

AO/OTA Fracture and Dislocation Classification Compendium

2018 Revisions

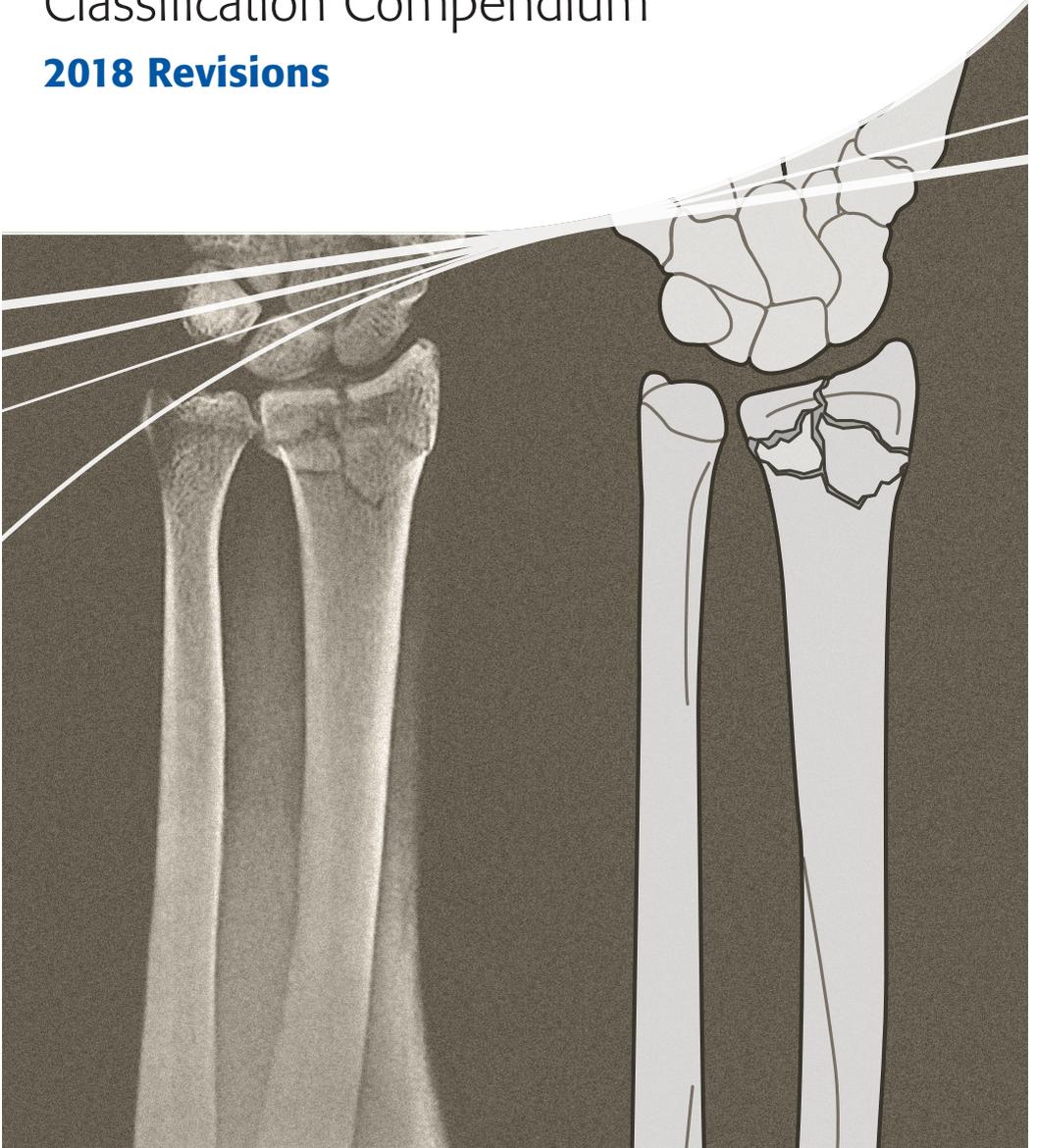
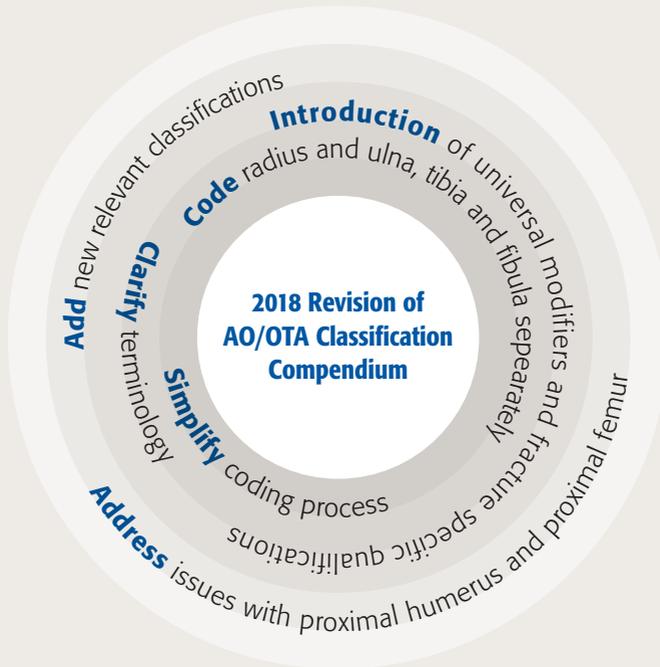


