

Core and optional content:

AOTrauma Course—Managing Pediatric Musculoskeletal Injuries

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Welcome to AOTrauma courses in pediatric trauma and orthopedics in a new highly interactive format

This document defines and documents the core/optional content to qualify as an AOTrauma Course—Managing Pediatric Musculoskeletal Injuries. The course is designed to be globally applicable and adaptable to regional differences, depending on different needs and logistical considerations without impacting the essential content to be covered.

Introduction

The AOTrauma Course—Managing Pediatric Musculoskeletal Injuries and the two optional AOTrauma Seminars—Special Pediatric Trauma Conditions and Pediatric Orthopedic Conditions are modular face-to-face educational events that constitute part of the overall AOTrauma Pediatrics curriculum, complemented by expert modules/seminars and further modalities—self-directed learning opportunities, resources, webinars, videos, etc.

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Link to AOTrauma Pediatrics Curriculum website

<https://aotrauma.aofoundation.org/Structure/education/educational-programs/pediatrics>

Link to AOTrauma Pediatrics Faculty Support Package

<https://aotrauma.aofoundation.org/Structure/faculty-center/Pages/faculty-center.aspx> (login required)

Competency-based curriculum

The development of this course followed a backward planning process leading to a competency-based curriculum (12 competencies and associated objectives)—please refer to the Competency Booklet PDF.

This course may be approved to carry the AO Competency-Based Curriculum stamp. See separate document for criteria and more information.



Chairperson Guide

Also check the Chairperson Guide in the Faculty Support Package for the course goal, overall learning objectives, target participants, faculty preparation, logistics, and much more about the specifics of this course.

Course modules

ALL AOTrauma Pediatrics educational events/activities (eg, course)

Opening session

Closing session

AOTrauma Course—Managing Pediatric Musculoskeletal Injuries

Topic/Module 1 Fundamentals of managing pediatric fractures

Topic/Module 2 Assessment and planning

Topic/Module 3 Decision making

Topic/Module 4 Lower limb—femoral fractures

Topic/Module 5 Lower limb—knee injuries

Topic/Module 6 Lower limb—tibial, fibula, and ankle injuries

Topic/Module 7 Entire lower limb

Topic/Module 8 Upper limb—shoulder and humerus

Topic/Module 9 Upper limb—supracondylar fractures

Topic/Module 10 Upper limb—other elbow injuries

Topic/Module 11 Upper limb—forearm and wrist fractures

Topic/Module 12 Entire upper limb

For the AOTrauma Seminars content, refer to the separate documents:

AOTrauma Seminar—Special Pediatric Trauma Conditions

Topic/Module 13 Managing the child and family

Topic/Module 14 Management of bone and joint infection in children

Topic/Module 15 Serious musculoskeletal injuries in children

AOTrauma Seminar—Pediatric Orthopedic Conditions

Topic/Module 16 Slipped capital femoral epiphysis

Topic/Module 17 Deformity management

Topic/Module 18 Pathological bone (non-oncological aspects)

In the core/optional content listing the core (mandatory) content is displayed in orange whereas optional content is displayed in gray.

Timing for practical exercises is based on experience.

Timing for small group discussions reflects minimal suggested time.

Core/optional content—all AOTrauma Pediatrics educational events (eg, course)

Opening session	Proposed timing:	Core/optional
Introduction to course <ul style="list-style-type: none"> • Course objectives • Logistical information including remarks about educational methods/formats, expectations 	10'	C
Closing session	Proposed timing:	Core/optional
Panel discussion— Closing session with all faculty <ul style="list-style-type: none"> • Participant-generated Q and A to be collected on paper during day OR offer reflection time before last break to generate questions in informal groups, moderator collects and bundles questions 	30'	C
Lecture— Summary of whole course learning and closure <ul style="list-style-type: none"> • Can include attainment of course objectives and take-home messages, acknowledgments, regional/local outlook, evaluations 	10'	C

Core/optional content—AOTrauma Course—Managing Pediatric Musculoskeletal Injuries

