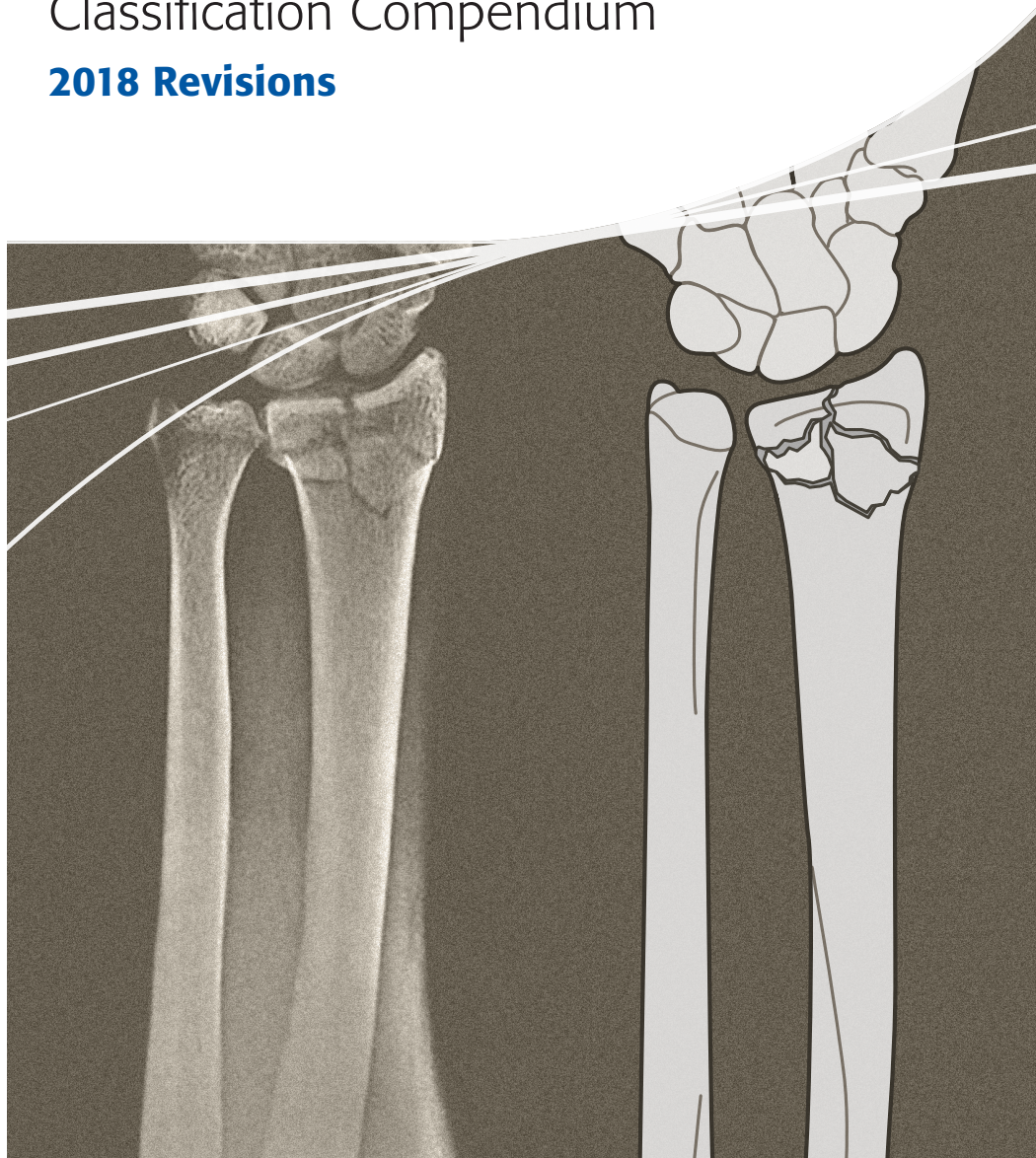


# AO/OTA Fracture and Dislocation Classification Compendium

**2018 Revisions**

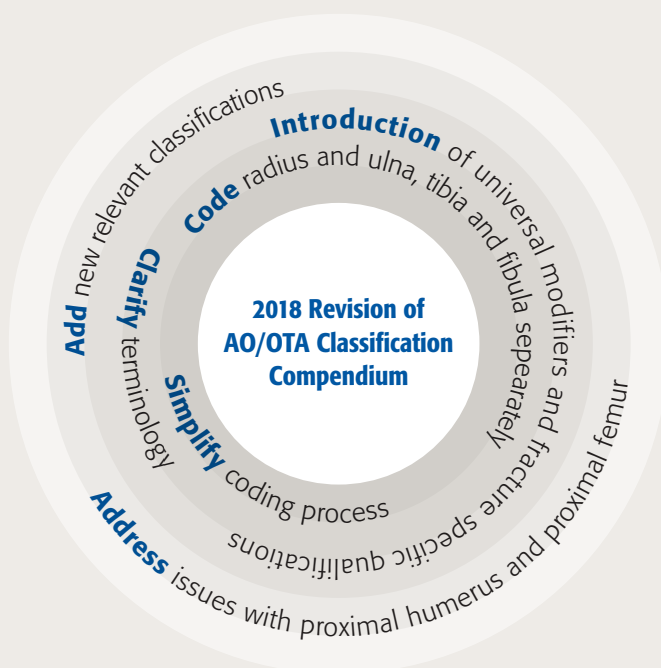


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# Introduction

Composed of representatives appointed by the AOTrauma International Board and the Orthopaedic Trauma Association, the International Comprehensive Classification of Fractures and Dislocations Committee (ICCF) 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.**

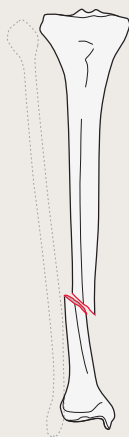
# Terminology

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

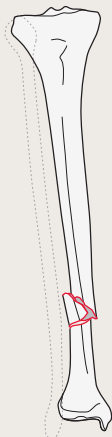
- “Complex” did not adequately describe a fracture pattern consisting of many fragments.
- “Multifragmentary” was previously used generically to refer to diaphyseal type B and C fractures and did not have a specific alphanumeric code. It is better used as a term to describe fractures consisting of many 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