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Introduction

Composed of representatives appointed by the AOTrauma International Board and the Orthopaedic Trauma Association, the International Comprehensive Classification of Fractures and Dislocations Committee (ICFC) undertook this 2018 review and revision with the aims to:



These changes in content and presentation are intended to make the Classification Compendium more versatile and simpler to use. These improvements should also make injury description more reliable, thus improving research and fracture outcomes assessments.

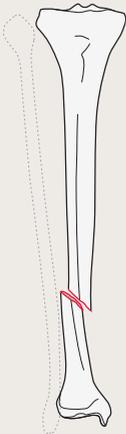
Terminology

The term “multifragmentary” replaces “complex” for the following reasons:

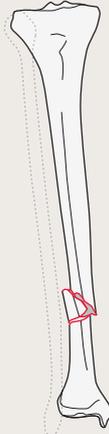
- “Complex” did not adequately describe a fracture pattern consisting of many fragments.
- “Multifragmentary” was previously used generically to refer to diaphyseal type B and C fractures and did not have a specific alphanumeric code. It is better used as a term to describe fractures consisting of many fragments.
- Consequently, the ICCFC felt that it is more concise to have three types of diaphyseal fractures: simple, wedge, and multifragmentary.
- “Multifragmentary” can be used to describe diaphyseal or end segment extraarticular fractures, and complete articular fractures.

EXAMPLES

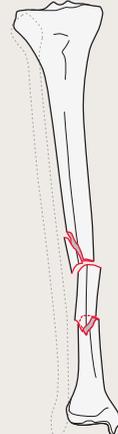
Tibia, diaphyseal segment
simple fracture
 42A



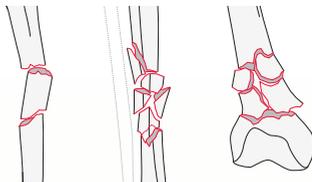
Tibia, diaphyseal segment,
wedge fracture
 42B



Tibia, diaphyseal segment,
multifragmentary fracture
 42C



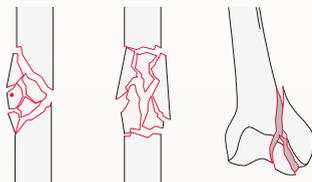
Multifragmentary diaphyseal, segmental diaphyseal, or end segment extraarticular fracture has many fracture fragments and after reduction there is no contact between the main fragments. The multifragmentary diaphyseal fracture also includes the segmental fracture.



Multifragmentary complete articular fracture has more than two fracture fragments of the articular surface.



Fragmentary is used to describe a wedge, multifragmentary segmental fracture or a partial articular fracture which has multiple fracture fragments.



