Imaging pediatric patients can present challenges to both the technologists acquiring the exams and the radiologists interpreting them. Radiologic exams can be a stressful experience for many children who may feel anxious, nervous, or even frightened. This may translate into a suboptimal exam, ranging from a mildly limited exam due to patient motion to early termination of an exam, thus reducing image quality and diagnostic confidence. For this reason, many pediatric patients are sedated when undergoing exams such as MRI. Sedation comes with its own risks and expenses.1,2 Furthermore, our medical center serves a large population of sickle cell patients, for whom sedation poses the additional burden of blood transfusion, as sedation can trigger vaso-occlusive crises.3

The University of Maryland Medical Center’s goal was to improve the safety and comfort of pediatric imaging by enhancing the experience for children. Two pediatric radiologists and two child life specialists worked together to create a training program to help guide radiology technologists on how to approach and interact with children undergoing medical imaging.

The results of surveys administered to technologists and parents or caregivers helped refine the strategy for both creating training sessions for technologists and reading materials for children and their parents to optimally prepare for the procedures.

Training sessions included information on language choices, developmental considerations, comfort techniques, patient- and family-centered care practices, procedural support techniques, and coping styles.

Through the implementation of learning sessions and distraction resources for technologists, and the development of preparation books, the imaging experience for pediatric patients at UMMC has improved.

The University of Maryland Medical Center (UMMC) is a 750+ bed, urban hospital with a Level I trauma center. UMMC physicians are faculty members at the University of Maryland School of Medicine, the nation’s first public medical school. Founded in 1823, the medical center is one of the oldest academic medical centers in the United States and serves as a tertiary care facility for the state of Maryland and the surrounding region. The University of Maryland Children’s Hospital (UMCH) based within UMMC serves a broad range of primary and subspecialty care pediatric patients. The Department of Diagnostic Radiology and Nuclear Medicine at UMMC has state-of-the-art facilities to provide cutting edge imaging services to pediatric and adult patients. Over 27,000 imaging studies in pediatric patients were performed in 2014.

UMMC’s goal was to improve the safety and comfort of pediatric imaging by enhancing the experience for children. Using a grant from the AHRA & Toshiba Putting Patients First Program, two pediatric radiologists and two child life specialists worked together to create a training program to help guide radiology technologists on how to approach and interact with children undergoing medical imaging. In addition, they created exam preparation books for each modality to educate children and their caregivers in advance of their scheduled imaging. Child life specialists have expertise in child development, children’s normal responses to stressful healthcare
Box 1. Pre-training Survey for Technologists

In which area do you primarily work?
   a. X-Ray
   b. Fluoroscopy
   c. Ultrasound
   d. CT
   e. MRI

What is your level of comfort with imaging children?
   a. Very comfortable
   b. Comfortable
   c. Neither comfortable nor uncomfortable
   d. Uncomfortable
   e. Very uncomfortable

Do you have any prior training specific to imaging children?
   a. Yes
   b. No

Have you worked with children before in another setting? (i.e., another job)
   a. Yes
   b. No
   
   If yes, please explain.

Have you had any prior bad experiences with imaging children?
   a. Yes
   b. No
   
   If so, please describe incident.

What is the most single challenging aspect you find when imaging children?

In your opinion, what do children have the most difficulty with during the exam?

Please rank in order from #1 to #5 (from easiest to most challenging) the age group with which you find most challenging to work.
   a. Newborns / Infants 0-1yr
   b. Toddlers 2-4yr
   c. Children 5-12yr
   d. Teenagers 13-18yr

   Please explain your #5 choice (most challenging to work with).

Do you feel that you are able to communicate with children effectively?
   a. Yes
   b. No
   
   If no, please explain your answer choice.
events, and best practices for minimizing stress and maximizing coping in children and families. By training technologists in developmentally appropriate and psychosocially supportive practices, we sought to improve the child’s experience with imaging by increasing readiness and reducing anxiety. The expectation was that this would ultimately result in better image quality and increase radiologists’ diagnostic confidence.