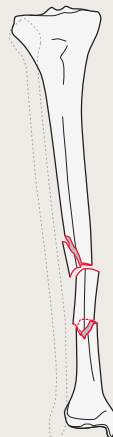
Tibia, diaphyseal segment  
**simple fracture**  
42A



Tibia, diaphyseal segment,  
**wedge fracture**  
42B

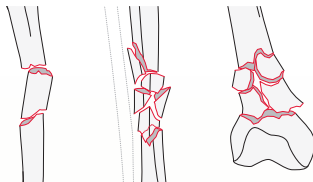


Tibia, diaphyseal segment,  
**multifragmentary fracture**  
42C





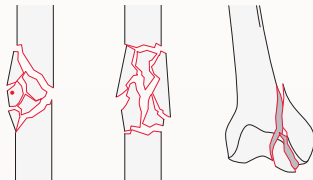
**Multifragmentary diaphyseal, segmental diaphyseal, or end segment extraarticular fracture** has many fracture fragments and after reduction there is no contact between the main fragments. The multifragmentary diaphyseal fracture also includes the segmental fracture.



**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.



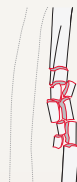
**Fragmentary wedge** consists of multiple intermediate fragments that compose the wedge. Once reduced, there is contact between the proximal and distal fragments.