Intact wedge consists of a single intermediate fragment located at the center of the fracture. Anatomical reduction of an intact wedge would reestablish contact between the bone fragments and restore the structure of the bone.



Fragmentary wedge consists of multiple intermediate fragments that compose the wedge. Once reduced, there is contact between the proximal and distal fragments.



Intact segmental fracture consists of a single intermediate fragment which if removed allows the proximal and distal fragment to collapse.



Fragmentary segmental fracture has multiple fracture fragments which following reduction allows the proximal and distal fragment to collapse.



Universal modifiers

The universal modifiers are descriptive terms of fracture morphology, displacement, associated injury, or location that are generalizable to most fractures. They provide detail that are optional for users.

- Universal modifiers may be added to the end of any fracture code within square brackets, eg, [1].
- Multiple universal modifiers may be contained within the same set of square brackets and separated by a comma.
- Universal modifiers are optional and may be applied at the discretion of the surgeon.

List of universal modifiers

1 Nondisplaced

2 Displaced

3 Impaction

3a Articular

3b Metaphyseal

4 No impaction

5 Dislocation

5a Anterior (volar, palmar, plantar)

5b Posterior (dorsal)

5c Medial (ulnar)

5d Lateral (radial)

5e Inferior (with hip is also obturator)

5f Multidirectional

6 Subluxation/ligamentous instability

6a Anterior (volar, palmar, plantar)

6b Posterior (dorsal)

6c Medial (ulnar)

6d Lateral (radial)

6e Inferior (with hip is also obturator)

6f Multidirectional

7 Diaphyseal extension

8 Articular cartilage injury*

- 8a ICRS Grade 0 Normal
- 8b ICRS Grade 1 (A) Superficial indentation and /or
(B) superficial fissures and cracks
- 8c ICRS Grade 2 Abnormal lesions extending down to 50% of cartilage depth
- 8d ICRS Grade 3 (A) Severely abnormal with defects extending down >50% of cartilage depth;
(B) down to calcified layer;
(C) down to subchondral bone but not through;
(D) blisters included
- 8e ICRS Grade 4 Severely abnormal cartilage loss through subchondral bone

9 Poor bone quality

10 Replantation

11 Amputation associated with a fracture

12 Associated with a nonarthroplasty implant

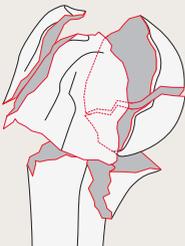
13 Spiral type fracture

14 Bending type fracture

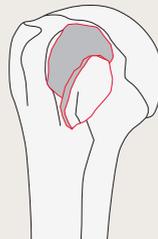
* This grading system is used with the permission of the International Cartilage Repair Society.³⁸

EXAMPLES

Humerus, proximal end segment, articular or 4-part fracture, with multifragmentary metaphyseal fracture and articular fracture, with an **anterior dislocation**
11C3.2[5a]



A 2-part, lesser tuberosity proximal humeral fracture-dislocation with **displacement, posterior dislocation, cartilage injury, and osteopenia**
11A1.2[2,5b,8e,9]



Qualifications

Qualifications are descriptive terms of fracture morphology or location that are specific to each fracture.

- Qualifications are represented with lower case letters to differentiate them from the fracture type (which is always an upper case letter).
- These are optional and applied to the fracture code where the asterisk is located as a lower case letter within rounded brackets.
- More than one qualification can be applied separated by a comma.

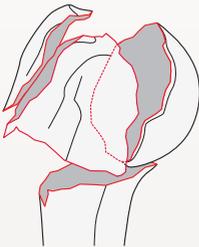
Group:

Humerus, proximal end segment, articular or 4-part, **anatomical neck fracture associated with metaphyseal fracture** 11C3

Subgroups:

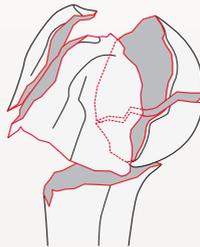
With a multifragmentary metaphyseal segment with intact articular surface

