


Recommendations for the Care of Pediatric Orthopaedic Patients During the COVID-19 Pandemic

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Abstract

The COVID-19 pandemic has necessitated modifications to pediatric orthopaedic practice to protect patients, families, and healthcare workers and to minimize viral transmission. It is critical to balance the benefits of alterations to current practice to reduce the chances of COVID-19 infection, with the potential long-term impact on patients. Early experiences of the pandemic from orthopaedic surgeons in China, Singapore, and Italy have provided the opportunity to take proactive and preventive measures to protect all involved in pediatric orthopaedic care. These guidelines, based on expert opinion and best available evidence, provide a framework for the management of pediatric orthopaedic patients during the COVID-19 pandemic. General principles include limiting procedures to urgent cases such as traumatic injuries and deferring outpatient visits during the acute phase of the pandemic. Nonsurgical methods should be considered where possible. For patients with developmental or chronic orthopaedic conditions, it may be possible to delay treatment for 2 to 4 months without substantial detrimental long-term impact.

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Since the first case of the novel coronavirus (COVID-19) was reported in Wuhan, China in December 2019, viral infection has spread at an alarming rate. On January 30, 2020, the World Health Organization (WHO) announced COVID-19 as a Public Health Emergency of International Concern, and by March 11, 2020, it was officially declared a pandemic.¹ As of April 5, 2020, the United States has 330,891 reported cases and 8,910 deaths in total, with 64,966 of those cases and 2,472 deaths attributed to New York City alone.^{2,3} The rapid progression of COVID-19 infection rates has stimulated the international implementation of social distancing practices and temporary cessation of all nonessential businesses. Because COVID-19 is primarily transmitted through respi-

ratory droplets and close contact, strict adherence to social distancing procedures is critical to limit the spread of infection and mitigate the foreseen impact on healthcare systems.⁴ Within the healthcare setting, adaptations to regular clinical procedures are necessary to reduce the risk of infection in patients, families, and healthcare providers alike while balancing the risks and benefits of delaying or altering typical patient care.

Overall Principles

The COVID-19 pandemic has necessitated substantial changes to the current practice. These guidelines are meant to offer a framework for safe and ethical management of the pediatric orthopaedic patient in these

uncertain times. We trust that each surgeon considers whether the benefits of typical treatment protocols before the COVID-19 crisis outweigh the risks in this unusual time. This is likely to require constant re-evaluation as the situation evolves and be based on the local healthcare constraints, rather than a “one-size-fits-all” approach.

These guidelines are based on an accumulation of expert opinion and evidence-based recommendations where possible, with the aim to reassure surgeons that pediatric patients can be safely and ethically managed with minimal negative long-term consequences. Once some post-pandemic normalcy has been restored, it will be imperative to use data obtained at this time to inform future management on the safety of these approaches that were necessitated by the risk of COVID-19.

During the COVID-19 pandemic, there will be an increased emphasis on nonsurgical strategies. Patients who need urgent orthopaedic management, such as serious traumatic injuries or tumors, will be managed according to the typical standard of care. The COVID-19 pandemic will more dramatically affect practice regarding elective procedures and the ensuing follow-up.

These changes in clinical practice are guided by following three overarching principles:

- (1) Clinical urgency
- (2) Patient and healthcare worker safety
- (3) Conservation of healthcare resources

General Changes in the Time of COVID-19

Liang et al⁵ from Singapore recently published their experiences on managing orthopaedic patients during the pandemic. Their advice, along with recommendations from China, the

British Orthopaedic Association (BOA), and the British Society for Children’s Orthopaedic Surgery (BSCOS), have formed the basis for a lot of the strategies discussed below.

The Singapore Group identified the need for balance between continuing care and safety for patients, caregivers, and healthcare workers. They concluded that day-case procedures could continue, given their limited impact on healthcare resources, especially allowing for rapid turnover of hospital beds potentially needed for acute admissions. In addition, same-day discharge minimizes the risk to the patient and family of nosocomial exposure to COVID-19.

Here at British Columbia Children’s Hospital (BCCH), Vancouver, Canada, we have implemented a rotating team approach in these unusual times. Splitting the department into self-reliant cells allows groups to be physically quarantined and avoids cross-contamination. There is a backup, or “Surge” team available each day, if the primary team is overwhelmed or unable to perform their duties—for instance, if a team member becomes unwell themselves from COVID-19. The lead surgeon for each day manages the trauma and delegates tasks to the other team members, aiming to minimize personnel exposure while maintaining quality care.

