Guest Editorial
What's New in Pediatric Orthopaedics

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This pediatric orthopaedic update represents a review of articles predominantly from October 2020 to October 2021.

Trauma

Supracondylar Humeral Fractures

The conventional wisdom on remodeling was challenged by Gamble and Vorhies, who showed remodeling of up to 100% capitellar displacement in children <5 years of age with sagittal plane malunions. However, of note, patients >8 years of age had little to no remodeling capacity[1]. Bekmez et al. studied older patients (7 to 15 years of age) with supracondylar humeral fractures (Sauvegrain ≥ 1) treated with percutaneous pinning. Although the lack of pin spread ($p < 0.01$) or of bicolumnar fixation ($p < 0.01$) was associated with a loss of reduction, age and skeletal maturity were not, showing that this is a viable treatment option even in an older age group[2].

Radial Fractures

In a series of radial neck fracture closed reductions, 0 of 10 patients with fracture angulation of ≥60° and only 1 of 14 patients presenting >24 hours after the injury had a successful reduction in the emergency room[3].

Lynch et al. studied remodeling of distal radial fractures in the coronal plane and discovered that this occurred at a rate of 2° per month. They recommended against manipulation for coronal angulation of <24°[4].

Lower-Extremity Fractures

Jian et al. described a salvage technique for the management of old femoral neck fractures (>3 weeks) with a corticoperiosteal pedicle flap from the greater trochanter. In their series of 23 patients, there were no nonunions and the rate of osteonecrosis was 13%[5]. Siddiqui et al. reviewed a series of 58 femoral shaft fractures treated with titanium elastic nails, of which 26 (45%) were length-unstable. There was no difference between the stable and unstable fracture patterns with regard to the incidence of major complications ($p = 0.68$) or minor complications ($p > 0.99$)[6].

In their study, Lurie et al. compared the use of transsyndesmotic screw fixation with that of suture buttons for the management of syndesmotic injuries. Although both techniques maintained the reduction, 36 (80%) of 45 patients in the screw group underwent a surgical procedure for implant removal compared with 4 (12.5%) of 32 patients in the suture button group ($p < 0.00001$)[7]. In a series of 83 patients, an alternative technique of lag screws alone for the management of unstable lateral malleolar fractures was compared with traditional plate fixation. Both groups had 100% union rates without a loss of reduction; however, the mean surgical time was longer in the plate group at 64 minutes compared with the lag screw group at 49 minutes ($p = 0.001$), and the plate group was 3.8 times more likely to have symptomatic implants ($p < 0.044$) than the lag screw group[8].

A randomized controlled trial comparing an above-the-knee cast with a controlled ankle motion (CAM) orthosis (CAM boot) for the treatment of nondisplaced tibial fractures (toddlers' fractures) showed no difference in fracture healing, but early ambulation was more common in the CAM boot group, with 78% of patients weight-bearing at 7 to 10 days compared with 54% of those in the cast group[9].

Spine

Adolescent Idiopathic Scoliosis

Shin et al. performed a systematic review of outcomes of tethering and posterior spinal fusion for adolescent idiopathic scoliosis in 10 anterior vertebral body tethering studies (211 patients) and 14 posterior spinal fusion studies (1,069 patients). The pooled reoperation rate for studies with a minimum follow-up of 36 months was 24.7% with anterior vertebral body tethering compared with 1.8% with posterior spinal fusion. The deformity correction, clinical outcomes, and intermediate-term Scoliosis Research Society (SRS)-22 scores were similar between the 2 groups, and the authors noted that, despite the potential for and excitement over anterior vertebral body tethering, caution should be exercised[10]. Concerns have been raised with regard to a unilateral posterior peri-apical distraction device (ApiFix). In a series of 20 patients with adolescent idiopathic scoliosis and a mean follow-up of 3.4 years, 10 patients had serious complications requiring revision. The study was terminated early due to safety concerns[11].

Given advancements in quality and safety, Mehta et al. reviewed the rate of unplanned returns to the operating room for patients with adolescent idiopathic scoliosis undergoing spinal fusion and found that this rate decreased 0.46% per year

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from 1997 to 2013[12]. In a review of patients undergoing posterior spinal fusion, Hughes et al. noted continued improvement from 2 to 5 years postoperatively with regard to the rate of coronal imbalance of >2 cm, which decreased from 17% to 6%, and shoulder asymmetry of >2 cm, which decreased from 8% to 1%[13].