11C3.1



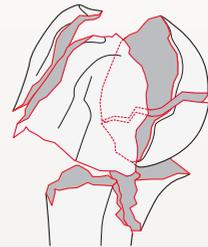
With a multifragmentary metaphyseal segment with articular fracture

11C3.2*



With a multifragmentary metaphyseal fracture, with diaphyseal extension and articular fracture

11C3.3*



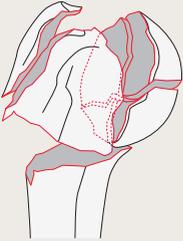
* Qualifications:

x **Simple articular**

y Multifragmentary articular

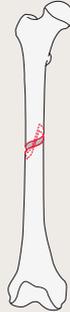
EXAMPLES

Humerus, proximal end segment, articular or 4-part fracture, with multifragmentary metaphyseal fracture and **multifragmentary articular** fracture
11C3.2(y)



* Qualifications:
x Simple articular
y **Multifragmentary articular**

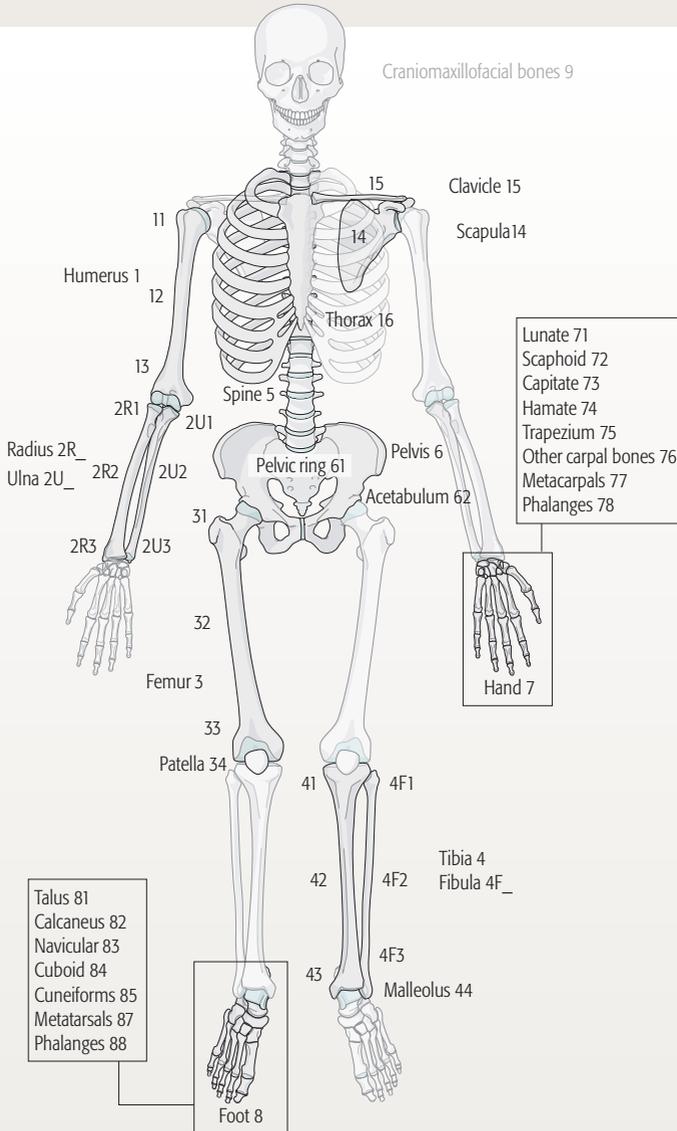
Femur, **middle** diaphyseal segment, simple, transverse fracture (<30°)
32A2(b)



* Qualifications:
a Proximal 1/3
b **Middle 1/3**
c Distal 1/3

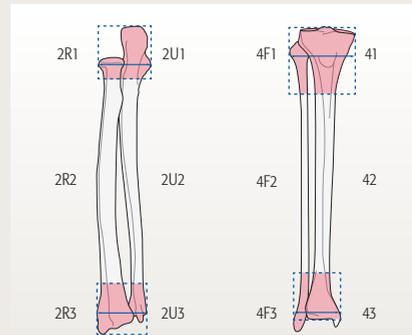
Alphanumeric system, morphology, and location

The bones including thorax have all been numbered in a consistent standardized fashion.



