

PHYSICIAN REPORT



**Rocky Mountain
Hospital for Children**

At Presbyterian/St. Luke's



Located at
20th and
High St. in
Denver, CO



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Average
PICC line
days from
18 to 13

30%
REDUCTION

Full story on page 4



SPRING 2017

QUALITY ISSUE

*When parents come together with the doctors,
nurses, and staff at Rocky Mountain Hospital
for Children, we can make amazing things happen.*

#AMAZINGTOGETHER

CARDIOLOGY



Article submitted by:
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Focus on Quality

Providing safe, expert, high quality care is always top priority at HealthONE's Rocky Mountain Hospital for Children (RMHC). In this issue of the Physician Report, our focus is on examples of our quality initiatives. We are very proud of our commitment to the high quality standards allowing us to deliver safe and effective patient-centered treatment. Our team of physicians is participating in national quality initiatives as we strive to reach the highest level of standards possible.

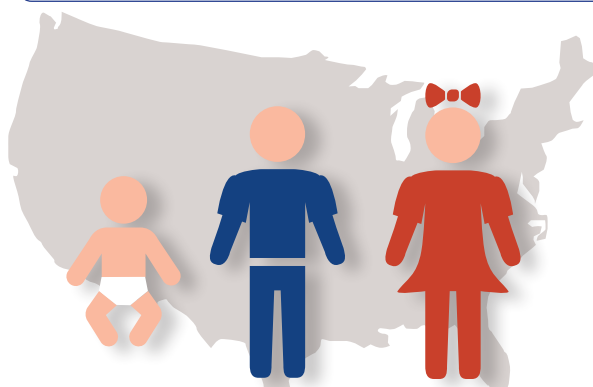
In this report, we also examine the importance of clinical research within the realm of neonatal

care, pediatric orthopedics and pediatric oncology. These are examples of how clinical research improves the quality of care we have the privilege to deliver.

At RMHC, we are committed to expanding our wealth of knowledge across all of our pediatric service lines. As a care team, we encourage our physicians and staff to participate in the search for a better process, a better way to deliver care, better treatment and the best outcomes possible. This research allows us to offer our patients and their families a higher level of treatment and outcomes.

Story continued on page 2

IRON DEFICIENCY IN CHILDREN

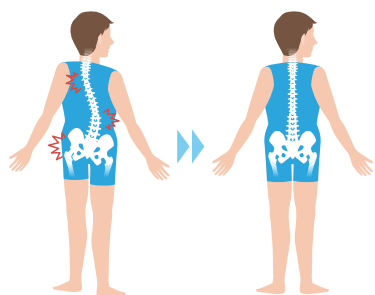


UP TO **9%**
between the ages
of 1-3 years
*2-3% have iron
deficiency anemia*

Full story on page 3



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SCOLIOSIS:

Results of New
Rod Lengthening Procedure

- 0 ZERO infections**
- 0 ZERO hardware failures**
- 0 ZERO unplanned returns to the operating room**

Early Onset Scoliosis — New Treatment Options

The medical term "scoliosis" is taken from the Greek word meaning "curvature". It is the most common spinal deformity in school-age children, with nearly three million new cases diagnosed and 29,000 scoliosis surgeries performed on adolescents in the United States each year.

Early onset scoliosis (scoliosis diagnosed before age 10 years) is a particularly dangerous condition. Severe spine deformity leads to a critical loss of lung volume, resulting in hypoxemia, pulmonary hypertension, and potentially early mortality. In order to maximize lung development, growth must be preserved while minimizing the size of the curve. Therefore, any intervention designed to treat early onset scoliosis must find a balance between these two principles.

When curves continue to progress despite bracing and casting, surgical intervention is indicated. Again, because we must straighten the spine

without compromising growth, a traditional posterior spinal fusion is contraindicated. The alternative, growth rods, have traditionally been static rods implanted and fused only to the proximal and distal ends of the curve, then lengthened through several subsequent open surgeries to ensure the spine grows along with the child. There is a litany of potential complications, including broken implants, infections, neurologic injuries, and iatrogenic malalignment. Recent literature has established a relationship between the number of surgeries a single patient endures, and the potential for complications. In other words, the earlier these kids need surgery, and the more open surgical lengthenings we perform, the greater risk to the patient.

We at Rocky Mountain Pediatric Orthopedics are pioneering a new device which has significantly improved our ability to address early onset scoliosis surgically, and at younger ages, but with fewer open procedures. The device is an implantable rod with an inner magnet that can be controlled transcutaneously by an

external magnetic device. Once implanted, we can perform rod lengthenings without the need for surgery, anesthesia, or even analgesia. The lengthenings are done in the office, and take just a few minutes to complete.