**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

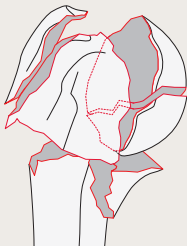
## 13 Spiral type fracture

## 14 Bending type fracture

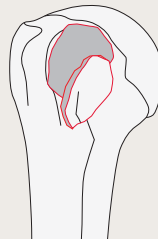
\* This grading system is used with the permission of the International Cartilage Repair Society.<sup>38</sup>

## 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.

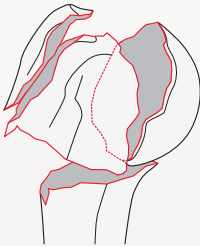
## Group:

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

## Subgroups:

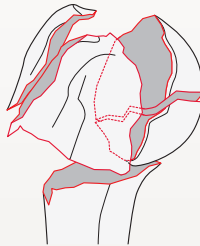
**With a multifragmentary metaphyseal segment with intact articular surface**

11C3.1



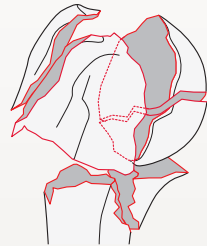
**With a multifragmentary metaphyseal segment with articular fracture**

11C3.2\*



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

11C3.3\*



\* Qualifications:

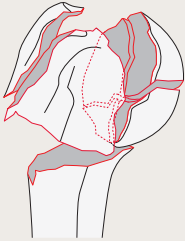
x **Simple articular**

y Multifragmentary articular

lar  
ry

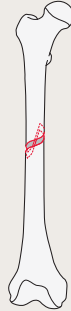
## EXAMPLES

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**

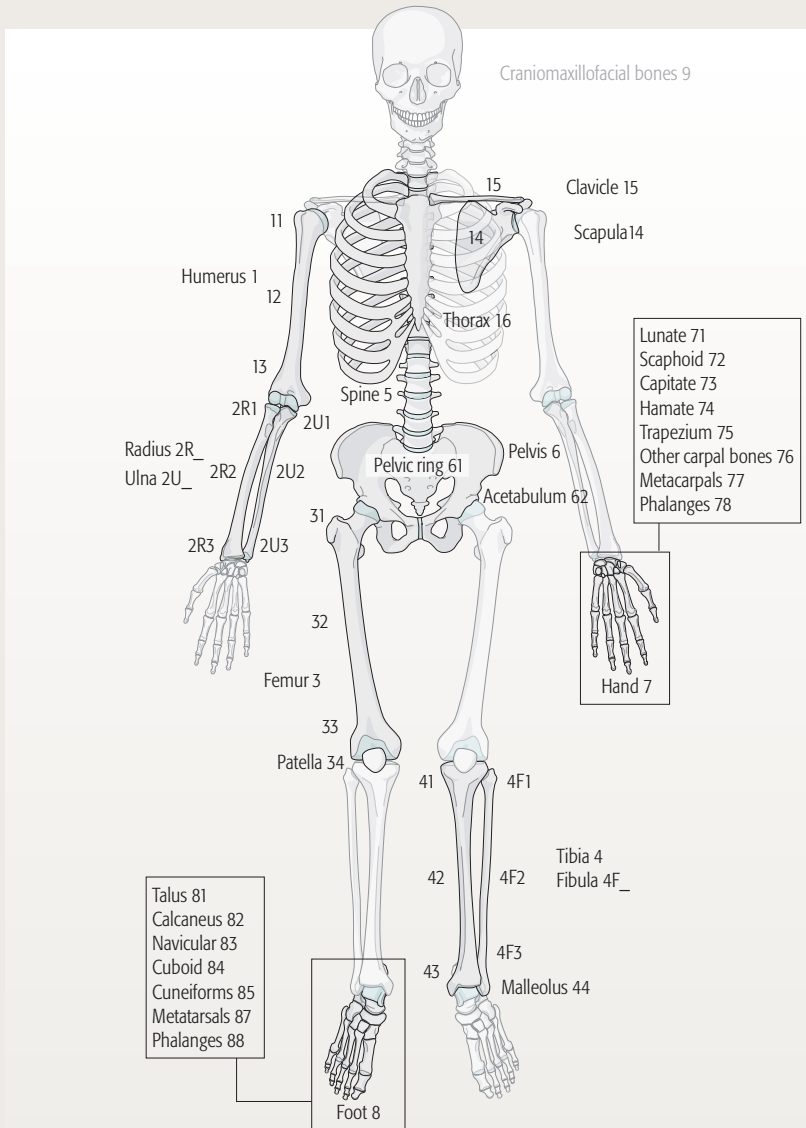
Femur, **middle** diaphyseal segment, simple, transverse fracture ( $<30^\circ$ )  
32A2(b)



