1. Accurate Diagnosis**<br>Clear images enable clinicians to make precise diagnoses and devise effective treatment plans for our veterans. |
| **2. Minimizing Contrast Use**<br>Repeating imaging studies increases the use of contrast agents, which are nephrotoxic and can harm the kidneys. Reducing the need for additional images helps protect our patients' renal function. |
| **3. Reducing Radiation Exposure**<br>Minimizing repeated imaging studies also lowers patients' exposure to x-ray radiation, which carries its own health risks. |

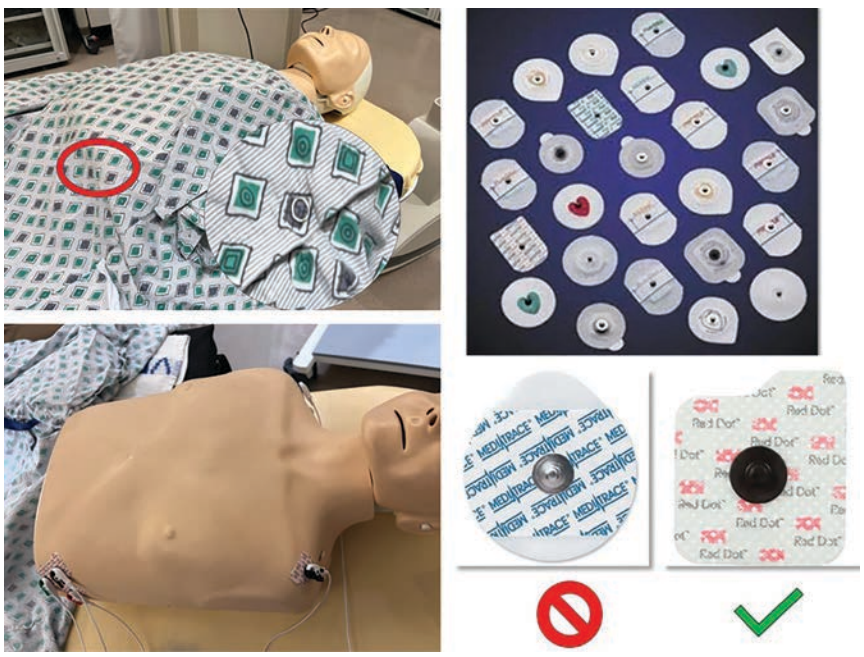

**Figure 1. Metal snaps on gown show in images.** Pull gown down to waistline. Gowns without snaps – OK. **ECG electrode pads and lead wire placement.** Use 3M Red Dot only. Remove all other ECG pads.

