

# Use of Non-Pharmacological Strategies and Magnetic Resonance Imaging Preparation Programs to Improve Workflow, Increase Patient Safety and Satisfaction, and Decrease Cost in a Tertiary Pediatric Hospital

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## Background

The use of Magnetic Resonance Imaging (MRI) in children frequently involves the use of sedation due to the necessity of the child remaining completely still in a noisy, unfamiliar environment. The high clinical demand for sedated MRI examinations resulted in a 3 month backlog of patients waiting to undergo an outpatient sedated MRI at our regional, tertiary pediatric hospital.

To alleviate this problem for our patients, the **MR-I Am Ready!** program was created. This program is a non-pharmacological approach to reduce the need for sedation in children undergoing outpatient MRI examinations, thus decreasing the cost and wait time for the examination and simultaneously increasing patient safety and satisfaction.

Some of the risks associated with sedation and anesthesia include, but are not limited to, broken teeth, allergic reactions, pneumonia, phlebitis (inflammation and infection of the veins), nerve injury or paralysis, damage to or failure of the heart, liver, kidneys, and/or the brain, and death. Though in most cases these risks and hazards are rare, they can occur, making non-anesthesia the safest option for patients requiring an MRI.

## Initiative Description

Patients between the ages of 4-17 years old were asked to participate in the **MR-I Am Ready!** program to attempt to undergo an MRI awake before being sedated. The certified child life specialist (CCLS) prepared the patient for the upcoming MRI examination by using an age/developmentally appropriate approach, including a three-dimensional (3D) toy-like MRI scanner and recorded sounds of an MRI scanner.

Appropriate preparation allowed the patient to become familiar with and desensitized to the MRI equipment, as well as helped the patient choose positive coping skills to decrease motion artifact. Research has shown that, "preparation is a safe and effective method to reduce the need for sedation and general anesthesia in children undergoing a clinical MRI scan. It provides a positive medical experience for children, parents and staff, and results in cost savings for the hospital."<sup>1</sup>

Non-pharmacological strategies such as **play-based therapy, desensitization and cognitive behavioral therapy** were used to increase patient and family familiarity with the MRI machine and decrease overall patient anxiety. According to Carter, et al., "play-based therapy can involve offering children an explanation of their procedure in a play-based manner and can include the use of medical toys or practicing a procedure using real equipment." Desensitization is a "gradual exposure to a feared stimulus allowing the child to gradually adjust and develop coping strategies at a suitable pace." Lastly, cognitive behavioral therapy is a "psychological procedure that assists children in developing strategies to manage stressful situations."<sup>2</sup> These positive coping strategies included breathing techniques, audio distraction through the use of headphones to listen to music, and positive reinforcement from the MR technologist to yield a diagnostic examination with as little motion artifact as possible. After a practice session during which the child was taught these strategies, the child attempted the MRI examination without sedation. If successful, the child's originally scheduled sedation MRI appointment was then cancelled and that time slot was given to another patient who required sedation.