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

# Alphanumeric system, morphology, and location

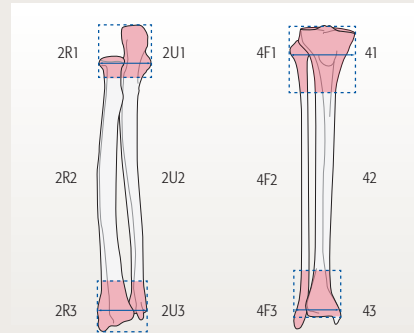
**The bones including thorax have all been numbered in a consistent standardized fashion.**





- 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.

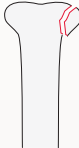
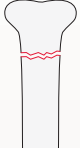
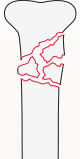
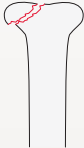
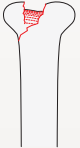
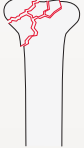


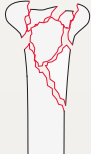
Universal modifiers and qualifications are applied when appropriate.

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

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

## Localization

## Morphology

Bone

Location

Type

Group

Subgroup



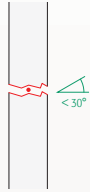




( Qualifications )

[ Universal modifiers ]

## Steps in identifying end-segment fractures:

Step	Question	Answer
1	<b>Bone:</b> What is the bone?	Specific bone number ▶ <i>See skeleton</i>
2	<b>Location:</b> At which end is the fracture located?	Proximal (1) Distal (3)
3	<b>Type:</b> 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	<b>Type:</b> If articular, is it partial (part of joint attached to metaphysis)?	Yes (type B) ▶ <i>go to step 6</i>
4b	<b>Type:</b> If articular, is it complete (no part of joint attached to metaphysis)?	Yes (type C) ▶ <i>go to step 7</i>
5	<b>Group:</b> If extraarticular (A) what is the fracture pattern?	Avulsion (1) Simple (2) Wedge or multifragmentary (3)
6	<b>Group:</b> If partial articular (B) what is the fracture pattern?	Simple (1) Split and/or depression (2) Fragmentary (3)
7	<b>Group:</b> If complete articular (C) what is the articular fracture pattern?	Simple (1) Multifragmentary (2)
8	<b>Subgroup:</b> 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
<b>Simple—type A fracture</b> with a single circumferential fracture.		
 <b>Spiral</b>	 <b>Oblique</b>	 <b>Transverse</b>
<b>Wedge—type B fracture</b> with one or more intermediate fragments. After reduction there is some cortical contact between the main proximal and distal fragments.		
	 <b>Intact</b>	 <b>Fragmentary</b>
<b>Multifragmentary—type C</b> with one or more intermediate fragments. After reduction there is no contact between the main proximal and distal fragments.		
	 <b>Intact segmental</b>	 <b>Fragmentary segmental</b>

**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	<b>Bone:</b> What is the bone?	Specific bone number ▶ <i>See skeleton</i>
2	<b>Location:</b> Is the fracture at the end or middle segment?	Middle–diaphyseal segment (2)
3	<b>Type:</b> What is the type?	Simple (A) Wedge (B) Multifragmentary (C)
4a	<b>Group:</b> If simple (A) what is the fracture pattern (group)?	Spiral (1) Oblique (2) Transverse (3)
4b	<b>Group:</b> If wedge (B) what is the fracture pattern (group)?	Intact (2) Fragmentary (3)
4c	<b>Group:</b> 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.