Farrell et al. elegantly demonstrated that the pulmonary dysfunction in patients with adolescent idiopathic scoliosis is not only restrictive but also obstructive. Correlating low-dose computed tomographic (CT) scans with pulmonary function tests, the authors found that chest intrusion creates right-sided bronchial narrowing and lung function loss in preoperative patients with adolescent idiopathic scoliosis, with nearly half (48%) of patients having a percent-of-predicted forced expiratory volume in 1 second (FEV1%) or percent-of-predicted forced vital capacity (FVC%) that was <65% compared with controls[14].

Early-Onset Scoliosis

A case-matched comparison of patients with severe early-onset scoliosis (≥90°) treated with magnetically controlled growing rods compared with traditional growing rods showed that the 2-year unplanned revision-free survival was 91% in the magnetically controlled growing rod group compared with 71% in the traditional growing rod group[15]. Mathew et al. found that serum titanium, cobalt, and chromium levels were elevated in children with spinal implants, particularly with growing spine devices, although the clinical importance of this remains uncertain[16].

Mackey et al. compared older patients (ages 8 to 11 years) with early-onset scoliosis treated with magnetically controlled growing rods, posterior spinal fusion, or vertebral body tethers. They found quality-of-life improvements with spinal fusion and vertebral body tethers but not with magnetically controlled growing rods. With a mean follow-up of 3 years, the complication rate was lower for patients who underwent fusion at 14% compared with 27% in the vertebral body tether group and 61% in the magnetically controlled growing rod group ($p < 0.0005$), adding to the growing body of evidence that this intermediate age group may be best served by a 1-stage fusion[17].

Neuromuscular Scoliosis

In a series of 198 patients with neuromuscular scoliosis, Stephan et al. demonstrated that the rate of postoperative infection following spinal fusion decreased from 16.1% to 4.4% with the institution of recommendations from the 2013 Best Practice Guideline, showing the significant impact ($p = 0.005$) of preventive measures in this high-risk population[18]. Using the Caregiver Priorities and Child Health Index of Life with Disabilities (CPCHILD) questionnaire, Miller et al. prospectively evaluated 157 patients with nonambulatory cerebral palsy undergoing posterior spinal fusion. Meaningful improvement was observed at 2 years in 36% of patients; however, with the absence of a control group, it is possible that even maintaining similar quality-of-life scores represents improvement over the natural history[19].

Infection

In a series of nearly 600 patients hospitalized with septic arthritis or osteomyelitis, Lansell et al. found no difference in the culture positivity rate in patients pretreated with antibiotics, with regard to bone cultures (75% for the pretreated group compared with 64% for the group not pretreated; $p = 0.29$), joint cultures (39% for the pretreated group compared with 39% for the group not pretreated; $p = 0.95$), or blood cultures (44% for the pretreated group compared with 42% for the group not pretreated; $p = 0.62$). These results suggest that empiric antibiotics can be initiated early without impacting the ability to identify the responsible organism[20]. Ramchandar et al. compared patients with culture-proven methicillin-sensitive *Staphylococcus aureus* osteoarticular infections (septic arthritis or osteomyelitis) who transitioned from intravenous antibiotics to either 4 times daily or 3 times daily oral dosing of cephalexin and found equivalent efficacy with the more convenient 3 times daily dosing[21].

Hamilton et al. found that patients with septic arthritis and contiguous osteomyelitis had longer hospitalizations (median, 8.0 compared with 4.0 days), a higher readmission rate (17.1% compared with 5.2%), a higher complication rate (38.1% compared with 0.7%), and a higher rate of intensive care (21.0% compared with 1.5%) when compared with patients with septic arthritis alone[22].

Cerebral Palsy

Hip

In a recent study, Terjesen and Horn showed that the femoral head-shaft angle in young children was not a predictor of late hip displacement, and, therefore, measurement of this angle was considered unnecessary during hip surveillance in patients <5 years of age[23]. In 229 children with spastic quadriplegic cerebral palsy and severe scoliosis, Hadad et al. evaluated factors associated with hip stability. They found that gestational age of ≥37 weeks, female sex, and normal brain magnetic resonance imaging (MRI) findings were associated with a lower risk of hip displacement[24].