## Stakeholders

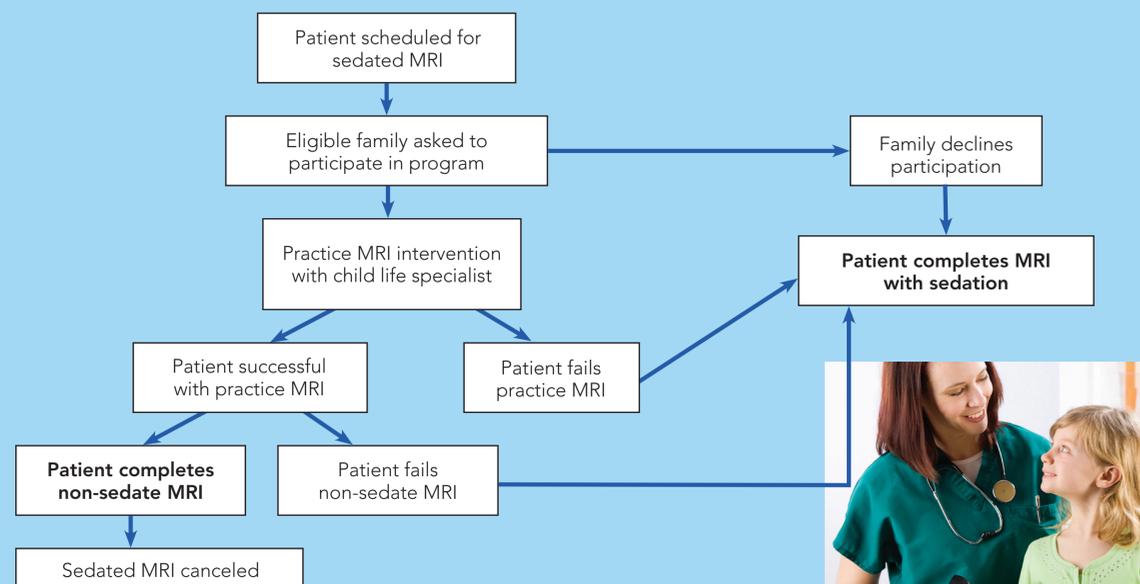
We considered input from multiple sources to be integral to our success. Using this multidisciplinary approach increased compliance and encouraged the different areas to promote the program to staff, caregivers, and patients.



## MR-I Am Ready! Flowchart Description

Patients who meet the specified criteria and are scheduled with anesthesia are called prior to their MRI appointment. Patients who do not have an anesthesia appointment are still asked to participate in the program either prior to or the day of the non-sedate MRI.

## MR-I Am Ready! Flowchart



## Results: January 2013-February 2014

The success rate of the program provides evidence that utilization of a play-based approach in conjunction with developmentally appropriate preparation can **decrease the need for and use of sedation**. 143 patients participated in the program from January 2013 - February 2014. 114 patients, or 79.7%, successfully completed the practice portion of the program. Of these 114 patients, 105 (92.1%) then went on to successfully complete their MRI examination without sedation. On average, the patients who successfully completed the practice program were able to obtain an MRI in 2.5 weeks, an average of 7.3 weeks sooner than their originally scheduled examination with sedation.

A total of 142 one-hour time slots were utilized to complete these examinations, which equates to 17.75 days of outpatient sedation

time. At the initiation of the program, the average wait time for an outpatient sedated MRI for patients 4-17 years old was 9.7 weeks. After 14 months (March 2014), this **wait time decreased** to approximately 5.1 weeks for the same age group.

This program also **decreased the overall cost** of the MRI examination. For example, in our population, a brain MRI with and without contrast was one of the most frequently ordered examinations, and costs on average \$1,599.00 less when performed without sedation. **Patient safety** was also increased as the risks of sedation were completely avoided. Random program participants were surveyed by mail after completion of their MRI. These surveys revealed a high level of **patient and family satisfaction** as demonstrated by statements provided by patients' caregivers citing decreased anxiety, wait time, and cost.



## Quotes from Caregivers

"We really were concerned about the use of sedation. Our child is young and has malignant hyperthermia and also several allergies. God answered our prayers and quieted our worries through Child Life."

"It was a great experience since I was so worried about my daughter having to get an MRI done. I hope the hospital always offers this option to save people a lot of time, money, and worry!"

"...turned a scary process into something manageable."

## Future of Initiative

- Use of MedVac Infant Immobilizer to allow infants 0-6 months old to complete brain MRIs and CTs without sedation
- Installation of CinemaVision Goggles and the Invivo Entertainment System to allow patients to watch movies during scans
- Increase the number of patients participating in the program and expand the program to include more patients 4-6 years of age and those with developmental delays, such as Autism Spectrum Disorder



## References:

- 1 de Amorim e Silva, C., Mackenzie, A., Hallowell, L., Stewart, S., & Ditchfield, M. (2006). Practice MRI: reducing the need for sedation and general anaesthesia in children undergoing MRI. *Australasian Radiology*, 50(4), 319-323.
- 2 Carter, A., Greer, M., Gray, S., & Ware, R. (2010). Mock MRI: reducing the need for anaesthesia in children. *Pediatric Radiology*, 40(8), 1368-1374.

## Contact Information

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