Overall, a pragmatic approach should be taken to treatment decisions and a specific note that the patient was assessed and managed during the coronavirus pandemic will be imperative in the future to assess quality maintenance and the long-term impact of COVID-19 in the pediatric orthopaedic setting. These recommendations should be viewed as guidance and be modified based on locally available resources. Specific reorganization procedures will depend on the practice setting. Considerations to take into account include the num-

ber of attending staff surgeons, support staff (clinic/nursing/extended providers/therapy team), and junior staff. Smaller units might have to contact larger centers if staffing becomes an issue.

Units should also consider whether they are in the acute phase and perhaps temper their response as the situation improves.

Recommendations—General considerations⁶⁻¹⁰

- (1) Limit in-person patient review to definitive decision-maker (Attending surgeon)
- (2) Separate in-patient teams attending to ward patients, operating, and covering on-call and an out-patient team managing clinic
- (3) Keep team prepared and informed—regular briefings, public health guidance, access to PPE, requirements for self-isolation, and facilitate remote working
- (4) Train and prepare allied health staff in cast application and removal
- (5) Plan trauma clinic for minor injuries to offload ED
- (6) Maximize remote management of injuries via increasing access for GPs in remote areas
- (7) Maximize the use of removable casts and splints
- (8) Minimize in-person visits.
- (9) Maximize follow-up via video or teleconference
- (10) Perform follow-up imaging ONLY if likely to make a significant change to care
- (11) Use web-based information or written guidelines to minimize rehabilitation options
- (12) Consider postponement of all elective work requiring admission, especially PICU admission
- (13) Monitor the mental health of your staff
- (14) Practice rational management of limited resources—for instance, PPE

Recommendations—Operating room considerations

- (1) Minimize personnel—excuse medical students and company representatives
- (2) Avoid laminar flow
- (3) Use N-95 masks and goggles—power tools may be associated with significant droplet and fine particle generation
- (4) Use additional face shield—can be reusable
- (5) Do not use pulse lavage
- (6) Limit team in the operating room during high-risk periods—intubation/extubation
- (7) Use electrocautery with smoke evacuator
- (8) Use absorbable sutures as much as possible
- (9) Use clear dressings
- (10) Avoid PICO dressings
- (11) Use splints and removable casts

Recommendations for Mitigating Risk to the Orthopaedic Surgeon

The risk to all healthcare workers is significant, and orthopaedic surgeons can learn from the early experiences of surgeons in Italy and China. In Italy, front-line healthcare workers were disproportionately prone to COVID-19 infection, and often contracted the most severe form of the disease. The risk specifically to surgeons is that the virus is transmitted primarily through aerosols—droplets containing the virus. This puts anesthesiologists at particular risk during intubation and extubation, but the rest of the team is also susceptible. The risk of aerosol-generating procedures has led centers to minimize personnel in the operating room. Orthopaedics often requires the use of power tools with aerosolization of material putting the team at further increased risk in comparison to other surgical procedures. Although blood is not the

preferred route of the virus, research supports the idea that COVID-19 is an opportunistic invader. Consequently, blood donors in Wuhan are now screened for the virus.

Guo et al surveyed orthopaedic surgeons in Wuhan, China, infected with COVID-19 and provided recommendations to safeguard the surgeon according to their experiences as the first province to experience the outbreak.^{11,12}

They recommended that healthcare workers have a high level of vigilance and take all necessary precautions to protect themselves from infection with COVID-19. They should use PPE and consider urging patients to wear masks. Orthopaedic surgeons need to be able to manage often limited resources, particularly PPE, and be flexible in their schedules, such as canceling elective work and being ready to be redeployed as necessary. They should avoid close contact with family members after being in known exposed environments and practice the usual social distancing measures to keep the community safe in all situations.

Surgeons should also be careful to monitor their own health regarding both COVID-19 symptoms and also manage fatigue and stress which could compromise their own immunity.

Management of Trauma

During the COVID-19 pandemic, prevention is better than cure. However, traumatic injuries will need to be considered for both surgical and nonsurgical management, regardless of clinic closures. Although social distancing and isolation might serve to limit trauma numbers, there will still be a clinical need to proceed with surgery in many instances. With parks closed, there has been a recent spike in purchase of home play equipment and trampolines. An average of 40% of pediatric injuries

requiring hospitalization or emergency department review occur in the home.¹³ Consequently, being isolated at home will not prevent all injuries. Minimizing the number of interactions during treatment for traumatic injuries will help protect the patient, caregiver, and healthcare workers.

