

## Unique Method of Teaching Root Cause Analysis Using a Simulated Case Scenario

E Sinz, M.D.

R Kratz, M.D.

Penn State Milton S. Hershey Medical Center

### Introduction

Two areas of the ACGME competencies requiring creative teaching strategies are systems-based practice and practice-based learning and improvement. We used a human patient simulator to demonstrate a sentinel event followed by a simulated root cause analysis. The learning objective was synthesis of root cause analysis, human factors in design, and systems improvement. Our case is described to clarify the format; however other cases could be substituted. The session began with a short presentation on root cause analysis by the quality and risk management nurses at our hospital. This allowed the residents to meet these individuals.

### Methods

*Human patient simulation format:* Two volunteer trainees play the roles of resident and attending anesthesiologist in the unknown simulated case, putting them in the same position as the original patient-care team. Other trainees observe the scenario via video link. The case is a healthy patient undergoing nasal surgery who develops hypertension and tachycardia after injection of local anesthesia by the surgeon. The simulated patient develops ECG changes consistent with ischemia. The trainees initially try to control the BP/HR; when unsuccessful they stop the procedure. The trainees determine that the patient has inadvertently received an excessive dose of epinephrine. (If the residents do not complete these tasks, the "surgeon" does so.) The residents are told that the patient continued to have ECG changes consistent with ischemia in the PACU. Emergency cardiac catheterization finds no significant coronary disease. There are no permanent injuries to the patient.

*Root Cause Analysis Simulation format:* The residents reconvene for discussion. They are asked if they would report this case and how. Upon interviewing the involved parties, they find that this surgeon uses a unique mixture of local anesthetic and epinephrine that is not available as a premixed solution from the factory. The circulating nurse is to use a recipe to mix the drugs while setting up equipment for the case. The recipe card specifies appropriate volumes of epinephrine and lidocaine. The hospital has 3 different concentrations of epinephrine. Although the appropriate concentration is written on the card, in this case the nurse used a higher concentration when unable to locate the correct vial. This nurse has not circulated for this surgeon previously. Once these facts are exposed, the residents are asked to define the root cause of the mishap and develop a plan to prevent this or similar occurrences in the future.

### Results and Discussion

Our residents initially blamed the nurse. Proposals included replacing the nurse, improved training, clarifying instructions, etc. Next they blamed the surgeon for not double-checking what the nurse did, not personally mixing the medications, and not using the same local mixture as other otolaryngologists. Upon further discussion, they recognized that well-trained, well-intentioned individuals can and do make mistakes. By the end of the discussion, the group considered recommendations such as use of a premixed local anesthetic mixture from the factory, or having one person always mix the solution in a controlled environment. Finally the recommendations and actions from the actual root cause analysis for this case were presented to the group for comparison with their own recommendations.

Follow-up survey of the residents revealed 75% had not heard of root cause analysis prior to this exercise, while 50% had not heard of systems improvement. After the exercise, all of the residents agreed with the statement, "Good people can make mistakes," and most agreed that, "Systems can be structured to enhance performance/reduce human error." This suggests the residents gained an understanding of how to improve health care using a systems approach.