



The Power of Preparation: Pediatric Pre-Operative Physical Therapy for Tethered Cord Release Surgery

The Science Behind Prehabilitation

Pre-operative physical therapy, often called "prehabilitation" or "prehab," can help patients feel stronger and more prepared during their recovery after surgery. The goal of prehabilitation is to help patients prepare their bodies for an upcoming surgery and recovery. Recent research supports personalized prehabilitation programs before major surgery demonstrating they can enhance recovery through demonstrating fewer post surgical complications and improvement in pain management, physical function, wound healing, immune function, and psychological state for the patient.¹⁻⁴

Prehabilitation works by:

- **Optimizing function:** Improving baseline mobility, core strength, and flexibility can make post-operative rehabilitation more effective.
- **Enhancing body awareness:** Teaching proper movement patterns before surgery makes it easier to learn and follow post-operative precautions.
- **Reducing anxiety:** Familiarity with therapeutic exercises and the physical therapy environment reduces stress about post-operative rehabilitation. This can be done through pain neuroscience education, cognitive behavioral therapy, and mindfulness, decreasing the sensitization throughout the neurological system.

Key Benefits of Pre-Operative Physical Therapy

1. Building Core Engagement and Stability

Pre-operative therapy focuses on gentle exercises that prepare the abdominal and back muscles to support the spine during healing. Depending on the age and needs of the patient, this can look very different for pediatric patients. The younger the child, the more likely a pediatric specialist will be needed to turn appropriate "exercise" positions into play time. Working on appropriate muscle activation prior to surgery can reduce the stress and strain on healing surgical tissues.

2. Learning Post-Operative Techniques

One of the most valuable aspects of prehabilitation is the opportunity to learn and practice post-operative techniques before surgery. A great example is log rolling- which is a way to get in and out of bed that decreases pain and stress through the spine.



During pre-operative physical therapy, you and your child can practice log rolling repeatedly in a comfortable environment. The physical therapist can:

- Demonstrate proper technique
- Allow multiple practice attempts – figure out ways to make it child-friendly
- Address any questions or concerns about the movement
- Build muscle memory that will make this motion easier to complete after surgery

Patients, parents, and caregivers also benefit enormously from this hands-on education. Learning how to assist with log rolling before surgery means you'll feel confident and competent when helping your child during the recovery period. Other things we more commonly are asked to help plan for before the surgery are helping get shoes on and off, modifying tooth brushing so they don't have to lean forward, and sleeping and lounging positions.

3. Establishing Baseline Measurements

Pre-operative physical therapy provides objective measurements of strength, gait mechanics, range of motion, neurological symptoms including neural mobility, and functional abilities. These baseline assessments are valuable for tracking recovery progress and identifying any changes in neurological symptoms as well as function after surgery.

4. Improving Family Confidence and Reducing Anxiety

Surgery is stressful for the entire family. Pre-operative physical therapy sessions provide a structured opportunity to ask questions, voice concerns, and develop a plan. Understanding what to expect and knowing you've taken proactive steps to prepare can reduce pre-surgical anxiety. This is a great opportunity for the providers and family to collaborate on the needs of the individual child and the best ways to address them both before and after surgery. The plans with this population are typically much more creative and individualized compared to our adult population.

5. Creating Continuity of Care

When you begin post-operative physical therapy you will have already established a relationship with a physical therapist. The therapist already knows your baseline abilities, personality, and learning style, allowing for more personalized and effective rehabilitation.

What Does Pre-Operative Physical Therapy Look Like?

One of the most important principles guiding your pre-operative physical therapy is avoiding additional strain on your already-tensioned nervous system. Your physical therapist will create a personalized program based on your specific needs, symptoms, and restrictions. The goal is to help you go into surgery as strong, mobile, and prepared as possible while respecting your body's current limitations.

A prehabilitation program for tethered cord release surgery might include:

Gentle Core Engagement: Pre-operative PT for tethered cord focuses on age-appropriate gentle core and posterior chain recruitment exercises and controlled movements that support the nervous system including:

- **Muscle Engagement Exercises:** These primarily isometric exercises involve contracting muscles without joint movement; this allows improved muscle activation and control without putting stretch on the spinal cord.
- **Neutral Spine Positioning:** Exercises done in positions that keep your spine in a neutral position rather than fully flexed or extended, minimizing tension on the spinal cord.
- **Supported Movements:** Using props, positions, or therapist support to ensure movements don't inadvertently increase neural tension.

Neural Health: This can include pain neuroscience education, pain-free neural mobility such as nerve flossing, as well as ways to reduce sensitization and support your nervous system.

Functional Movement Training: Practicing safe movement patterns, getting in and out of bed safely, and maintaining proper positioning.

Education Sessions: Dedicated time to learn about any post-operative precautions, expected timeline for recovery, and strategies for managing post-operative limitations.

Breathing Exercises: Teaching diaphragmatic breathing and gentle breathing techniques that will be important during recovery.

Activity Pacing: Learning to balance activity with rest—a skill that becomes essential during the recovery period.

Practical Tips

If your surgical team recommends pre-operative physical therapy, here are some ways to maximize its benefits:

1. **Start Early:** Begin prehabilitation as soon as surgery is scheduled, ideally several weeks before the procedure.
2. **Practice at Home:** Reinforce what's learned in therapy sessions by practicing techniques at home.
3. **Ask Questions:** Use therapy sessions as an opportunity to address any concerns about the recovery process. Especially how to make things work with the personality of the child.
4. **Create Reference Documents:** Take notes or videos (with therapist permission) of techniques so you have references during recovery.

The Role of Personalized Programs

A one-size-fits-all approach rarely works in rehabilitation. The most effective prehabilitation programs acknowledge that each person's starting point, learning style, and support system are different. This is very relevant within our pediatric population, as most younger patients require more creativity and accommodations within the program designed for them. Physical therapists create specific pre-operative physical therapy plans to address those individual needs. For tethered cord release surgery, this means tailoring exercises to their specific baseline abilities, adapting for the age and learning styles of the patient, addressing any existing mobility limitations, and adapting techniques to the family's unique circumstances.

If your child is scheduled for tethered cord release surgery, talk to your surgical team about whether pre-operative physical therapy might be beneficial.

1. Cambriel A, Tsai A, Choisy B, et al. Immune modulation by personalized vs standard prehabilitation before major surgery: a randomized controlled trial. *JAMA Surg.* Published online November 12, 2025. doi:10.1001/jamasurg.2025.4917
2. Gohel, P., Lavadi, R. S., Jawad-Makki, M. A. H., Kumar, R. P., Waheed, A. A., Elkaim, L. M., ... & Agarwal, N. (2025). Comprehensive guidelines for prehabilitation in spine surgery. *Journal of Craniovertebral Junction and Spine*, 16(1), 5-15.
3. Eubanks, J. E., Carlesso, C., Sundaram, M., Bejarano, G., Smeets, R. J., Skolasky, R., ... & Schneider, M. J. (2023). Prehabilitation for spine surgery: a scoping review. *PM&R*, 15(10), 1335-1350.
4. Pester, B. D., Yoon, J., Yamin, J. B., Papianou, L., Edwards, R. R., & Meints, S. M. (2023). Let's get physical! A comprehensive review of pre-and post-surgical interventions targeting physical activity to improve pain and functional outcomes in spine surgery patients. *Journal of clinical medicine*, 12(7), 2608.

This article is for informational purposes only and does not constitute medical advice. Always consult with your child's healthcare team about their specific surgical preparation and recovery plan.