Topic/Module 1: Fundamentals of managing pediatric fractures

<ul style="list-style-type: none"> • Define normal children's anatomy and physiology • Recognize the relevance of age in relation to injury pattern and optimum treatment of the whole child • Explain the relationship of age to modeling capacity and define acceptable limits of malunion • Recognize the importance of patient safety • Describe the impact of disturbance of growth in the management of pediatric fractures 	Proposed timing:	Core/optional
1.1 Plenary session— Warm-up cases to promote thinking about modeling capacity Cases: metaphyseal forearm fracture, humeral diaphyseal fracture, femoral diaphyseal fracture Note: moderator does not give outcome of treatment as the cases will be revisited at end of module	15'	C
1.2 Lecture— The influence of growth and modeling in pediatric fractures <ul style="list-style-type: none"> • The relationship of age/bone segment to remodeling capacity—scientific aspects 	20'	C
1.3 Lecture— What is our acceptable standard of treatment? Are we there yet? How can we improve? <ul style="list-style-type: none"> • Safety, effectiveness, function, cost/benefit for child/family/health system • According to local health economy resources, ie, independent of technique 	20'	C
1.4 Plenary discussion OR expert panel— Reevaluation of warm-up cases with the outcomes	10'	C
1.5 Lecture— Patient safety essential to management of pediatric patients Address communication, nonaccidental injury, analgesia, work-rounds, relationships, psychosocial and education aspects and the fact that serious failures of care are not solely due to inadequate surgical management, eg, <ul style="list-style-type: none"> • Inability to elicit history or perform examination, which is more difficult in children than in adults • Failure to identify nonaccidental injury • Errors in prescribing medication that can be fatal 	10'	C

Topic/Module 2: Assessment and planning

- Identify how to use appropriate imaging and other assessment techniques with the correct frequency to plan management, monitor treatment and define outcomes
- Describe available classification systems, how to use them and why
- Describe available validated outcome measures for different injury patterns
- Establish principles of recognized predictors associated with satisfactory long-term outcomes to avoid overinvestigation and/or overtreatment
- Identify recognized predictors that demand long-term review to avoid poor outcomes

Proposed timing: Core/ optional

2.1	Lecture— Optimizing investigations for children—how much radiation exposure is necessary?	20'	C
	<ul style="list-style-type: none"> • Define adequate imaging including image quality and patient positioning for x-ray; CT, ultrasound, MRI, intraoperative arthrogram; radiation risk reduction of surgeon and patient. How much x-ray do we need? • Classification—assists diagnosis, prerequisite for planning, quality control, assessment of union • Follow-up and assessment of long-term outcome (define key assessment parameters)—do you need an x-ray? 		
2.2	Lecture— The AO Pediatric Comprehensive Classification of Long-Bone Fractures (PCCF) and the AO Comprehensive Injury Automatic Classifier (AOCOIAC) Link to AO classification and treatment algorithms	15'	C
2.3	Plenary session— Summary to reevaluate cases shown in lecture “Optimizing investigations...”	15'	C
	<ul style="list-style-type: none"> • Assessment of distal radial and lateral condylar fractures to highlight the need for adequate x-ray investigations and reduce radiation exposure • Injury patterns: Monteggia, distal humerus, supracondylar fractures to highlight the special features of the classification system 		

Topic/Module 3: Decision making

Proposed timing: Core/ optional

3.1	Lecture— Strategy for managing injuries at different ages	20'	C
	<ul style="list-style-type: none"> • Choice of technique/method according to age, bone segment, development, and available infrastructure 		
3.2	Open small group discussions— Clinical decision making based on module 1 Fundamentals of managing pediatric fractures and module 2 Assessment and planning	40'	C
	<ul style="list-style-type: none"> • Address 3 age groups 0–3 y, 4–10 y, >10 y • Give examples of injuries to the epiphysis, metaphysis, and diaphysis 		
3.3	Plenary session—Summaries from each table of their discussions on decision making	10'	O

Topic/Module 4: Lower limb—femoral fractures

- Evaluate the range of treatment options for epiphyseal, metaphyseal and diaphyseal femoral fractures
- Define indications for and principles of femoral traction
- Perform the technique for elastic nailing of femoral fractures and discuss limitations
- Perform the technique for ALFN in adolescents
- Compare and contrast treatment options in children of different ages, ie, casting, traction, plating, external fixator, intramedullary devices