Carroll et al. evaluated factors influencing outcomes in the dysplastic hip in children with nonambulatory cerebral palsy and found that pelvic osteotomy had a positive effect on hip reconstruction outcomes with severely subluxated hips. However, capsulorrhaphy did not improve the rate of success in this population[25].

Knee

In patients undergoing distal femoral extension osteotomies for knee flexion contractures, patellar tendon imbrication for extensor mechanism shortening was associated with significant improvements in quadriceps strength, knee extensor lag, and popliteal angle ($p < 0.01$)[26]. Rectus femoris tendon transfer and resection were compared, and both resulted in an improvement in peak knee flexion during swing. However, the transfer technique resulted in a greater tendency to crouch in children

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with Gross Motor Functional Classification System (GMFCS) Levels III and IV, which was not observed in the resection group[27].

Foot and Ankle

Stotts et al. found that revision of gastrocnemius-soleus complex lengthening was needed in around 40% of patients who were <7 years of age and had GMFCS Level III[28]. Lower revision rates were found for older patients and patients who had GMFCS Levels I and II[28]. Rethlefsen et al. found that both calcaneal lengthening osteotomy and calcaneal slide osteotomy were effective in providing planovalgus foot correction. Talonavicular fusion, when combined with calcaneal slide osteotomy, provided superior results and was considered a key to success in patients with low functional levels[29].

Pediatric Foot Deformity

In the management of clubfoot, Monforte et al. found comparable results using plaster of Paris or semirigid fiberglass while performing Ponseti casting[30]. Ankle dorsiflexion after Ponseti treatment was shown to be influenced by age and the initial severity of clubfoot. Overall, ankle dorsiflexion of around 20° was maintained through the age of 3 years, and dorsiflexion of 15° was maintained through the age of 5 years. Values lower than these thresholds were suggested as possible indicators of relapse[31].

Using 7 pairs of cadaveric feet, Siebert et al. analyzed the occurrence of calcaneocuboid subluxation with lateral column lengthening with and without the use of a Steinmann pin. The authors found that subluxation occurred in both groups and proposed the use of 2 pins to potentially prevent this rotatory subluxation[32]. Another anatomic study showed the presence of an accessory cuboid facet in 75% of feet that have calcaneonavicular coalition[33].

In the treatment of congenital vertical talus, a minimally invasive approach, consisting of serial casting followed by talonavicular joint reduction and Achilles tenotomy, demonstrated overall good outcomes[34]. However, although no recurrence was seen in idiopathic deformities, 29% of syndromic clubfeet had recurrence[34].

Lower-Extremity Alignment

Several studies focused on predicting remaining growth[35-37]. Combining multiple methods was recommended for higher accuracy in growth prediction[36,37]. Proximal tibial metaphyseal width and lateral tibial epiphyseal height seem ideal to determine the growth remaining in children[38]. In addition, epiphyseal-metaphyseal ratio measurements around the knee, when combined with sex and chronological age, were comparable with the Greulich and Pyle technique for the estimation of skeletal maturity[39]. The Roche-Wainer-Thissen system using 7 radiographic parameters around the knee was also supported and was found to be resilient to rotational variations[40]. The White-Menelaus formula with skeletal age was recommended to predict lower-extremity segment length at maturity[35].

Hemiepiphysiodesis continues to be a topic of interest. Screw configuration in tension-band plating systems did not show an effect on the rate of correction[41]. A prospective study of 48 patients undergoing tension-band plating showed that, at 1 month postoperatively, 65% of the patients had not yet returned to their preoperative activity level, which can be used in guiding preoperative discussions[42]. The use of a percutaneous retrograde transphyseal screw was also effective for hemiepiphysiodesis[43].

A recent femoral lengthening technique of using extramedullary (submuscular) placement of magnetically lengthening nails in a retrograde fashion with a 10° bend matching the distal femoral metaphysis revealed promising early results. Satisfactory and safe deformity correction and lengthening can be achieved with careful patient selection and reasonable lengthening goals[44]. Although good outcomes were seen with vascularized fibular grafting in the management of congenital tibial pseudarthrosis, ankle valgus at the donor site occurred despite tibiofibular synostosis[45].