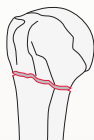
## Type

A

B

C

### Humerus, proximal end segment 11



#### Extraarticular, unifocal, 2-part

Tuberosity or nonimpacted/impacted metaphyseal



#### Extraarticular, bifocal, 3-part

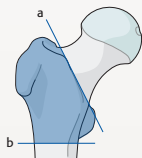
With or without metaphyseal impaction, or with glenohumeral dislocation



#### Articular or 4-part

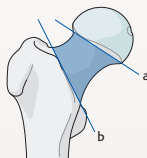
Displaced, impacted, or dislocated

### Femur, proximal end segment 31



#### Trochanteric

Pertrochanteric simple or multifragmentary, or intertrochanteric



#### Neck

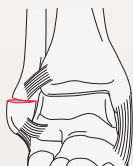
Subcapital or transcervical



#### Head, articular

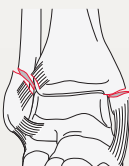
Split, depression (may involve neck)

### Tibia/fibula, malleolar segment 44



#### Infrasyndesmotric

With or without medial lesion



#### Transsyndesmotric

With or without medial or posterior lesion



#### Suprasyndesmotric

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.

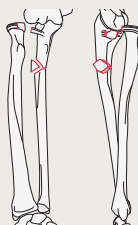
### How do I code a Galeazzi and Monteggia fracture?

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.

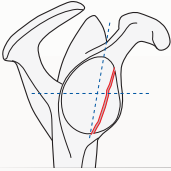
### How do I find the corresponding new code?

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

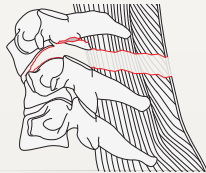
### AO/OTA Scapular Fracture Classification



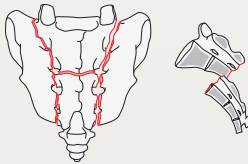
### Unified Classification of Periprosthetic Fractures (UCPF)



### 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.

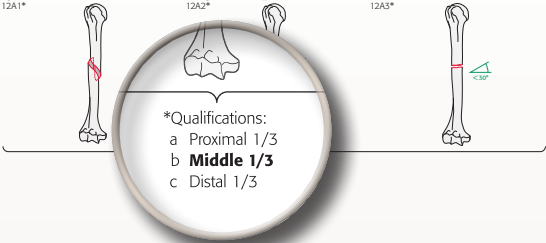
12A

Type: Humerus, diaphyseal segment, **simple fracture** 12A

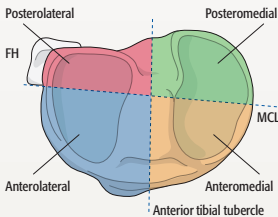
Groups:  
Humerus, diaphyseal segment, simple, **spiral fracture** 12A1\*

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

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

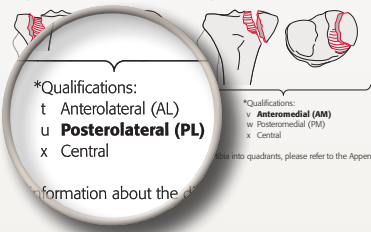


## Updated proximal tibial plateau classification to include quadrants.



Subgroups:  
**Lateral plateau fracture** 41B3.1\*

**Medial plateau fracture** 41B3.2\*

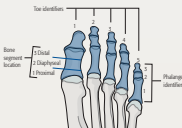


\*Qualifications:  
v **Anteromedial (AM)**  
w Posteromedial (PM)  
x Central

For more information about the di...

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

Bone: Foot, **phalanx** 88

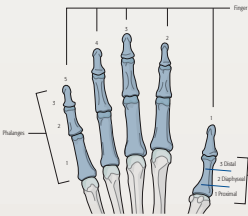


Bone: Clavicle 15

Clavicle, **diaphyseal segment** 15.2



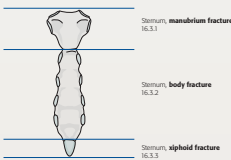
Bone: Hand and carpus, **phalanx** 78



Bone: **anterior end segment** 16.3.1



Bone: Thorax, **Sternum** 16.3



Sternum, **manubrium fracture** 16.3.1

Sternum, **body fracture** 16.3.2

Sternum, **xiphoid fracture** 16.3.3

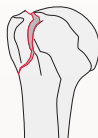
## Integration of the Neer classification of proximal humeral fractures.