	Proposed timing:	Core/optional
4.1 Plenary session— Warm-up cases Cases: Proximal metaphyseal, length unstable diaphyseal, and distal metaphyseal fractures	10'	C
4.2 Focused round-table group discussions— Treating femoral fractures in children and adolescents <ul style="list-style-type: none"> • Proximal femoral fractures (not including SCFE) • Femoral fractures—how to treat children up to 3 years of age (include traction, hip spica, elastic nailing) • Femoral fractures—how to treat children older than 3/4 years of age: address elastic nail and end caps, conventional nailing, external fixator, plating • Femoral fractures in older children/young adolescents—ALFN • Distal femoral metaphysis and epiphysis 	75'	C
4.3 Plenary session— Reevaluation of warm-up cases	10'	C
4.4 Practical exercise— ESIN in the femur: retrograde and anterograde techniques (half-group)	30'	C
4.5 Practical exercise— ALFN (half-group)	30'	C
4.6 Lecture— Summary of femoral fractures including attainment of objectives and take-home messages (or integrate this into previous ARS session or at the end of previous practical exercise)	15'	O

Topic/Module 5: Lower limb—knee injuries

- Relate mechanisms to patterns of injury around the knee
- Ensure identification of early recognition of pediatric knee injuries
- Evaluate different treatment methods for complex knee injuries
- Describe treatment options
- Anticipate complications and evaluate options for management

	Proposed timing:	Core/optional
5.1 Plenary session— Warm-up cases Cases: tibial spine injuries, physeal fractures, metaphyseal fractures	10'	O
5.2 Focused round-table group discussions— Treating knee injuries in children of different ages <ul style="list-style-type: none"> • Injuries in a younger child: tibial spine fractures, injuries to the extensor mechanism, including patella fractures/dislocations • Injuries in the older child (include ACL and meniscal tear) • Injuries of the proximal tibia (include tuberosity, crush trauma of the epiphysis, proximal metaphyseal injury) • Traumatic patellar dislocation with osteochondral lesion 	45'	C
5.3 Plenary session— Reevaluation of warm-up cases	10'	O
5.4 Lecture— Summary of knee injuries including attainment of objectives and take-home messages (or integrate this into previous ARS session or discussion groups with a pre-prepared slide for all groups)	15'	O

Topic/Module 6: Lower limb—tibial, fibular, and ankle injuries

	Proposed timing:	Core/ optional
<ul style="list-style-type: none"> Recognize the range of treatment options of tibial diaphyseal fractures Describe the presentation of compartment syndrome Describe the pattern of triplane fractures Apply principles of fracture reduction and fixation that maintain the function of the physis 		
6.1 Plenary session— Warm-up cases <i>Tibial diaphysis</i>	10'	C
6.2 Lecture— Tibial diaphysis <ul style="list-style-type: none"> Address challenges, conservative treatment (casting), operative treatment (ESIN and its problems), alternative treatments (external fixator and plating) Alert to danger of compartment syndrome 	15'	C
6.3 Lecture— Distal tibial fractures <ul style="list-style-type: none"> Address Tillaux/two-plane fractures, triplane fractures, unstable ankle fractures 	15'	C
6.4 <i>Alternative to replace the two above-mentioned lectures if time allows</i>	45'	O
Focused small group discussions—Tibial diaphysis and distal tibial fractures <ul style="list-style-type: none"> Address challenges, conservative treatment (casting), operative treatment (ESIN and its problems), alternative treatments (external fixator and plating) Alert to danger of compartment syndrome Address Tillaux/two-plane, triplane, and unstable ankle fractures 		
6.5 Plenary session— Reevaluation of warm-up cases	10'	C
6.6 Practical exercise— Triplane fractures	40'	O
6.7 Lecture— Summary of tibia, fibula, and ankle injuries including attainment of objectives and take-home messages (or integrate this into previous practical exercise)	10'	O

Topic/Module 7: Entire lower limb

	Proposed timing:	Core/ optional
7.1 Open small group discussions— Pediatric lower limb injuries <ul style="list-style-type: none"> Base on content/issues raised in knee, tibia, fibula, and ankle injuries Focus on specific treatments/injury patterns 	60'	C
7.2 Plenary session— Summaries from each table of their discussions on the entire lower limb	10'	O

Topic/Module 8: Upper limb—shoulder and humerus

	Proposed timing:	Core/ optional
<ul style="list-style-type: none"> Identify indications for operative intervention Describe assessment of injuries associated with musculoskeletal trauma around the shoulder, eg, peripheral nerve injury, brachial plexus injury, vascular injury, labral tears 		
8.1 Plenary session— Warm-up cases	10'	C
8.2 Focused small group discussions— Shoulder girdle and humerus <ul style="list-style-type: none"> Shoulder girdle injuries: Include scapula, clavicle proximal humerus including sterno-clavicular and acromio-clavicular, gleno-humeral, physeal injuries and dislocations Humeral diaphysis 	30'	C
8.3 Plenary session— Reevaluation of warm-up cases	10'	C
8.4 Lecture— Summary of module Attainment of objectives, take-home messages (alternatively ensure summary is integrated into previous plenary session)	15'	O