- Paired long bones are coded separately.
- Classification is now aligned with the ICD-10.
- End segment determination is done with both bones as a unit.

The hyphen has been removed to ensure easier coding in a database.



Diagnosis X-rays, CT scan, MRI as required, operative findings

Localization **Morphology**

Bone Location Type Group . Subgroup (Qualifications) [Universal modifiers]

Qualifications are applied at asterisk as a lower-case letter in rounded brackets () after the fracture code.

Universal modifiers are added in square brackets [] after the fracture code.

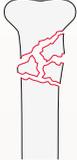
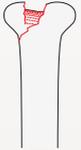
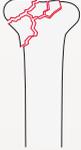
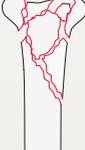
Universal modifiers and qualifications are applied when appropriate.

EXAMPLES

Coding a both-bone forearm fracture. Multifragmentary radial fracture and simple ulnar fracture = **2R2C3(b), 2U2A2(b)**.



Describing the fracture morphology— types of end-segment fractures

Group		
1	2	3
<p>Extraarticular—type A, when the fracture does not involve the joint surface.</p>		
 <p>Avulsion</p>	 <p>Simple</p>	 <p>Multifragmentary</p>
<p>Partial articular—type B, when the fracture involves one part of the articular surface while the remainder of the joint remains attached to the metaphysis and diaphysis.</p>		
 <p>Simple</p>	 <p>Split depression</p>	 <p>Fragmentary</p>
<p>Complete articular—type C, when the fracture has disrupted the joint surface, which is completely separated from the diaphysis.</p>		
 <p>Simple articular, simple metaphysis</p>	 <p>Simple articular, multifragmentary metaphysis</p>	 <p>Multifragmentary articular, multifragmentary metaphysis</p>

Diagnosis X-rays, CT scan, MRI as required, operative findings

Localization

Morphology

Bone

Location

Type

Group

Subgroup

(Qualifications)

[Universal modifiers]

Steps in identifying end-segment fractures:

Step	Question	Answer
1	Bone: What is the bone?	Specific bone number ▶ <i>See skeleton</i>
2	Location: At which end is the fracture located?	Proximal (1) Distal (3)
3	Type: Does the fracture enter the joint surface?	No—extraarticular (A) ▶ <i>go to step 5</i> Yes—articular (B or C) ▶ <i>go to step 4</i>
4a	Type: If articular, is it partial (part of joint attached to metaphysis)?	Yes (type B) ▶ <i>go to step 6</i>
4b	Type: If articular, is it complete (no part of joint attached to metaphysis)?	Yes (type C) ▶ <i>go to step 7</i>
5	Group: If extraarticular (A) what is the fracture pattern?	Avulsion (1) Simple (2) Wedge or multifragmentary (3)
6	Group: If partial articular (B) what is the fracture pattern?	Simple (1) Split and/or depression (2) Fragmentary (3)
7	Group: If complete articular (C) what is the articular fracture pattern?	Simple (1) Multifragmentary (2)
8	Subgroup: If complete articular (C) what is the metaphyseal fracture pattern?	Simple articular with simple metaphyseal (1) Simple articular fracture with multifragmentary metaphyseal (2) Multifragmentary articular with multifragmentary metaphyseal (3)
9	Add (qualifications) and/or [universal modifiers]	

Describing the fracture morphology— types of diaphyseal fractures

Group		
1	2	3
<p>Simple—type A fracture with a single circumferential fracture.</p>		
 <p>Spiral</p>	 <p>Oblique</p>	 <p>Transverse</p>
<p>Wedge—type B fracture with one or more intermediate fragments. After reduction there is some cortical contact between the main proximal and distal fragments.</p>		
	 <p>Intact</p>	 <p>Fragmentary</p>
<p>Multifragmentary—type C with one or more intermediate fragments. After reduction there is no contact between the main proximal and distal fragments.</p>		
	 <p>Intact segmental</p>	 <p>Fragmentary segmental</p>

