



QUICK SCANS

MEDICAL MYSTERY

What made the night-shift nurses sick?

By Mark E. Bruley
FOR THE INQUIRER

Editor's note: The scientists, engineers, and clinicians at nonprofit ECRI Institute in Plymouth Meeting study medical devices, drugs, procedures and processes to determine which are best. Mark E. Bruley, a biomedical engineer and vice president for accident and forensic investigation at ECRI, shares one of his most memorable Medical Mysteries here; look for more in the weeks to come.

The urgent phone call from a hospital administrator came into ECRI Institute's accident investigation hotline late one Friday morning. We were asked to find out, as soon as possible, why intensive-care unit night shift nurses had become ill on the previous three evenings. After discussing the issues enough to get a general understanding of the situation, I immediately gathered some test equipment and was at the hospital about an hour later, accompanied by one of my chemist colleagues.

The ICU patients did not suffer the symptoms the nurses were complaining of, which included severe headache, lethargy, nausea, sore throat, and burning eyes. But tensions among the nursing staff and administration were running high, and the quality of nursing care was potentially being affected. The problem needed to be identified and fixed quickly.

The call brought to mind other instances of acute illness among hospital staff that I had investigated over the years. There were many possibilities to consider: environmental contaminants, food poisoning, housekeeping chemical spills, air conditioning problems. In this case, there had been occasional strong odors in the ICU in the evening, but no source had been identified. Throughout the three evenings, the mostly young, vibrant, otherwise healthy nurses experienced severe symptoms, and several had to leave

work sick. Nursing staff on the day shift had not been affected.

When we got to the hospital, just after lunchtime, we toured the ICU, the adjacent areas on that floor, and the floors above and below. Construction was underway on a new section of the hospital and we toured that area, too, looking for any potential chemicals, vapors, or aerosols that may have gotten into the ICU, and how they got there.

With hospital facility and medical staff in tow, we walked past the lunch room and I was asked whether I had eaten. I admitted that I was hungry and accepted a fresh bag of microwave popcorn to eat during the remainder of the tour.

The tour revealed nothing remarkable other than that some remodeling was taking place in the radiology department immediately below the ICU. Detailed examination of all cabinets, nightstands, rooms, and closets in the ICU offered no clues.

At 3 p.m., the evening shift ICU nurses arrived, and we interviewed them one by one. Some had become ill during previous shifts. The nurses said those who had the worst symptoms had been sitting at the nurses' station for extended periods while charting medical records. My investigation of the cabinetry there revealed sliding panels that concealed where electrical power and signal cabling came up from the floor below through open holes in the concrete.

As I slid one panel open, I smelled what seemed to be the culprit, and went alone to radiology downstairs to verify my suspicions.

I rushed back up to the ICU, ready to explain my findings. But before I could say anything, the hospital CEO took me aside and confided his own theory: that the nurses may have been sick from eating drug-laced popcorn.

I paused and gently suggested that we go meet privately.

Solution on G7.

SOLUTION TO THE MEDICAL MYSTERY ON G2

Here is what made the night-shift nurses ill

Before going downstairs to radiology, I placed my unfinished bag of popcorn on the nurse's station, right where I found the sliding panels. The administrator, who came to the ICU to check on the progress of our investigation, was surprised to see the bag of popcorn on a desk where there should be no food. He then found, to his surprise, a popcorn maker in the ICU nurses' lounge.

That led him to speculate that the popcorn was the culprit and perhaps even that these free-spirited nurses (as he viewed them) had put some kind of drug in there, and that that had made them sick. I proceeded to provide a more evidence-based explanation from what I found in radiology.

The renovation work in radiology that week had dislodged a dedicated exhaust duct from the X-ray film processors. The ductwork, in the dead space between the drop ceiling and the floor

above, was designed to continuously vent the noxious chemical fumes from the processors to the outside. During the day, radiology was very active and kept its access doors open. In the evening, the department was mostly inactive with its main doors shut.

The dislodged vent caused film processor chemical fumes to vent into and accumulate in the ceiling space during the day. At night, with the doors closed, the air conditioning pressure in radiology was higher than during the day. This caused the accumulated fumes to vent during the evening through the utility openings in the floor of the ICU, wafting up to the desk where the nurses sat.

A bit of duct tape to reconnect the ductwork and a recommendation to immediately seal the holes in the cement floor under the nurse's station cabinetry solved the problem.

— *Mark E. Bruley*