Last year, seven children underwent implantation of the device. There have been no infections, hardware failures, or unplanned returns to the operating room. The kids love growing 3-4 mm every time they come in!

Washington continued from page 1

RMHC is a large specialty medical center that provides all the unique services of a pediatric hospital. We serve our community physicians and their patients from across a six-state region. Our physicians and staff provide tertiary maternal-fetal, neonatal, and pediatric care for Colorado, Kansas, Nebraska, South Dakota, Utah, and Wyoming. Some programs (our pediatric minimally invasive surgery, orthopedic surgery and cardiovascular surgery programs) bring children to our facility from not just all over the country, but also all over the world.



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Iron from fruits, vegetables and grains are best absorbed in the body when eaten with a food high in Vitamin C or a meat high in iron.

Some suggested food combinations would be:

- Iron fortified cereal and orange juice
- Chili (Ground beef or turkey, beans, tomatoes)
- Iron fortified oatmeal with fruit salad (kiwi, strawberries, orange)
- Iron fortified pasta with broccoli
- Grilled Chicken with spinach salad

Milk and calcium:

- Cow's milk is low in iron, and its iron is poorly absorbed.
- It is common for toddlers to consume too much cow's milk and not enough iron rich foods.
- Milk consumption should be limited to less than 24 oz per day, and in some situations, 16 oz per day.
- Do not drink milk with meals or snacks containing high iron foods to avoid poor absorption in the body.

Iron Deficiency in Infants and Young Children

Iron deficiency is the most common nutritional deficiency in children, ranging from mildly low iron stores to profound iron deficiency anemia. Low Iron levels may effect normal growth and development. Iron deficiency anemia can result in learning and behavioral problems.

In the United States, up to 9% of children between the ages of 1-3 years have iron deficiency and 2-3% have iron deficiency anemia.

Infants and young children most at risk for iron deficiency include:

- ▶ Babies born prematurely
- ▶ Babies with low birth weight
- ▶ Babies who drink goat's milk, cow's milk, or soy milk before age 1 year
- ▶ Breast-fed babies who do not receive supplemental iron-containing foods after age 6 months.
- ▶ Babies who receive non-iron-fortified formula
- ▶ Children ages 1-5 who receive more than 24 ounces of milk or less than 3 servings of iron-rich foods daily.
- ▶ Children with certain health conditions, (e.g. chronic GI problems, dietary limitations, lead toxicity)

Iron deficiency is generally preventable. Additionally, it can usually be corrected with supplementation directed by the child's primary care provider. Screening for iron deficiency anemia is recommended by the AAP beginning at 12 months. Symptoms of iron deficiency anemia can include pallor, fatigue, delayed growth and development, rapid breathing, unusual cravings for things such as ice, dirt, paper.

The most easily absorbed iron — called heme iron — is found in meat. The other form of iron — called non-heme iron — comes from plant sources, but because of its chemical structure, it's not as easy for the intestines to absorb. Still, both sources of iron are worth eating. In fact, heme iron helps improve the absorption of non-heme iron, so eating food sources of both forms of iron at the same time is ideal.

HIGH IRON FOODS:

Heme Iron Rich foods:

- Lean beef, pork
- Poultry (dark meat)
- Scallops, shrimp
- Salmon, tuna
- Eggs

Non-Heme Iron Rich foods:

- Beans (black, kidney, pinto)
- Hummus
- Prunes, raisins, figs
- Peanut butter
- Leafy green vegetables (kale, spinach)
- Broccoli
- Enriched breads, cereal, pasta
- Oatmeal or cream





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Neonatal Intensive Care Unit (NICU)

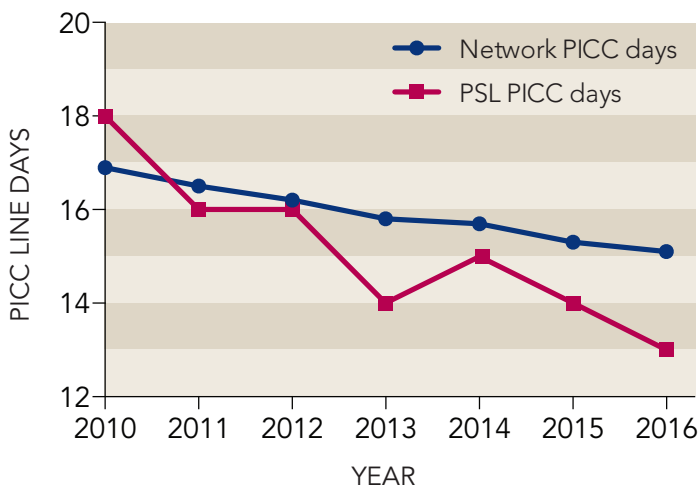
The Neonatal Intensive Care Unit (NICU) at RMHC at Presbyterian/St. Luke's is the largest Level 4 NICU in the region with 84 beds. As such, we care for the smallest and sickest infants who require intensive care or surgery from all over Colorado as well as parts of Kansas, Nebraska, South Dakota,

