Simulated troubleshooting session for medical physics resident rotations

The CAMPEP program has regulated the rotations for medical physics education. This program is well designed, and the graduated residents have long proved to be qualified medical physicists. To further improve the program, we suggest adding a simulated troubleshooting session to each of the rotation. One thing is hard to teach is to expect the unexpected, especially in the stressful clinical situations. It is unlikely that a resident can have opportunity to experience many real clinical troubleshooting events in one rotation. To help them better handle the real clinical situations after graduation, we have simulated many clinical scenarios for the residents to troubleshoot.

We have noticed that one of our three month brachytherapy rotations, there was only one very minor real clinical troubleshooting event: the treatment was started with the afterloader index ring unlocked. The treatment console displayed an error message during the dummy seed run. The mentor physicist read the error message and went into the brachy suit to lock the ring. After closing the door, the mentor physicist resumed the treatment, and the treatment was successfully executed afterwards. The resident was next to the mentor physicist watching the whole time. Several days later, the resident was asked how to troubleshoot if the treatment console displayed an error message preventing the treatment from proceeding. The resident was not aware that the error message included an error code and suggestions for troubleshooting. Under the real clinical situation, the mentor physicist had no time to teach resident the step-by-step procedure for troubleshooting, and the in-experienced resident also did not know what kind of details he needed to pay more attention to. The lesson we learned here is: it is important to add a simulated troubleshooting session into resident rotations, so that the residents can have opportunities to practice troubleshooting as well! This will be so much more practical and thorough than teaching troubleshooting skills during the real clinical scenarios.

In order to generate as many high quality troubleshooting scenarios as possible, the mentor physicist had to talk to other medical physicists and physicians to collect possible clinical events. Most troubleshooting scenarios can be simulated in the clinic using a dummy patient, and these scenarios will provide residents hands on experiences. For the events that cannot be simulated, we make sure the mentor will orally describe the details and step-by-step troubleshooting procedure to the residents.

Let's still use the brachytherapy rotation as an example. Common troubleshooting events in our center were presented to the residents first. Some events are: 1) transfer tube was curved too heavily that the system would complain; 2) transfer tube was loose. The resident would be asked to troubleshoot the problem in a given time frame. The mentor would watch the resident troubleshoot and give him feedback afterwards. After some practice on the common troubleshooting events, some rare problems were also simulated, such as: 1) wrong transfer tube length was entered into the planning station; 2) transfer tubes were plugged in a wrong order; 3) wrong prescription points were used in the planning; 4) wrong date was entered to calculate the current source activity; 5) wrong patient name appeared in the planning station. These clinical problems are rare. However, they can cause crucial mistakes. We should not wait
till these events happen before teaching our residents. These events can be simulated and presented to the resident for the troubleshooting purpose (also in a given time frame). Residents were also suggested to search the literature for the past related medical events that happened in other centers. After the mentor presented all his designed simulations, the resident was asked to think if there might be other possible troubleshooting events that were not covered in the simulation. If yes, the resident was encouraged to simulate the corresponding events by himself.

In order to have a comparison, we let one resident go through a 3 month rotation with the simulated troubleshooting session, and one without (he was given the troubleshooting session afterwards). By the end of the rotation, an oral exam was given to both residents, evaluating how well they understood the brachytherapy clinical practice. Both residents performed well in the exam. However, the one with troubleshooting experience demonstrated a deeper understanding of the “behind the scenes” reasoning for certain clinical procedures. Naturally, the one who had practiced troubleshooting skill demonstrated superior troubleshooting capability for clinical settings.

We plan to implement the simulated troubleshooting session to all of our physics resident rotations. Residents will be divided into two groups: one group will be presented with the simulation session during the rotation, and the second group will have the simulation session following the completion of the rotation. A mock ABR oral exam and written exam will be administered following the rotation completion, prior to the second resident group receives the simulated troubleshooting session. We will compare the quantitative and qualitative results of these exams for the two resident groups. Resident feedback will be collected through a written survey as well. We expect that the troubleshooting simulations will result in the residents performing better on their end of rotation competency exams. We also believe the feedback from the residents during this study will result in further improvement of future troubleshooting simulations.

We conclude that medical physics residents can benefit tremendously from the simulated troubleshooting session. The simulation can not only improve residents’ troubleshooting skills, but also help them to better appreciate certain clinical procedures. It can better prepare the residents to fit in the real clinical world after they graduate.