Diagnosis X-rays, CT scan, MRI as required, operative findings

Localization

Morphology

Bone

Location

Type

Group

Subgroup

(Qualifications)

[Universal modifiers]

Steps in identifying diaphyseal fractures:

Step	Question	Answer
1	Bone: What is the bone?	Specific bone number ▶ <i>See skeleton</i>
2	Location: Is the fracture at the end or middle segment?	Middle–diaphyseal segment (2)
3	Type: What is the type?	Simple (A) Wedge (B) Multifragmentary (C)
4a	Group: If simple (A) what is the fracture pattern (group)?	Spiral (1) Oblique (2) Transverse (3)
4b	Group: If wedge (B) what is the fracture pattern (group)?	Intact (2) Fragmentary (3)
4c	Group: If multifragmentary (C) what is the fracture pattern (group)?	Intact segmental (2) Fragmentary segmental (3)
9	Add (qualifications) and/or [universal modifiers]	

Exceptions for the classification of fracture types

The proximal end segment of the humerus and femur, and the malleoli are exceptions:

- Simple proximal humeral fractures involving one tuberosity or the metaphysis (unifocal or Neer 2-part fractures) and proximal femoral fractures involving the trochanteric area are type A.
- The partial articular type does not exist in the humerus or femur. Proximal humeral fracture involving one tuberosity and the metaphysis (bifocal or Neer 3-part fractures), and the proximal femoral fracture involving the femoral neck are type B.
- Proximal humeral articular fractures involving the anatomic neck (and Neer 4-part fractures) of the humerus and fractures involving the femoral head are type C.
- For the proximal femur type A fractures are trochanteric, type B are femoral neck and type C are femoral head fractures.
- The malleolar segment is separate because of the well-known Weber classification and the fact that the malleoli are not included in the classical definition of an end segment
- The definitions or description of groups and subgroups are fracture specific.

Type

A

B

C

Humerus, **proximal end segment** 11**Extraarticular, unifocal, 2-part**

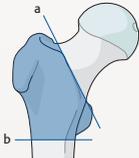
Tuberosity or nonimpacted/impacted metaphyseal

**Extraarticular, bifocal, 3-part**

With or without metaphyseal impaction, or with glenohumeral dislocation

**Articular or 4-part**

Displaced, impacted, or dislocated

Femur, **proximal end segment** 31**Trochanteric**

Petrochanteric simple or multifragmentary, or intertrochanteric

**Neck**

Subcapital or transcervical

**Head, articular**

Split, depression (may involve neck)

Tibia/fibula, **malleolar segment** 44**Infrasyndesmotom**

With or without medial lesion

**Transsyndesmotom**

With or without medial or posterior lesion

**Suprasyndesmotom**

With or without medial or posterior lesion

Specific questions

I see gaps in the classification.

Why are some sequential codes not present?

Codes from the 2007 Compendium were reviewed for usage and accuracy. Some were removed because they were better described using new standardized terminology or by using the universal modifier list.

Do I have to use the modifiers from the universal modifier list?

No. The **universal modifier list**, as well as **qualifications** for a specific fracture pattern, can be used at the individual coder's discretion.

How do I code a displacement, impaction, and dislocation?

Displacement and **impaction** can be added from the universal modifier list.

Pure dislocations can be coded using the dislocation classification in the Compendium and the direction can be added from the universal modifier list.

Direction of a **fracture dislocation** can be added from the universal modifier list.

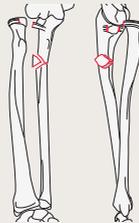
How do I code a Galeazzi and Monteggia fracture?

These are coded using the qualifications (g) and (m).



Galeazzi

Radial shaft, distal diaphysis,
intact wedge fracture = 2R2B2(c)
with dislocation of distal
radio-ulnar joint = 2R2B2(c,g)



Monteggia

Ulna, proximal diaphysis, intact
wedge fracture = 2U2B2(a)
with anterior dislocation of proximal
radio-ulnar joint = 2U2B2(a,m)[5a]

The code is different.