Topic/Module 9: Upper limb—supracondylar fractures

<ul style="list-style-type: none"> Define the indications for internal fixation in pediatric elbow fractures Explain the classification of supracondylar fractures Apply different methods of fixation List the treatment options and perform the most common techniques Anticipate, identify, and manage complications, eg, cubitus varus, vascular and peripheral nerve injuries, compartment syndrome 	Proposed timing:	Core/optional
9.1 Plenary session— Warm-up cases	10'	C
9.2 Focused small group discussions— Supracondylar fractures <ul style="list-style-type: none"> Traction—is there a place for it? (optional according to geographical region) Blount method: focus on complications or advantages/disadvantages Advantages of different wiring techniques: comparison of stability between crossed, lateral divergent, multiple wires including risks Radial external fixator/anterograde ESIN: address when and why traditional methods are ineffective 	60'	C
9.3 Plenary session faculty panel— Vascular/peripheral nerve injuries	20'	C
9.4 Plenary session— Reevaluation of warm-up cases	10'	C
9.5 Lecture— Summary of module Attainment of objectives and take-home messages (alternatively ensure summary is integrated into previous plenary session)	10'	O
9.6 Practical exercise— Supracondylar fractures <ul style="list-style-type: none"> Address cross k-wires, divergent lateral k-wires, radial external fixator 	60'	C

Topic/Module 10: Upper limb—other elbow injuries

<ul style="list-style-type: none"> Describe the late complications of lateral condyle fractures, eg, nonunion, malunion, tardy ulnar nerve palsy Recognize cubitus varus deformity from overgrowth, avascular necrosis from excessive surgical dissection Avoid missing the Monteggia lesion Perform intramedullary rod fixation of radial neck fractures 	Proposed timing:	Core/optional
10.1 Plenary session— Warm-up cases Cases: nonunion, malunion, growth arrest, missed Monteggia lesion	10'	C
10.2 Focused small group discussions— Other elbow injuries <ul style="list-style-type: none"> Lateral condyle, medial condyle and medial epicondyle fractures Focus on surgical approach, reduction and fixation techniques Radial neck fracture treatment according to the Métaizeau technique Video available on request/AO video catalog under webinars Monteggia lesion 	45'	C
10.3 Plenary discussion— Nonunion, malunion, growth arrest, missed Monteggia lesion <ul style="list-style-type: none"> For more complex cases “InQuizition” format (see chairperson guide) 	20'	O
10.4 Plenary session— Reevaluation of warm-up cases	10'	C
10.5 Lecture— Summary of module Attainment of objectives and take-home messages (alternatively ensure summary is integrated into previous plenary session)	10'	O

Topic/Module 11: Upper limb—forearm and wrist fractures

- Explain how the forearm functions as a multi-axial joint, ie, flexion, extension, pronation, supination
- Explain the methods of stabilization and fixation according to the level of fracture in the forearm and wrist
- Describe indications for surgical treatment
- Perform ESIN techniques for forearm
- Discuss indications for and application of other techniques

	Proposed timing:	Core/ optional
11.1 Plenary session— Warm-up cases	10'	C
11.2 Lecture— What is current (state-of-the-art) treatment?	15'	C
11.3 Focused small group discussions— Treating forearm and wrist fractures	45'	C
<ul style="list-style-type: none"> • Focus on avoidance of complications of forearm shaft fractures to ensure healing and restoration of function • Distal radius: Focus on function and healing • Guidelines for operative or nonoperative treatment: assessment to optimize treatment method: stability, fracture level, both bones, and deformity/displacement 		
11.4 Plenary session— Reevaluation of warm-up cases	10'	C
11.5 Lecture— Summary of module including attainment of objectives and take-home messages (alternatively ensure summary is integrated into previous plenary session)	20'	O
11.6 Practical exercise— Elastic nailing of forearm and radial neck fractures	40'	C

Topic/Module 12: Entire upper limb

	Proposed timing:	Core/ optional
12.1 Open small group discussions— Pediatric upper limb injuries	60'	C
<ul style="list-style-type: none"> • Base on content/issues raised in upper limb modules • Focus on specific treatments/injury patterns • Address complications and failures, eg, malunion, nonunion, loss of function, potential for modeling 		
12.2 Plenary session— Summaries from each table of their discussions on decision making	10'	O