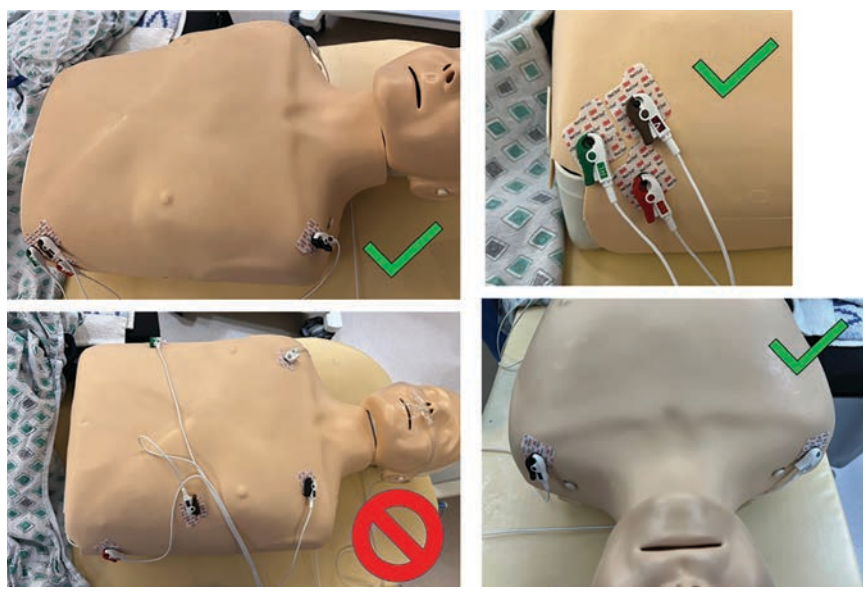

**Figure 2. ECG electrode pads and lead wire placement.** No wires across torso. Green (right leg) pad placed as shown. Black (left arm) and white (right arm) pads placed on superior aspect of shoulders. White ECG wire runs behind patient's neck