Upper Extremity

Kazarian et al. compared the cost-effectiveness of surgical release with that of botulinum toxin injections in treating upper-extremity cerebral palsy. The authors concluded that a surgical procedure provided a greater benefit at a lower cost and suggested that botulinum toxin injections should be used sparingly in this population; the potential cost savings could be $5.6 billion to $11.3 billion annually in the United States[46].

A systematic review and meta-analysis of 13 articles showed that arthroscopic release improved shoulder mobility and bone deformity in young children with brachial plexus birth injury[47].

In a study of 78 patients, at a follow-up of 5 years, 32% of pediatric trigger thumbs resolved spontaneously and 43% eventually had a surgical release. At 3 years, patients who had had interphalangeal joint flexion contractures of >30° at baseline often lacked spontaneous resolution; it may be reasonable to consider these patients as early surgical candidates[48].

In a series of 125 patients with acute posterior sternoclavicular dislocations, 11 patients underwent successful closed reduction, and 114 patients (91%) underwent open reduction and internal fixation. Compression without laceration of the ipsilateral brachiocephalic vein was common on axial imaging (50%), but there were no vascular or mediastinal injuries that required intervention. Regardless, the authors acknowledged that an injury to the vascular structures is potentially catastrophic and urged careful consideration of institutional interventional resources for patient safety[49].

Zheng et al. concluded that improvements in elbow motion, especially supination, could be achieved following surgical reconstruction of missed Monteggia lesions at a mean time of 12.9 weeks after the injury. Seventy-five percent of patients achieved radiocapitellar stability, and 6 of 52 patients had a further surgical procedure for instability. Repair of the anular ligament, rather than its reconstruction or lack of its treatment, increased radiocapitellar stability[50].

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Sports

Anterior Cruciate Ligament (ACL)

Mitchell et al. theorized that an ACL-deficient knee would have a more vertical orientation of the lateral collateral ligament (LCL) and that the LCL could then be seen on a single coronal slice, termed the coronal LCL sign. In a series of 153 adolescents with ACL reconstruction, the authors found that the coronal LCL sign was predictive of an anterolateral complex injury, with an odds ratio of 4.3 for ACL graft failure[51].

A multicenter cohort of patients with tibial eminence fractures was reviewed for subsequent ACL rupture. Of the 385 patients, ACL injuries occurred at a rate of 2.6% with a median follow-up of 6.5 months. The median time to rupture was 10.2 months following operative fracture treatment, and rupture most commonly occurred with completely displaced (type-III or IV) fractures. Of note, in patients with follow-up of at least 2 years, the rate of ACL rupture increased to 21.7%[52].

In a series with a mean follow-up of 10 years, Martin et al. evaluated the lateral posterior tibial slope in skeletally immature patients with ACL injuries initially managed nonoperatively. The authors found that the posterior slope increased in the ACL-injured knee more than in the contralateral side over the study period. Twenty-two patients had ACL reconstruction during the study period and 16 did not, and the posterior tibial slope was not predictive of surgical intervention[53].

Discoid Meniscus

Logan et al. reported on 470 cases of symptomatic discoid menisci in adolescents and found a high rate of failure with nonoperative treatment (39%), common findings of a meniscal tear (63%) and instability, and a high rate of either reoperation or continued symptoms postoperatively (33%)[54]. Another group, which included 2 authors of the previous group, also conducted a survey following lateral meniscal rim-preserving surgery in 25 patients with a mean age of 10.8 years at the time of the surgical procedure. At a minimum follow-up of 15 years, two-thirds of patients were satisfied with their outcomes, although nearly half of patients underwent revision saucerization[55].