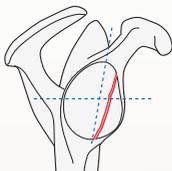
How do I find the corresponding new code?

The new AO/OTA Fracture and Dislocation Classification of **long bones** app has a search function. As far as possible, the old codes have been matched to their corresponding new codes. For the other classifications, use the QR code (on the back cover) to download further information, or download the online Compendium.

Other validated classifications

OTA Open Fracture Classification

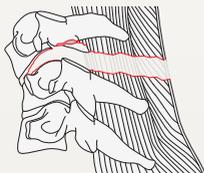
AO/OTA Scapular Fracture Classification



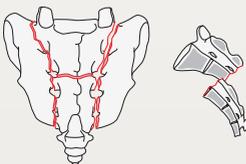
Unified Classification of Periprosthetic Fractures (UCPF)



AOSpine subaxial cervical and thoracolumbar spine injury classification



AOSpine Sacral Fracture Classification



Further noteworthy updates

Uniform presentation of diaphyseal fracture codes into thirds, with diaphyseal location as a qualification.

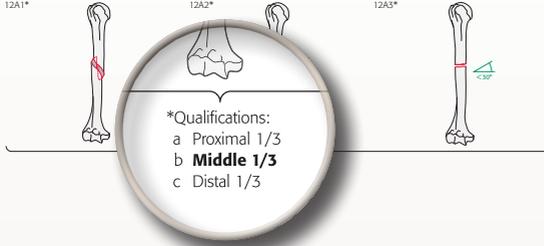
12A

Type: Humerus, diaphyseal segment, simple fracture 12A

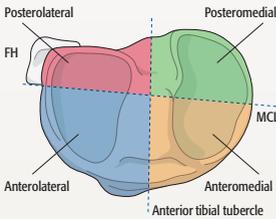
Groups:
Humerus, diaphyseal segment, simple, spiral fracture 12A1*

Humerus, diaphyseal segment, simple, oblique fracture (>30°) 12A2*

Humerus, diaphyseal segment, simple, transverse fracture (<30°) 12A3*

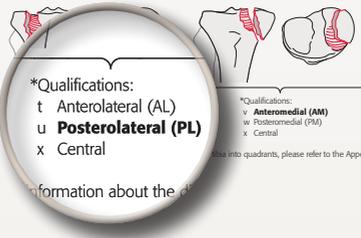


Updated proximal tibial plateau classification to include quadrants.



Subgroups:
Lateral plateau fracture 41B3.1*

Medial plateau fracture 41B3.2*



Revised coding for the foot, hand, clavicle, and a new classification for thoracic fractures.

Bone: Foot, phalanx 88

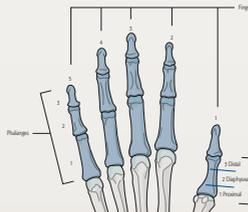


Bone: Clavicle 15

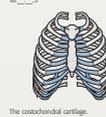
Clavicle, diaphyseal segment 15.2



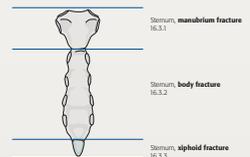
Bone: Hand and carpus, phalanx 78



RB, anterior end segment 16.3.1



Bone: Thorax, Sternum 16.3.3



Integration of the Neer classification of proximal humeral fractures.

11A

Type: Humerus, proximal end segment, e

Group: Humerus, proximal end segment, e

Subgroups:

Greater tuberosity fracture
11A1.1



Local, 2-part fracture 11A

Local, 2-part, **tuberosity fracture**



11B

Type: Humerus, proximal end

Group: Humerus, proximal end

Subgroups:

With greater tuberosity fracture
11B1.1*



Local, 3-part fracture 11B

Local, 3-part, **surgical neck fracture**



*Qualifications:
u Intact wedge
v Fragmentary wedge

As well as:

- Development of separate codes for radius/ulna and tibia/fibula.
- Accurate description of complex injuries (complex elbow injuries).
- Stability for pertrochanteric fractures is defined using the lateral wall thickness.
- Updated Schatzker classification of proximal tibial fractures that integrates posterior fracture patterns.
- Hawkins/Canale classification of talar neck fractures.
- Integration of the Young-Burgess classification into the AO/OTA or OTA/AO pelvic ring classification.