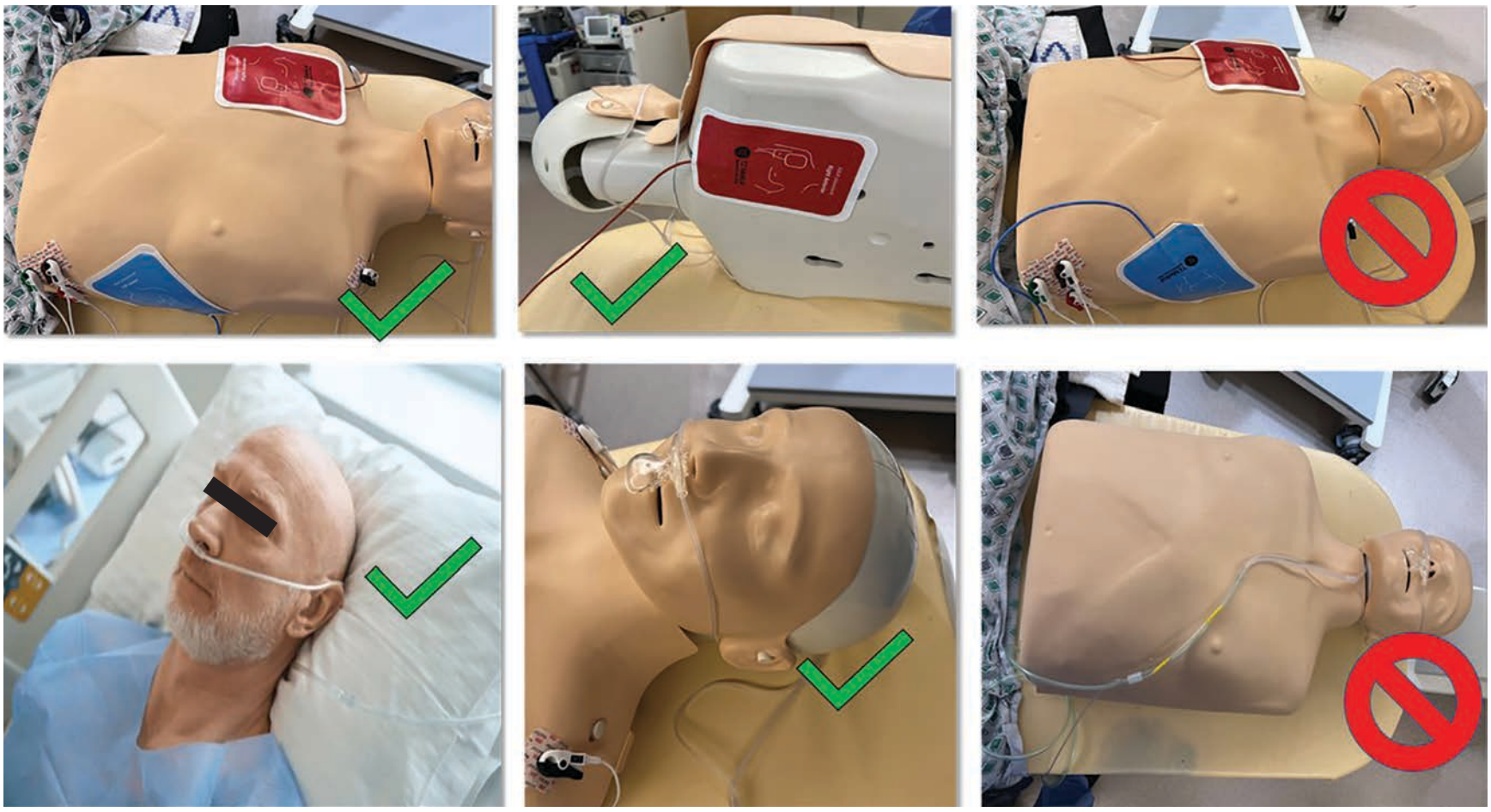

**Figure 3. Defibrillator pads and wire placement.** No wires across torso. Alternative placement for red (right anterior pad) is right posterior. Must use radiolucent defibrillator pads. **Nasal cannula and ET $CO_2$ tubing placement.** No tubes across torso.