Oxford Network and the Mednax Clinical Data Warehouse, that we can use to benchmark our progress against a national network of NICUs. For example, in a recent quality initiative, we have worked to reduce PICC line use in our extremely preterm babies through an improved feeding protocol and increased attention to prompt line removal. As the figure demonstrates, the average number of PICC line days in preterm infants has declined across

the country. At RMHC, we have exceeded the national average by successfully reducing our average PICC line days in these patients from 18 to 13 days, a nearly 30% reduction! This translates to better enteral nutrition and fewer opportunities for line infections for our babies.

At the RMHC NICU, we continue to strive for the highest possible quality of care and the best possible outcomes for the most fragile patients.

AVERAGE VLBW PICC LINE DAYS



Utah, and Wyoming. We are proud to provide a full range of neonatal services including high frequency ventilation, inhaled nitric oxide, ECMO, total body cooling, and a wide range of neonatal surgical subspecialties.

In order to deliver the best possible care for our babies, we continually monitor clinical outcomes as quality measures. We are fortunate to have two large neonatology databases, the Vermont





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RMHC PICU

Research Initiatives at Rocky Mountain Hospital for Children — Quality Management Committee

RMHC is actively involved in multiple research and quality initiatives. There are numerous individuals and groups at RMHC performing clinical research. Many of these initiatives help provide feedback to improve ongoing patient care. Some of these studies focus on niches in our community, including several of which focus on RMHC's Neonatal ICU. With the largest Level IV NICU in the region, the opportunities are vast for research. One study specifically attempted to determine the effect of our unique altitude on the physiology of our patients.

Here is a compilation of some of the active research studies and items:

- **The Neonatal Hypoxic Ischemic Encephalopathy Total Body Cooling Study** This ongoing study is attempting to examine the effectiveness of total body cooling on neurological outcomes. This longitudinal study is reviewing clinical outcomes for over 250 neonates that underwent this procedure over the last six year period.
- **The Neonatal Critical Congenital Heart Disease Screening Study** In recent years, with the advent of prenatal ultrasound evaluations, congenital heart disease is frequently diagnosed

prior to birth. The American Academy of Pediatrics has been encouraging the use of a simple upper and lower extremity pulse oximetry study in all newborns in attempt to capture the few babies that are undiagnosed prenatally. Diagnosis before leaving the hospital would reduce considerable morbidity and mortality. Dr. Del Eichorst is leading efforts to determine if altitude plays any role in the usefulness of this simple screening tool. Although final data collection is ongoing, preliminary data shows that screening at altitude does not differ considerably from screening at sea level.

- **Dr. Ted Stathos, Pediatric Gastroenterology, Dr. Steven Leonard, Pediatric Cardiothoracic Surgery, and the pediatric ICU team** are examining the formation of lacto-bezoars in patients undergoing therapy for chylothoraces. The initial treatment plan for chylothoraces involved the use of a low fat formula especially low in long chain fatty acids. The most common first line therapy has been a high MCT oil fat content formula. The use of this formula at our facility has been associated

with poor feeding tolerance and further workup has revealed lacto-bezoars in multiple patients. This has been unreported in the literature previously.

- **The human intestinal microbiome** is immensely complex and an area of significant research interests worldwide. There may be an opportunity to alter the gut microbiome with post-natal probiotics. Dr. David Randolph, Neonatal Perinatal Medicine, is examining the gut microbiome of neonates prior to and following dietary supplementation of a probiotic regimen. All samples have been collected, but analysis and data collection are ongoing. This work also may positively contribute to the further reduction of Necrotizing Enterocolitis occurrence in this patient population.
- **The Quality Management Committee at RMHC** examines all at Pediatric Resuscitation events across all of the RMHC facilities. Early efforts were focused on improving reporting from all RMHC sites. With that foundation in place, recent reviews have demonstrated excellence in care. It has also provided learning



RMHC Staff Publications 2016-2017

Carrie Reynolds, MD – Pediatric GI

Pall, Harpreet, et al. "Developing the Pediatric Gastrointestinal Endoscopy Unit: A Clinical Report by the Endoscopy and Procedures Committee." *Journal of pediatric gastroenterology and nutrition* 63.2 (2016): 295-306.