Social and physical distancing preventive measures remain critical to reduce spread.¹⁴ A normal trauma clinic would present many situations capable of facilitating viral transmission. Take the scenario of a child sustaining a both bones forearm fracture that requires reduction in the ED. This child and their family come in contact with ambulance paramedics, the ED booking clerk, nurse, ED physician, radiology booking clerk and technician, orthopaedic staff, and all the staff members required for follow-up. If this same child requires surgery and a short in-patient stay, the potential transmission contact will be exponentially high. Therefore, it is ethically logical to implement changes to minimize these potential transmissions.

When considering surgical management, in-patient care should be kept to a minimum and used only when no alternative is available. Every effort should be made to maximize day surgery options.

During the COVID-19 pandemic, there will be increased emphasis on managing children with nonsurgical strategies and limiting outpatient visits.

The aim is to minimize long-term consequences by prioritizing conditions that have immediate, permanent morbidity, or lack a practical remedial option.

Day-Case Surgery

Day-case surgery can be an option for many injuries requiring surgical management:⁸

- (1) Reduction of joint dislocations
- (2) Fractures with abnormal neurology or soft-tissue compromise that is resolving
- (3) Periarticular fractures
- (4) Extra-articular femoral fractures in children aged less than six years

General Trauma Management Considerations

Management of nonaccidental injury should not change.⁸ In many instances of traumatic injury, minimizing postoperative imaging can be done safely. A 2018 systematic review found that immediate postoperative imaging led to an absolute benefit increase in identifying complications of only 0.22%.¹⁵ This can be a valuable application in the current situation, and all imaging that will not change management should be avoided.

With open fracture cases, consideration should be given to wash-out and application of a windowed cast. Cases of septic arthritis and osteomyelitis with subperiosteal collection are likely to require operative surgery and ongoing inpatient management. Aim to minimize procedures as much as possible, and use a PICC line at time of surgery. Keep imaging to a minimum, choosing the single, most useful imaging modality to limit contacts and transmissions between patients and healthcare workers. Where possible, consider the use of at-home intravenous antibiotic treatment. Dislocations should be reduced in emergency wherever possible and managed as day surgery if admission is required.

Fracture Management

These treatment protocols should serve as a framework for the management of common fractures in this time. At our center, trauma referrals are reviewed by the day's attending

surgeon. As much as reasonably possible, required follow-ups are done using video or teleconferencing, and conditions which can wait are postponed during this period. Much of the clinical assessment can be done via videoconference or teleconference with the family. Imaging is only performed if it is likely to change the treatment plan. When not in-person, follow-up needs to be carefully organized to ensure patients are not lost to follow up, and parents have appropriate support for the extra tasks with which they are being entrusted.

Most upper limb fractures can be managed conservatively. As an overarching principle, aim to maximize the use of removable casts and splints. Accept that there will be more initial deformity than what might previously have been tolerated; the high remodeling potential in pediatric patients mitigates the risk of residual deformity, and there are options for highly successful corrective procedures at a later date if needed.¹⁶

Please refer to Table 1 for a summary of recommendations for pediatric orthopaedic trauma management.

Management of Nontraumatic Pediatric Orthopaedic Conditions

Many orthopaedic units in hospitals across the globe have begun to take preventive measures by reducing or closing clinics to most outpatients. Taking lessons learned from early experiences with the COVID-19 pandemic in Singapore and China, the BCCH Orthopaedic Surgery department has scaled back clinics as much as possible for a 3-month period. Key decisions have been made to limit or postpone treating children with developmental, congenital, or chronic orthopaedic conditions, such as developmental dysplasia of the hip (DDH), Legg-Calvé-Perthes dis-

ease (LCPD), clubfoot, scoliosis, and orthopaedic conditions secondary to cerebral palsy.

The decision to defer clinic visits for up to three months may be fraught with concern over the long-term impact of delayed treatment. This is particularly true in conditions, such as DDH, where early detection and treatment are widely regarded to optimize outcomes. However, the risks of deferring treatment must be weighed against the risks of continuing treatment as usual during the COVID-19 crisis. A unique feature of pediatric care is the number of caregivers and/or family members who typically accompany an infant or child to a clinic appointment. It is common to see two or three caregivers in clinic along with the child. In addition, there are typically a minimum of four healthcare workers in contact with the family during the visit. Each family member present could potentially be an asymptomatic or presymptomatic vector for viral transmission, increasing the chance of spreading infection to healthcare workers or other patients and families. Eliminating as many of these visits as possible during the peak of the pandemic can greatly reduce the chances of viral spread.