Patellar Instability

Lin et al. investigated the association between external tibiofemoral rotation and the increased risk of a medial patellofemoral ligament injury and concluded that the degree of tibiofemoral rotation is correlated with the severity of patellar instability. The authors postulated that high external tibiofemoral rotation may be an important factor in obligatory or fixed dislocators and, with further understanding, may become a surgical target or a prognostic factor[56]. Similarly, Ling et al. sought to develop a model to predict recurrent instability in first-time patellar dislocators. The authors determined that age, Insall-Salvati ratio, history of contralateral patellar dislocation, tibial tubercle-trochlear groove (TT-TG) distance, skeletal immaturity, lateral patellar tilt, and trochlear dysplasia were the most important predictors of recurrent dislocation, but cautioned that prospective validation is needed[57].

Shoulder

Yapp et al. sought to determine the incidence of recurrent instability following shoulder dislocation in patients who were ≤14 years of age. The authors found that recurrent dislocation occurred in 18 (43.9%) of 41 patients at a median of 14.7 months after the injury. Skeletal maturity was associated with recurrent instability (6 of 24 immature patients compared with 12 of 17 mature patients; $p = 0.01$). Twenty percent of patients with recurrent instability and a mean of 8 dislocations required surgical intervention[58].

Hip

Hip Preservation

Hassan et al. queried the Pediatric Health Information System (PHIS) Database for patients who underwent hip arthroscopy and were between 10 and 19 years of age and found that, over 10 years, the number of hip arthroscopies had a 3.9-fold increase compared with the number of total orthopaedic surgical procedures in adolescents. The authors postulated that this increase may be due to improved understanding of hip pathology and increasing sports participation[59]. Hanke et al. found that 52% of hockey players enrolled in a longitudinal MRI study at the ages of 12 and 13 years developed cam morphology within 3 years. The authors concluded that the cam lesion develops at the end of the growth spurt of the femoral head between the ages of 13 and 16 years[60]. Youngman et al. found that an increased α angle correlated with labral pathology, including severity of disease and increased tear length in patients undergoing a surgical procedure for femoroacetabular impingement[61].

Allahabadi et al. evaluated venous thromboembolism in adolescents who had undergone pelvic osteotomies and determined that the overall rate of venous thromboembolism was 0.61%. Aspirin was the most common anticoagulant, used in 47.6% of patients, but there was no difference in the overall venous thromboembolism rates between those who received prophylaxis and those who did not, highlighting the need for guidelines with regard to this aspect of postoperative care[62].

Southam et al. reported on pediatric and adolescent acetabular fractures treated with open reduction and internal fixation. Eighteen (86%) of 21 patients had a favorable functional outcome, although 2 patients with a delayed reduction (>6 hours) of a fracture-dislocation developed osteonecrosis[63]. Griffith et al. reviewed patients with sickle cell disease who had a mean age of 14 years and were undergoing core decompression with a bone marrow aspirate concentrate injection for femoral head osteonecrosis. At a mean follow-up of nearly 4 years, skeletally immature patients demonstrated regression of at least 1 Steinberg grade in 89% of cases and reconstitution of the femoral head in 78% of cases[64].

Rainer et al. reported on the outcomes of primary total hip arthroplasty in patients with open triradiate cartilage and a mean follow-up of 5.5 years. The mean postoperative Harris hip score was 92.3. Follow-up radiographs demonstrated osseointegration in 12 (92%) of 13 acetabular components, and the authors concluded that it is not necessary to await triradiate closure prior to total hip arthroplasty[65].

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Slipped Capital Femoral Epiphysis (SCFE)

St George et al. reported using a posterior sloping angle threshold of 14.5° for prophylactic fixation in preventing contralateral SCFE, which prevented 77% of subsequent SCFEs while decreasing unnecessary intervention. The authors also stated that a posterior sloping angle can increase over time and recommended that the protocol be used for the entire follow-up[66].

Comparing patients undergoing surgical hip dislocation for the sequelae of SCFE with patients who underwent arthroscopic surgery for primary femoroacetabular impingement, more diffuse cartilage injury was found in patients with SCFE. Lieberman et al. advocated for early surgical intervention in patients with symptomatic SCFE because of the risk of premature joint damage[67]. Sinha et al. reviewed 55 unstable SCFE cases and 255 stable SCFE cases to identify preoperative factors associated with osteonecrosis and found that there was greater superior translation in hips that developed osteonecrosis (17.2 mm) compared with hips that did not (12.9 mm) ($p < 0.02$)[68].