Friedlander, Joel A., et al. "NASPGHAN Capsule Endoscopy Clinical Report." *Journal of Pediatric Gastroenterology and Nutrition* (2017). <— published ahead of print

Sue Kirelik, MD – Pediatric Orthopedics

"Acute Concussion Management with Remove-Reduce/Educate/Adjust-Accommodate/Pace" (REAP). Kirelik SB, et al. *J Emerg Med*. 2016. Authors Kirelik SB1, McAvoy K1. Author information1 Center for Concussion at Rocky Mountain Center for Concussion at Presbyterian/St. Luke's Medical Center, Lone Tree, Colorado. Citation *J Emerg Med*. 2016 Feb;50(2):320-4. doi: 10.1016/j.jemermed.2015.02.054. Epub 2015 Nov 14.

Karen McAvoy, MD, PsyD – Center for Concussion at Rocky Mountain Hospital for Children

ACUTE CONCUSSION MANAGEMENT WITH REMOVE-REDUCE/EDUCATE/ADJUSTACCOMMODATE/PACE (REAP), Susan B. Kirelik, MD and Karen McAvoy, PsyD, Center for Concussion at Rocky Mountain Hospital for Children at Presbyterian/St. Luke's Medical Center, Centennial, Colorado

Expanding Concussion Laws Not Necessary for Return to Learning After Concussion. Mark E. Halstead, MD, a Karen McAvoy, PsyD, b Brenda Eagan Brown, MEd, CBISc

Cognitive rest following concussions: rethinking 'cognitive rest'. BJSM Online First, published on September 15, 2016 as 10.1136/bjsports-2016-096674

Michael Pettersen, MD – Pediatric Cardiology

"Diastolic function in antracycline-treated children." Harahsheh A, Aggarwal S, Pettersen MD, L'Ecuyer T. *Cardiol Young*. 2015 Aug;25(6):1130-5

Steve Rothenberg, MD – Pediatric General Surgery

Thoracoscopic Lobectomy in Infants and Children Utilizing a 5 mm Stapling Device.

Rothenberg SS J Laparoendosc Adv Surg Tech A. 2016 Dec;26(12):1036-1038. PMID: 27705088

Two-Site Appendectomy in Children: Description of Technique and Outcomes.

Slater BJ, Rothenberg SS. *J Laparoendosc Adv Surg Tech A*. 2017 Jan 18. doi: 10.1089/lap.2016.0243. [Epub ahead of print] PMID: 28099058 Similar articles Select item 28085557 [J2].

Two-Incision Laparoscopic Cholecystectomy in Children.

Lai SW, Rothenberg SS, Shipman KE, Kay SM, Slater BJ.

J Laparoendosc Adv Surg Tech A. 2017 Jan 13. doi: 10.1089/lap.2016.0221. [Epub ahead of print] PMID: 28085557 Similar articles Select item 27301604 [J3]. *Tracheoesophageal fistula.*

Slater BJ, Rothenberg SS. *Semin Pediatr Surg*. 2016 Jun;25(3):176-8. doi: 10.1053/j.sempedsurg.2016.02.010. PMID: 27301604 Similar articles Select item 26698191 [J4].

Trans-Atlantic Telementoring with Pediatric Surgeons: Technical Considerations and Lessons Learned.

Bruns NE, Irtan S, Rothenberg SS, Bogen EM, Kotobi H, Ponsky TA.

J Laparoendosc Adv Surg Tech A. 2016 Jan;26(1):75-8. doi: 10.1089/lap.2015.0131.

PMID: 26698191. Similar articles Select item 26485521 [J5].

Experience with Thoracoscopic Repair of Long Gap Esophageal Atresia in Neonates.

Rothenberg SS, Flake AW. *J Laparoendosc Adv Surg Tech A*. 2015 Nov;25(11):932-5. doi: 10.1089/lap.2015.0124. PMID: 26485521 Similar articles Select item 26312644 [J6].