Summary

The 2018 Classification Compendium is a streamlined, concise, and clinically relevant tool for coding of fractures and dislocations.

Since the original publication of the Fracture Classification and its subsequent many years of use, there has been important **progress in fracture classification** toward the goal of a **universally accepted** and **comprehensive fracture language**.

During that time, the Compendium has demonstrated its strengths and shortcomings. The recent changes and updates to content and presentation of the Compendium address many of these issues.

The 2018 Compendium is **comprehensive** and **standardized, universal, simpler to use** which should **improve research** and **fracture outcomes assessments**.

Furthermore, this revision process has allowed for the **addition of new published classifications**.

This has been achieved through collaboration between representatives of AO and OTA Classification Committee as part of the International Comprehensive Classification of Fractures and Dislocations Committee. It has also resulted in the return of the Compendium copyright to both organizations so it is **available for any clinician to use without charge**, allowing for its **worldwide dissemination**.

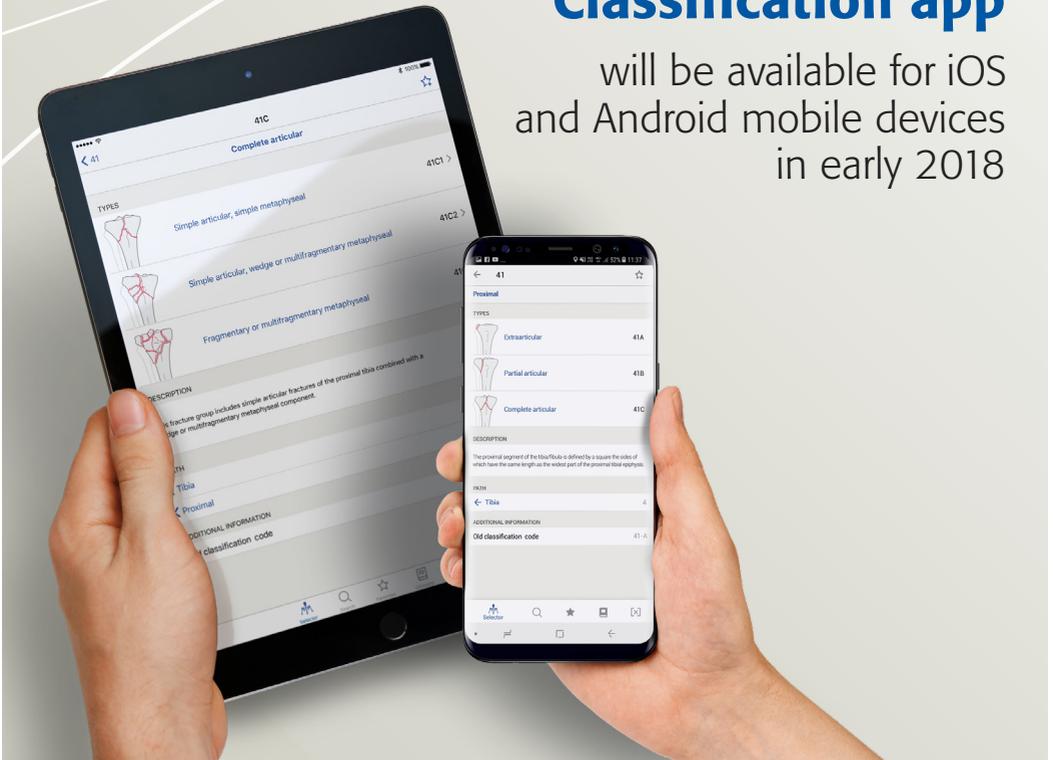
Both organizations are committed to working together to continually evaluate the compendium and revise as necessary.

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The revised AO/OTA Classification app

will be available for iOS
and Android mobile devices
in early 2018



Use the QR code
to access the new compendium
and support materials

For questions or comments about the 2018 revisions please contact:
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