Another primary concern is for the safety of the child. Although initial impressions of COVID-19 have been that children are not as susceptible to infection, a recent retrospective review of the epidemiology of pediatric cases in China suggested that infants were more susceptible to the severe infection than older children, with 10.6% of cases severe or critical in infants younger than one year of age.²⁰ For a condition such as DDH, most children coming to the orthopaedic clinic for DDH are younger than one year of age; therefore, these patients represent a potentially vulnerable cohort during this time. Children with cerebral palsy also represent a particularly at-risk

Table 1**Recommendations for Orthopaedic Pediatric Trauma Management^{8,17}**

Injury	Immediate	Follow-up
Clavicle fracture ¹⁸	Sling in ED Commence ROM in 1 week	None required Offer teleconference
Shoulder dislocation	Reduce in ED Sling for comfort Commence ROM in 1 week	Teleconference at week 4–6
Midshaft humeral fracture	Minimally displaced—Collar and cuff Displaced—Well-fitting high above elbow splint Commence ROM from 2 weeks	Teleconference at week 4–6
Supracondylar fracture (no neurovascular compromise) ¹⁹	Gartland 1—Collar and cuff, removed by family at 3 weeks Avoid high-risk activities for further 3 weeks Gartland 2A—Manipulation under anesthetic Above elbow removable splint, removed by family at 3 weeks Avoid high-risk activities for further 3 weeks Gartland 2B—Manipulation under anesthetic ± K-wires Above elbow removable splint, removed by family at 3 weeks Avoid high-risk activities for further 3 weeks Gartland 3—Surgical management with K-wires Document COVID status	None required 2A (manipulation only)—Family to remove cast at week 4 Teleconference at week 6 2B (wires)—Fracture clinic at week 4—removal of splint and wires No high-risk activities for a further 3 weeks Teleconferencing visits to monitor ROM Fracture clinic at week 4—removal of splint and wires No high-risk activities for a further 3 weeks Teleconferencing visits to monitor ROM
Lateral Condyle fracture	Undisplaced—Well-fitting above elbow backslab Displaced—Surgical management with screw ^a fixation and removable cast or wires	Radiograph at week 2 to ensure no displacement and then family to remove cast at week 6 Follow-up after COVID pandemic Family to remove cast at week 4 Teleconference at week 6 Follow-up after COVID pandemic If wires—fracture clinic at 6 weeks—removal of splint and wires No high-risk activities for a further 3 weeks Teleconferencing visits to monitor ROM
Monteggia and Galeazzi fractures	Admit for surgical management Manipulation under anesthetic first line If unsuccessful or requires open reduction—recommend plating ^a	Soft cast removal by family at week 6 Teleconference at week 6
Single bone forearm fracture	Apply above elbow backslab or soft cast	Cast removal by family at week 4 Teleconference at week 6
Both bone forearm fractures	Minimally displaced—Above elbow backslab or soft cast Displaced—Surgical management or reduction in ED Anatomical reduction not necessary Apply molded cast with soft gutter If > 10 years—check radiograph at 2 weeks If surgical management then plate fixations ^a	Family to remove cast at week 5–6 Teleconference at week 8–10 Family to remove cast at week 6 Teleconference at week 8–10

*(continued)*ED = emergency department; ROM = range of motion ^a Significant change in usual management in the setting of COVID

Table 1 (continued)