Over the course of a few months, several separate training sessions were conducted for fluoroscopy, ultrasound, CT, and MRI, since training for these imaging modalities consists of differing approaches given the unique aspects of each exam. Training included information on language choices, developmental considerations, comfort techniques, patient- and family- centered care practices, procedural support techniques, and coping styles. Examples of challenging cases were solicited prior to training for incorporation into training scenarios. These issues were identified by a survey administered to technologists prior to training.

Surveys of Technologists and Parents
The survey included questions about technologists’ experience and level of comfort imaging children. It included whether they had any prior training and asked them to discuss any prior bad experiences. Recipients were also asked to describe what they thought children have the most difficulty with during the exam and to rank various age groups in order from easiest to most challenging. Technologists were asked if they felt they were able to communicate effectively with children and if the children and parents are optimally prepared for exams and, if not, what could be done to improve readiness. They were also asked if they had worked with child life specialists before and, if so, what the experience was like. Lastly, they were asked what they would like to gain from the training. See Box 1.

Seventy-six technologists from five modalities (x-ray, fluoroscopy, ultrasound, CT, and MRI) completed the survey. The results showed that although 86% of technologists described themselves as either “very comfortable” or “comfortable” imaging children, 39% reported a prior bad experience. These experiences included difficulty controlling motion and dealing with fearful, crying children and anxious parents. When asked to rank age groups with which to work (newborns, toddlers, children, teenagers, parents) in order from easiest to most challenging, not surprisingly technologists ranked toddlers the most difficult (46%). However, the second most challenging group identified was parents (19%), which illuminated the need to prepare not only children but also their parents for the exams. See Figure 1.

In addition to administering surveys to technologists, a survey was also developed for parents or caregivers to complete prior to their child’s exam. Nearly 100 individuals completed the survey. When asked if they felt they were prepared for their child’s exam, 87% responded that they were. However, only 60% of parents felt their children...
were prepared for the exam. When asked if parents or caregivers read any materials beforehand explaining the exams their children were having, 42% responded that they had. When asked if they would read an online resource tool explaining the exams, 82% replied that they would.

The results of the surveys administered to technologists and parents or caregivers helped refine the strategy for both creating training sessions for technologists and reading materials for children and their parents to optimally prepare for the procedures.

Training Sessions

Training sessions specific to each modality were conducted over the course of several months by a certified child life specialist. To optimize attendance, training sessions were conducted during the time usually allotted for technologists’ team meetings. These were the goals of each training session:

- Increase knowledge about the common stressors and fears related to pediatric patients and best practices for supporting the pediatric population during imaging.
- Increase knowledge of coping styles and techniques for supporting a child’s preferred coping style.
- Learn strategies for using preparation resources to improve patient and family compliance and imaging success.

Among the items discussed were: different ways to calm children, methods of distraction, techniques to improve communication with children and parents (including the use of age-appropriate language), positioning and supportive techniques, how to best approach each age group based on their developmental level, and how to handle challenging parent situations. Technologists had ample time to ask questions during the training sessions. Post-training support was provided by the child life specialist during high volume scheduled pediatric imaging timeframes. The child life specialist was available to observe, support, and model training techniques with technologists for real-time feedback.

Distraction Tool Kits and Preparation Books

Two deliverables directly funded by the grant were distraction tool kits and preparation books. The distraction tool kits were created by the child life specialists in conjunction with the pediatric radiologists and were provided to every imaging modality at both inpatient and outpatient facilities. Bins were labeled with contents and suggestions for use appropriate for each age group. The tool kits contained items such as pacifiers, board books, spinning light wands, pinwheels, look and find books, and View-Masters® along with suggestions of non-tangible distraction methods such as singing to infants and using guided imagery with teenagers.