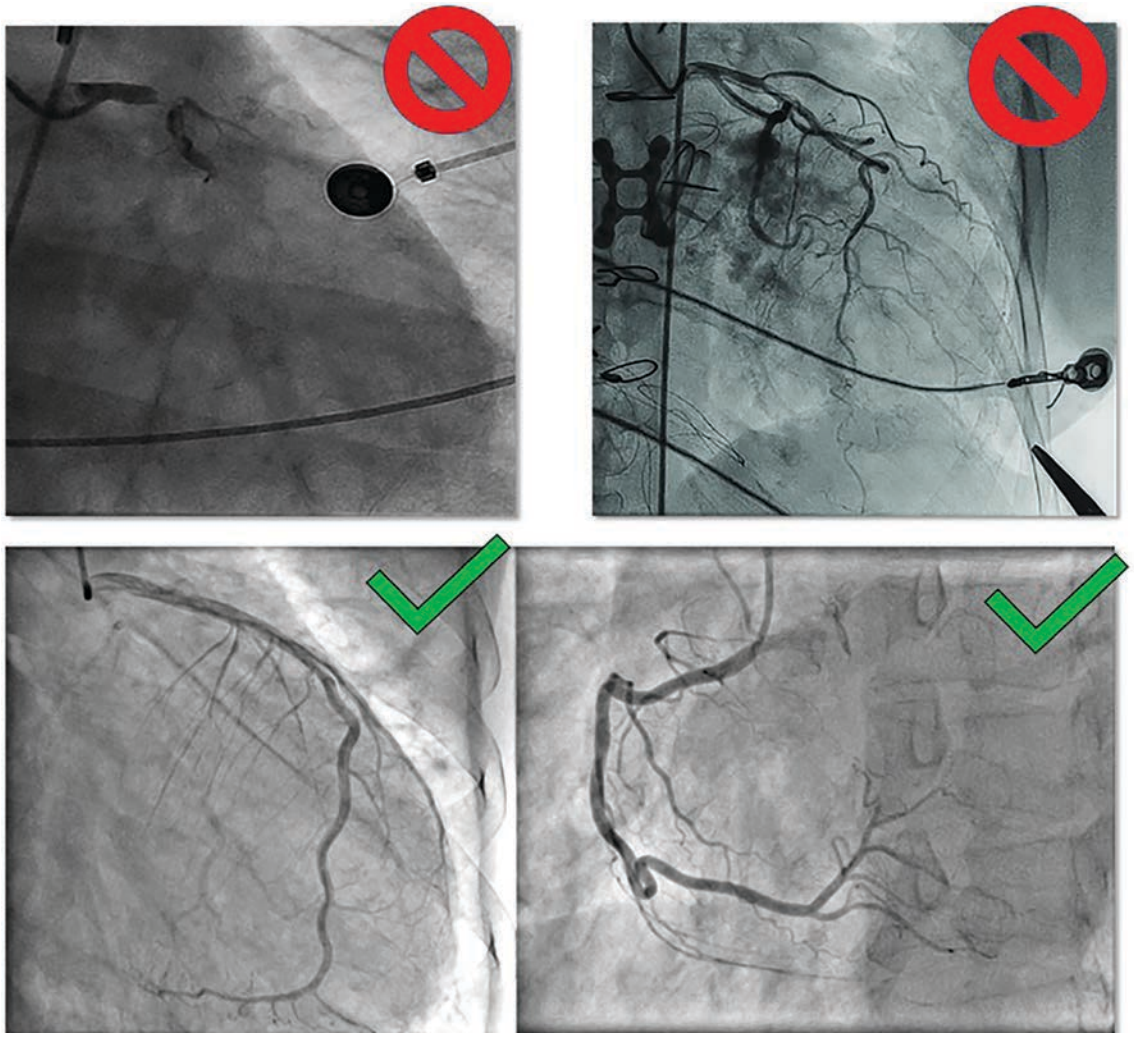

**Figure 4. Angiographic images. Cardiac silhouette with (top) and without (bottom) artifacts.**

## Monitoring and Results

We closely monitored the impact of our educational initiative over the following months. The results were remarkable. In the first month after implementing the new protocols, our success rate for artifact-free images improved dramatically, to 95-97%. By the third month, we achieved a 100% success rate, with all cardiac structural images free of artifacts and no need for retakes.

## Limitations to Our Initiative

Although we achieved a high success rate with significantly improved imagery on the first attempt, we were unable to precisely calculate the exact dose of radiation and contrast reduction that would have been associated with fewer retakes, because each patient required specific views and operator-selected additional imaging with a highly variable contrast dose to visualize the vessels. In addition, some patients went on to have a percutaneous coronary intervention or additional studies. Lastly, we could not control for patient-related devices, which may have required additional images to visualize the coronary arteries without being obscured by device/vessel overlap.

## Conclusion

The success of our initiative at the Long Beach VA Cardiac Cath Lab underscores the importance of continuous education and process improvement in healthcare settings. By addressing the root cause analysis of