Recommendations for Orthopaedic Pediatric Trauma Management^{8,17}		
Injury	Immediate	Follow-up
Grade 1 open forearm fracture	Irrigation and one dose of IV antibiotics Manage as fracture pattern	As per fracture pattern
Buckle fracture—Distal radius	Apply removable wrist splint	Family to remove at week 3 No follow-up required
Distal radius fracture	Undisplaced—Apply wrist splint	Family to remove in 4–6 weeks No follow-up required
	Displaced—Apply below elbow molded gutter cast, extend above elbow and reinforce with soft cast	Family to remove cast at week 6 Teleconference at week 8
Potential scaphoid fracture	Apply thumb extension splint	Family to remove splint at week 6 Teleconference at week 8 Review at month 3–4 with radiograph to exclude non-union
Knee ligament injuries/Patellar dislocations	Brace for 7–10 days, then commence ROM and directed written physiotherapy program	Teleconference at week 6 MRI at month 3 to 4—late reconstruction
Closed femoral shaft fracture	Apply thomas splint and admit <7 years—Hip spica >7 years—Surgical stabilization	Spica removal at week 6 Review operatively fixed fracture at week 8–10
Closed distal femoral/proximal tibial physeal fracture	Admit for surgical stabilization	Dependent on procedure undertaken
Intraarticular fracture of the knee	Surgical management if displaced	Dependent on procedure undertaken
Toddler fracture	Apply above knee soft cast	Family to remove at week 4–6 No follow-up required
Potentially unstable distal tibial metaphyseal fracture	Apply a below knee backslab and reinforce with soft cast	Family to remove cast at week 4–6 Teleconference at week 6
Tibial shaft fracture >10 years	Minimally displaced—Apply above knee backslab and reinforce with soft cast Consider admission for compartment monitoring depending on mechanism	Radiograph at week 8 Teleconferencing after radiograph review Family informed when to remove cast guided by radiograph
	Displaced—If soft tissues amenable; molded cast or internal fixation If soft tissues not amenable; consider ex-fix and involvement of limb recon team	Dependent on surgical technique used
Salter-Harris 2 fracture—distal tibia	Below knee backslab reinforced with soft cast Non-weight-bearing	Family to remove cast at week 6 Teleconference at week 8
Triplane and tillaux fractures	Undisplaced—Below knee backslab reinforced with soft cast	Family to remove cast at week 6 Teleconference at week 8
	Displaced—Apply cast in internally rotated position If gap/step minimal—Reinforce with soft cast If gap/step unacceptable—Surgical reduction and fixation	Family to remove cast at week 6 Teleconference at week 8
Fibular fracture	Apply walking boot Weight-bear as tolerated	Family to remove boot at week 4 Teleconference week 6
Foot fractures (excluding Lis Franc injuries)	Apply walking boot or below-knee backslab reinforced with soft cast Weight-bear as tolerated	No follow-up required

ED = emergency department; ROM = range of motion

^a Significant change in usual management in the setting of COVID

Table 2**Recommendations for Orthopaedic Pediatric Elective Management^{19,20}**

	Management	Rationale	Follow-up
Hip disorders			
Developmental dysplasia of the hip (DDH)—Unstable and dislocated hips	Postpone risk factor screening	Outcomes remain good with bracing treatment started at month 2–4	Advice on hip healthy swaddling habits Follow-up after COVID pandemic Aim to commence harness at month 2–4 Risk factor screening can restart after the COVID pandemic
Slipped capital femoral epiphysis (SCFE)—Including mild-severe stable and unstable	Admit for in-situ pinning Avoid open reduction No prophylactic pinning	Severe/Unstable slip—open reduction will necessitate longer in-patient stay Minimize surgical intervention	Non-weight-bearing for 6 weeks Teleconference at week 6 Further follow-up after COVID pandemic
Legg-Calvé-Perthes disease (LCPD) ^{23,24}	<7 years—ROM or bracing treatment >7 with >50% head involved ± extrusion and before fragmentation—Recommend containment with brace	Bracing treatment has good results ^a	Consider teleconference with radiograph to assess stage Follow-up after COVID pandemic to determine whether surgical intervention is necessary
Foot disorders			
Clubfoot—new	Do not commence ponsetti casting	Casting requires multiple reviews and potential for transmissions	Ponsetti casting started later can be successful Review after COVID pandemic (3 months) Consider teleconferencing with stretching advice
Clubfoot—Residual	Postpone—can wait without likely ill-effect	Each treatment option requires multiple reviews and potential for transmissions	Follow-up after COVID pandemic Consider teleconferencing with stretching advice
Tarsal coalition	Postpone—can wait without likely ill-effect	Each treatment option requires multiple reviews and potential for transmissions	Follow-up after COVID pandemic
Charcot-Marie-Tooth (CMT)	Postpone—can wait without likely ill-effect	Each treatment option requires multiple reviews and potential for transmissions	Follow-up after COVID pandemic
Spine²⁵			
Adolescent idiopathic scoliosis (AIS)	Minimize routine follow-up	Minimal ill effect from 2- to 3-month delay	Follow-up after COVID pandemic Ideally 2–3 months
Neuromuscular scoliosis	Minimize routine follow-up	Minimal ill effect from 2 to 3 month delay	Follow-up after COVID pandemic Ideally 2–3 months
Limb reconstruction			
Minor deficiencies/Defects	Postpone and minimize reviews	Usual follow-up requires multiple reviews and potential for transmissions	Follow-up after COVID pandemic Ideally 3 months Guided-growth procedures likely to increase after this (continued)

^a Significant change in usual management in the setting of COVID.