Legg-Calvé-Perthes Disease

Selberg et al. hypothesized that variable anatomy supports the concept of anatomically specific containment in Legg-Calvé-Perthes disease. Of 168 patients, 35% were substantially dysplastic, 30% were in varus, and 12% were in valgus, suggesting that the one-surgery-fits-all approach may lack specificity for an individual patient[69].

Kim et al. performed a review of 65 patients, with a mean age of 7.9 years at the diagnosis of Legg-Calvé-Perthes disease, who underwent an early proximal femoral osteotomy and had a mean follow-up of 11.8 years. Of the patients who underwent early proximal femoral osteotomy, 40.5% bypassed the fragmentation stage. The degree of lateral pillar collapse was lower, and there were more patients with a spherical femoral head, in this bypass group[70].

Developmental Dysplasia of the Hip

Lin et al. investigated the effect that an inverted acetabular labrum had on the outcomes of Pavlik harness treatment for developmental dysplasia of the hip in 229 hips. The authors found a significant difference ($p < 0.001$) in the incidence of Pavlik harness treatment failure: 91% (20 of 22) in the inverted labrum group and 27% (55 of 207) in the control group[71]. Imerci et al. assessed risk factors for Pavlik harness treatment failure and found that the onset of treatment after the seventh week of age, infants of multigravida mothers, and initial hip mobility (fixed-dislocated hips) by dynamic sonography were predictive of Pavlik harness treatment failure. Six percent of hips with no risk factors had failed Pavlik harness treatment, and treatment failure occurred in 42% of hips with 1 risk factor, 69% of hips with 2 risk factors, and 100% of hips with all 3 risk factors[72].

Theunissen et al. studied whether treatment duration was reduced by shortening the time to the first routine follow-up ultrasound after the initiation of a Pavlik harness. The median time of harness treatment was reduced from 12 weeks to 6.1 weeks ($p < 0.001$). Residual dysplasia at 1 year of age was detected in 17% of patients in the 12-week group compared with 11% of patients in the 6-week group ($p = 0.189$). The authors concluded that the first routine follow-up ultrasound can be safely accelerated from 12 to 6 weeks after harness initiation[73]. The impact of Pavlik harness weaning was evaluated and, although they had longer total harness time, infants treated with Pavlik weaning, compared with those who were not weaned, did not demonstrate different radiographic results at 1 year of age[74].

In their study, Morris et al. examined patients with late reduction of developmental dysplasia of the hip and found that patients treated with closed reduction had a higher rate of a secondary surgical procedure (47%) than those with open reduction (30%), despite a decreased severity of displacement. There was no difference in the prevalence of osteonecrosis: 22% for the closed reduction group and 19% for the open reduction group ($p = 0.60$)[75].

A review of 9,299 patients who presented from 1998 to 2019 was conducted to evaluate the impact of a universal newborn ultrasound screening program instituted in 2006. The mean age at presentation for developmental dysplasia of the hip decreased from 2.65 to 2.19 years with universal screening ($p = 0.0067$)[76]. In a prospective study, Murphy et al. described the implementation of a virtual clinic for developmental dysplasia of the hip and found that median waiting times from referral to treatment decision were reduced by >70% and that only 1.8% of parents opted for in-person appointments, demonstrating considerable cost savings without adverse outcomes[77].

Evidence-Based Orthopaedics

The editorial staff of *JBJS* reviewed a large number of recently published studies related to the musculoskeletal system that received a higher Level of Evidence grade. In addition to articles cited already in this update, 5 other articles relevant to pediatric orthopaedic surgery are appended to this review after the standard bibliography, with a brief commentary about each article to help guide your further reading, in an evidence-based fashion, in this subspecialty area.

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Evidence-Based Orthopaedics

Colaco K, Willan A, Stimec J, Barra L, Davis A, Howard A, Boutis K. Home management versus primary care physician follow-up of patients with distal radius buckle fractures: a randomized controlled trial. *Ann Emerg Med.* 2021 Feb;77(2):163-73.