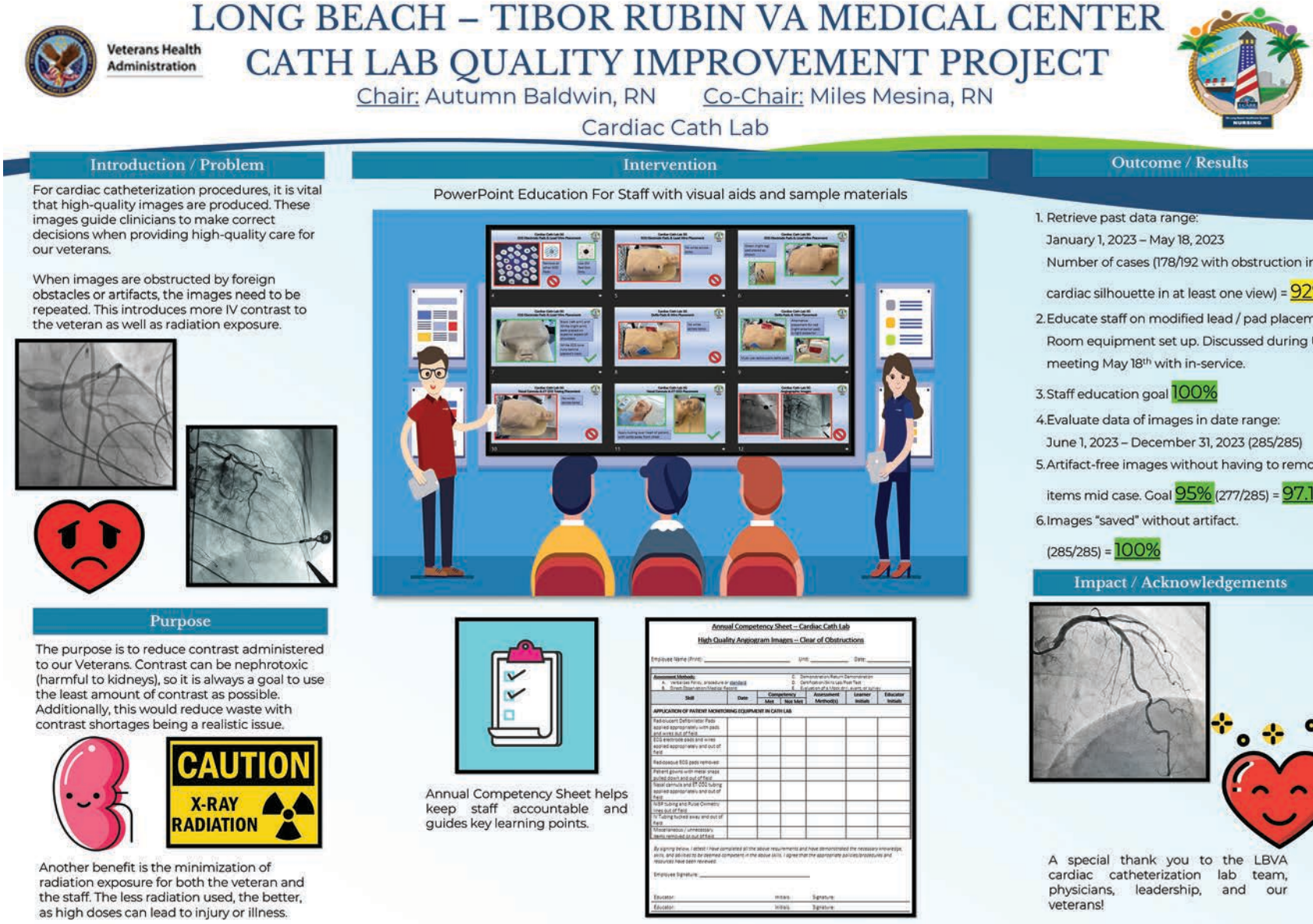


**Figure 5.** **An abstract poster created for the QI project.**

imaging artifacts and implementing targeted training, we were able to significantly enhance the quality of our cardiac imaging. This, in turn, has allowed our clinicians to make more accurate diagnoses and provide better care for our veterans, while also reducing the risk of nephrotoxicity and radiation exposure.

Our experience also highlights a crucial lesson for healthcare facilities everywhere, namely, investing in staff education and increasing attention to details that can lead to substantial improvements in patient care outcomes. The Long Beach VA Cardiac Cath Lab is now better equipped to provide the highest quality cardiac imagery, ensuring that our veterans receive the best possible care. ■

## Sources and Recommended Reading

Rigatelli G, Gianese F, Zuin M. Modern atlas of invasive coronary angiography views: a practical approach for fellows and young interventionalists. *Int J Cardiovasc Imaging*. 2022 May; 38(5): 919-926. doi:10.1007/s10554-021-02489-5

Sorajja PS, Lim MJ, Kern MJ. (Ed.) Chapter 3. Coronary Angiography. In: *Kern's Cardiac Catheterization Handbook, 7th Ed*. Elsevier; 2020.

## COMMENTARY

### A Nurse Quality Improvement (QI) Project to Improve Angiographic Imaging

*Morton J. Kern, MD*

I am proud of our cath lab nurses' QI project, headed by Autumn Baldwin, RN, RCIS, in identifying the issues that degrade angiographic images and potentially impair the accurate diagnosis of coronary artery disease. This was a nurse-driven initiative after we started using the angiographic fractional flow reserve (FFR) system by CathWorks. We found that the routine technique was not sufficient to get great angiography when we overlooked the artifacts described by Ms. Baldwin and her team. I am impressed that the nurses took on this project to improve angiography in the lab as a personal matter, owning the problem and addressing the issues to make substantial improvements. I hope others will take note of this QI project, and review their practices to get the best angiograms and hence, the most accurate diagnoses for our patients.

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