To address the need identified on the technologists’ and parents’ surveys to better prepare children and caregivers prior to their exams, preparation books were developed for each imaging modality (Figure 2). Using child-friendly language, the preparation books

Figure 1 - Results of pre-training survey question: Please rank in order from #1 to #5 (from easiest to most challenging) the age group with which you find most challenging to work.
Welcome to the University of Maryland Medical Center!

Today you will be having a CT Scan. “CT” stands for Computed Tomography. A CT is a way to take pictures of the inside of your body.

Figure 2 - Sample Page from Preparation Book.
books describe each imaging modality accompanied by photographs of children going through each of the imaging exams from start to finish. These books are available online (http://umm.edu/programs/diagnosticrad/patients/pediatric-prep) and in the radiology waiting areas. During scheduling, patients are given information regarding accessing the book online.

**Post-Training Surveys**

A post-training survey was administered several months after initial training for feedback on the program. Sixty-four percent of respondents said the seminar increased their level of confidence in imaging children, with 81% reporting using child life techniques on subsequent imaging exams. The seminar increased the technologists’ ability to communicate more effectively with children (64%). The majority of technologists (75%) had used the distraction kit, and all of them found it useful. Respondents were asked what they found most helpful from the seminar—sample responses included: the role of child life in the hospital setting, specific techniques on how to work with children including using a soothing voice, the use of age-appropriate toys for distraction, and the importance of explaining the procedure to the child and parent. Specific suggestions were gathered with the intent to incorporate into future sessions.

**Conclusion**

Child life education brings value to pediatric imaging by optimizing comfort and increasing compliance. Through the implementation of learning sessions and distraction resources for technologists, and the development of preparation books, the imaging experience for pediatric patients at UMMC has improved. With a more patient-friendly imaging encounter, we foresee improved pediatric patient compliance, thus increasing image quality and diagnostic confidence.

**References**


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Questions

Instructions: Choose the answer that is most correct. Note: Per a recent ARRT policy change, the number of post-test questions has been reduced from 20 to 8.

1. Through the implementation of learning sessions and distraction resources for technologists, the imaging experience for pediatric patients at the University of Maryland Medical Center (UMMC) has:
   a. Not changed
   b. Improved
   c. Declined
   d. Improved at first, but then declined

2. UMMC’s goal was to:
   a. Improve the safety of pediatric imaging
   b. Improve the comfort of pediatric imaging
   c. Teach radiology technologists how to approach and interact with children undergoing imaging
   d. All of the above

3. Training sessions included information about:
   a. Spanish language usage
   b. Techniques for comforting anxious children
   c. Conflict resolution with co-workers
   d. Anesthetic sedation

4. Imaging pediatric patients can present challenges to:
   a. The technologists acquiring the exams
   b. The radiologists interpreting the exams
   c. Both a and b
   d. None of the above

5. Traditionally, many pediatric patients are sedated when undergoing exams such as MRI because:
   a. Technologists generally do not like to image children who are awake
   b. Radiologists prefer to read studies of children who are sedated or asleep
   c. It’s less costly to image children who are sedated
   d. Children may feel anxious during the exam and not be able to hold still long enough to obtain good quality images

6. Examples of challenging imaging cases were obtained prior to the training for radiology technologists by:
   a. A survey distributed to radiology technologists
   b. Information overheard in staff meetings
   c. Information provided by another hospital
   d. A survey distributed to pediatric radiologists

7. Child life specialists have expertise in:
   a. Child development.
   b. Children’s normal responses to stressful healthcare events
   c. Best practices for minimizing stress and maximizing coping in children and families
   d. All of the above

8. Item(s) developed by UMMCs child life specialists and pediatric radiologists to optimize the imaging experience for children is/are:
   a. Toys and games
   b. A brief video that demonstrates the ultrasound procedure
   c. Distraction tool kits and preparation books
   d. A puppet show

Continuing Education

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Carefully read the following multiple choice questions and take the post-test at AHRA’s Online Institute (www.ahraonline.org/onlineinstitute)