Table 2 (continued)

Recommendations for Orthopaedic Pediatric Elective Management^{19,20}			
	Management	Rationale	Follow-up
Major deficiencies/Defects	Postpone and minimize reviews	Usual follow-up requires multiple reviews and potential for transmissions Rehabilitation will not be available	Follow-up after COVID pandemic Ideally 3 months Guided-growth procedures likely to increase after this
Cerebral palsy surgery	Only consider in situations of intractable pain or complications of previous procedures		
GMFCS I-III	Postpone	Surgical success dependent on rehab and surgery—access to rehab will not be available/would result in multiple reviews and potential for transmissions	Follow-up after COVID pandemic
GMFCS IV-V	Postpone	Surgical success dependent on rehab and surgery—access to rehab will not be available/would result in multiple reviews and potential for transmissions	Follow-up after COVID pandemic
Pediatric sports			
Anterior cruciate ligament (ACL)	Postpone	Surgery can have excellent outcomes with period of delay	Follow-up after COVID pandemic Offer prehab program
Locked knee/Bucket-Handle meniscal tear	Admit for surgery—Arthroscopy ± repair	Urgent surgical procedure	Use surgical recommendations Give written physiotherapy instructions Teleconference at week 6—with advice depending on surgery performed
Osteochondritis dissecans (OCD)	Postpone	Surgery can have excellent outcomes with period of delay	Follow-up after COVID pandemic Teleconference and implement activity modification measures
Shoulder reconstruction	Postpone	Surgery can have excellent outcomes with period of delay	Follow-up after COVID pandemic Offer prehab program

^a Significant change in usual management in the setting of COVID.

patient cohort because of the substantial comorbidities typically involved. Although a decision to defer patients with these conditions for three months does introduce concerns about long-term impact, the heightened risk of viral transmission between patients, caregivers, and healthcare workers outweighs the risk of treatment deferral for three months in many cases.

Please refer to Table 2 for a summary of recommendations for non-traumatic pediatric orthopaedic condition management.

DDH

Clinic visit deferrals rightly prompt concerns about late detection/treatment for DDH patients. How-

ever, data from the International Hip Dysplasia Registry (IHDR) suggest that harness or brace treatment can still be effective in older infants and that if necessary, closed reduction is successful in 91% of cases in infants up to one year of age.^{21,22} An Ortolani positive hip that remains untreated for three months may eventually require open reduction, but the success rates of both closed

and open reduction even in older infants seen within IHDR can allay some of these concerns.

At present, the main priority is reducing the spread of COVID-19. After careful consideration of the risk/benefit ratio of delaying treatment to reduce odds of infection, BCCH is choosing to postpone assessment and treatment of DDH for the next 2 to 4 months. There is evidence to suggest that good outcomes for DDH can still be achieved, by either conservative or surgical approaches, beyond 4 months of age. Even when treated by conservative methods, infants require frequent hospital visits throughout their treatment course. Given the emerging evidence showing infants may be vulnerable to COVID-19 infection, this would put them at increased risk.

Consideration should be given to provide extensive educational tools and guidance to parents on hip healthy swaddling techniques and hip healthy baby carriers.

Postpandemic Impact Assessment

Once the COVID-19 pandemic has settled, it will be important for surgeons to look back on the results of the way trauma and elective care have been managed during this period. Research will be needed to look at what the negative consequences of these interventions have been. We expect there to be more residual deformity to correct, conditions that might have been addressed more simply sooner might require more extensive procedures, and all surgeons will have to manage their own surgical backlog as best they can according to their available resources.

COVID-19-necessitated practice changes provide the potential for positives lessons that can result in meaningful long-term improvements in care. With a greater emphasis on

videoconferencing and teleconferencing, it might be possible to see more routine patient reviews in this manner, freeing up personnel and resources for more involved or complicated new patients. Managing without such frequent imaging might highlight which conditions truly require the routine follow-up radiograph and which do not, ultimately reducing unnecessary exposure to radiation and unnecessary clinic visits.

Teams may also gain unexpected new experience in the management of limited resources. They will likely learn to be more adaptable and resilient, having worked in today's constantly changing environment. These are valuable skills which are ultimately learned best through experience. Adapting to perform clinical practice during this unusual time of COVID-19 could galvanize the pediatric orthopaedic community both locally and worldwide.

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