In this noninferiority randomized controlled trial, 149 patients underwent either home removal of a splint and follow-up as needed (referred to as home management) or evaluation in 1 to 2 weeks with a primary care physician. The outcomes in both groups were similar with regard to functional recovery and significant cost savings were demonstrated in the home management group, showing the viability of this treatment option. This study provides valuable information supporting a treatment option that is more convenient and cost-effective for both patients and providers in managing these mild injuries.

What's New in Pediatric Orthopaedics

James EW, Dawkins BJ, Schachne JM, Ganley TJ, Kocher MS, Anderson CN, Busch MT, Chambers HG, Christino MA, Cordasco FA, Edmonds EW, Green DW, Heyworth BE, Lawrence JTR, Micheli LJ, Milewski MD, Matava MJ, Nepple JJ, Parikh SN, Pennock AT, Perkins CA, Saluan PM, Shea KG, Wall EJ, Willimon SC, Fabricant PD; PLUTO Study Group. Early operative versus delayed operative versus nonoperative treatment of pediatric and adolescent anterior cruciate ligament injuries: a systematic review and meta-analysis. *Am J Sports Med.* 2021 Mar 15:363546521990817.

In this systematic review and meta-analysis of 30 studies with 1,176 patients, both early and delayed operative treatment achieved knee stability. However, delaying ACL reconstruction for >12 weeks was associated with an increased risk of meniscal injuries (odds ratio, 0.23; $p = 0.006$) and irreparable meniscal tears (odds ratio, 0.31; $p = 0.001$). The results of nonoperative management were a low rate of return to sports, an increased risk of meniscal tears, and high rates of residual knee instability. This study demonstrated the importance of prompt management in pediatric ACL injuries to minimize the potential for associated meniscal injury and negative outcomes in this young patient population.

Kelley-Quon LI, Kirkpatrick MG, Ricca RL, Baird R, Harbaugh CM, Brady A, Garrett P, Wills H, Argo J, Diefenbach KA, Henry MCW, Sola JE, Mahdi EM, Goldin AB, St Peter SD, Downard CD, Azarow KS, Shields T, Kim E. Guidelines for opioid prescribing in children and adolescents after surgery: an expert panel opinion. *JAMA Surg.* 2021 Jan 1;156(1):76-90.

A multidisciplinary team reviewed current literature and the expert panel created a series of recommendations. The 3 themes highlighted were: (1) health-care professionals caring for children who require a surgical procedure must recognize the risk of opioid misuse; (2) nonopioid analgesic use should be optimized in the perioperative period; and (3) patient and family education with regard to safe opioid use should occur both before and after the surgical procedure. This effort represents the first opioid-prescribing guidelines for children following a surgical procedure and is a promising first step in a more cohesive approach to address the opioid epidemic.

Lin Y, Lou E, Lam TP, Cheng JCY, Sin SW, Kwok WK, Wong MS. The intelligent automated pressure-adjustable orthosis for patients with adolescent idiopathic scoliosis: a bi-center randomized controlled trial. *Spine (Phila Pa 1976).* 2020 Oct 15;45(20):1395-402.

This study investigated the use of an automated pressure-adjustable orthosis compared with a traditional orthosis for the management of adolescent idiopathic scoliosis and demonstrated enhanced wear, with a mean duration that was 1 hour longer, and a 34% higher targeted pressure in the pressure-adjustable orthosis group. Although this concept is intriguing, currently, this bracing option is not commercially available in the United States. It also appears quite prominent in the provided images, raising concerns about the generalizability of these results.

Singh KA, Shah H, Joseph B. Comparison of plaster-of-Paris casts and Woodcast splints for immobilization of the limb during serial manipulation and casting for idiopathic clubfoot in infants. *Bone Joint J.* 2020 Oct;102-B(10):1399-404.

In this randomized controlled trial, 23 idiopathic clubfeet were immobilized with plaster-of-Paris casts and 23 clubfeet were treated with Woodcast splints that only encircled two-thirds of the limb. The time required for the application and removal of Woodcast splints was significantly less than that for the plaster-of-Paris casts ($p < 0.001$), although both treatments had similar effectiveness in maintaining the deformity correction. In this small series, Woodcast splints showed promise as an alternative to the traditional Ponseti method. Although further study is warranted, this has exciting potential to increase clinic efficiency given its decreased application and removal time while achieving similar outcomes.