Thoracoscopic Management of Patent Ductus Arteriosus and Vascular Rings in Infants and Children. Slater BJ, Rothenberg SS. *J Laparoendosc Adv Surg Tech A*. 2016 Jan;26(1):66-9. doi: 10.1089/lap.2015.0126. PMID: 26312644 Similar articles Select item 25976148 [J7].

Thoracoscopic Thoracic Duct Ligation for Congenital and Acquired Disease. Slater BJ, Rothenberg SS. *J Laparoendosc Adv Surg Tech A*. 2015 Jul;25(7):605-7. doi: 10.1089/lap.2014.0360. PMID: 25629239 Similar articles

Bethany Slater, MD – Pediatric General Surgery

Two-Site Appendectomy in Children: Description of Technique and Outcomes.

Slater BJ, Rothenberg SS. *J Laparoendosc Adv Surg Tech A*. 2017 Jan 18. doi: 10.1089/lap.2016.0243. [Epub ahead of print] PMID: 28099058 Similar articles Select item 28085557 [J2].

Two-Incision Laparoscopic Cholecystectomy in Children.

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Tracheoesophageal fistula.

Slater BJ, Rothenberg SS.

Semin Pediatr Surg. 2016

Jun;25(3):176-8. doi: 10.1053/j.sempedsurg.2016.02.010. PMID: 27301604 Similar articles

Select item 26790674 [J4].

Childhood and adolescent tracheobronchial mucoepidermoid carcinoma (MEC): a case-series and review of the literature.

Jaramillo S, Rojas Y, Slater BJ, Baker ML, Hicks MJ, Muscal JA, Vece TJ, Wesson DE, Nuchtern JG. *Pediatr Surg Int*. 2016 Apr;32(4):417-24. doi: 10.1007/s00383-015-3849-y. PMID: 26790674 Similar articles Select item 26312644 [J5].

Thoracoscopic Management of Patent Ductus Arteriosus and Vascular Rings in Infants and Children.

Slater BJ, Rothenberg SS. *J Laparoendosc Adv Surg Tech A*. 2016 Jan;26(1):66-9. doi: 10.1089/lap.2015.0126. PMID: 26312644 Similar articles

Kristina Walick, MD – Pediatric Orthopedic Surgery

Pediatrics in the Austere Environment. *Current Orthopedic Practice* 2015; 26(5):502-508.

Howard, Jeffrey, Rivera, Jessica, and Walick, Kristina. Preliminary Evidence of an Association Between ADHD Medications and Diminished Bone Health in Children and Adolescents. Accepted for publication in *Journal of Pediatric Orthopedics*. Aug 2015.

Walick, Kristina. Host Nation Pediatric Care. Forward Surgical Team Handbook. The Borden Institute, 2015.

Reginald Washington, MD Chief Medical Officer Rocky Mountain Hospital for Children

Van Hare GF, Ackerman MJ, Evangelista JA, Kovacs RJ, Myerburg RJ, Shafer KM, Warnes CA, Washington RL. American Heart Association Electrocardiography and Arrhythmias Committee of the Council on Clinical Cardiology, Council on Cardiovascular Disease in the Young, Council on Cardiovascular and Stroke Nursing, Council on Functional Genomics and Translational Biology, and the American College of Cardiology. Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities: Task Force 4: Congenital Heart Disease: A Scientific Statement From the American Heart Association and American College of Cardiology. *Circulation*. 2015 Dec 1;132(22):e281-91.

Maron BJ, Levine BD, Washington RL, Baggish AL, Kovacs RJ, Maron MS.

Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities: Task Force 2: Preparticipation Screening for Cardiovascular Disease in Competitive Athletes: A Scientific Statement From the American Heart Association and American College of Cardiology. *J Am Coll Cardiol*. 2015 Dec 1;66(21):2356-61.

Research initiatives continued from page 5

opportunities for improvement in resuscitation practices. These metrics have permitted the focused use of monthly mock pediatric and neonatal codes in all areas of the hospital where children are cared for to ensure staff effectiveness in managing pediatric and neonatal code events.

■ **Pediatric Falls** are an additional area of continued analysis and reporting through RMHC Quality Management Committee. All pediatric falls are analyzed for recurrent themes, preventive measures, and action items to remedy after an event. Themes and information from all falls are also shared Division wide, with facilities implementing preventive measures collectively with the ongoing goal of elimination of pediatric falls.

■ **Pediatric Sepsis.** The Quality Management Committee is involved in the creation of pediatric sepsis guidelines and order-sets for both ER and inpatient facilities. We are hopeful that RMHC's leadership in the creation of the guidelines can serve as a national model for all of the HCA facilities that are involved in the care of children.