### 11A

**Type:** Humerus, proximal end segment, e

**Group:** Humerus, proximal end segment, e

**Subgroups:**  
Greater tuberosity fracture  
11A1.1



### focal, 2-part fracture 11A

focal, 2-part, tuberosity fracture



### 11B

**Type:** Humerus, proximal end

**Group:** Humerus, proximal end

**Subgroups:**  
With greater tuberosity fracture  
11B1.1\*



### focal, 3-part fracture 11B

focal, 3-part, surgical neck fracture 11B1



\*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.



# References

1. **Association Committee for Coding and Classification.** Fracture and dislocation compendium. *J Orthop Trauma*. 1996;10 Suppl 1:v-ix, 1–154.
2. **Müller ME, Nazarian S, Koch P.** *Classification AO des fractures*. Tome I. Les os longs. 1st Ed. Berlin: Springer-Verlag; 1987.
3. **Müller ME, Nazarian S, Koch P, et al.** *The Comprehensive Classification of Fractures of Long Bones*. Berlin, Germany:Springer-Verlag;1990.
4. **Slongo T, Audigé L, Clavert JM, et al.** The AO comprehensive classification of pediatric long-bone fractures: a web-based multicenter agreement study. *J Pediatr Orthop*. 2007;27:171–180.
5. **Slongo T, Audigé L, Lutz N, et al.** Documentation of fracture severity with the AO classification of pediatric long-bone fractures. *Acta Orthop*. 2007;78:247–253.
6. **Webster's New Riverside University Dictionary.** Boston, MA: Riverside Publishing; 1984:268.
7. **Martin JS, Marsh JL.** Current classification of fractures. Rationale and utility. *Radiol Clin North Am*. 1997;35:491–506.
8. **Brumback RJ, Jones AL.** Interobserver agreement in the classification of open fractures of the tibia. The results of a survey of two hundred and forty-five orthopaedic surgeons. *J Bone Joint Surg Am*. 1994;76:1162–1166.
9. **Schatzker J, McBroom R, Bruce D.** The tibial plateau fracture. The Toronto experience 1968–1975. *Clin Orthop Relat Res*. 1979;138:94–104.
10. **Siebenrock KA, Gerber C.** The reproducibility of classification of fractures of the proximal end of the humerus. *J Bone Joint Surg Am*. 1993;75:1751–1755.
11. **Martin JS, Marsh JL, Bonar SK, et al.** Assessment of the AO/ASIF fracture classification for the distal tibia. *J Orthop Trauma*. 1997;11:477–483.
12. **Sidor ML, Zuckerman JD, Lyon T, et al.** The Neer classification system for proximal humeral fractures. An assessment of interobserver reliability and intraobserver reproducibility. *J Bone Joint Surg Am*. 1993;75:1745–1750.
13. **ICD-10-CM Expert for Physicians: The complete official code set.** Optum360, LLC; 2015.
14. **Luo CF, Sun H, Zhang B, et al.** Three-column fixation for complex tibial plateau fractures. *J Orthop Trauma*. 2010 Nov;24(11):683–692.
15. **Parsons BO, Klepps SJ, Miller S, et al.** Reliability and reproducibility of radiographs of greater tuberosity displacement. A cadaveric study. *J Bone Joint Surg Am*. 2005;87:58–65.
16. **Crist BD, Martin SL, Stannard JP.** Tibial Plateau Fractures. In: Stannard JP, Schmidt AH, eds. *Surgical Treatment of Orthopaedic Trauma—Second edition*. New York: Thieme; 2016:913–945.
17. **Evans AR, Agel J, DeSilva GL, et al.** **Orthopaedic Trauma Association: Open fracture study group.** A new classification scheme for open fractures. *J Orthop Trauma*. 2010 Aug;24(8):457–464.
18. **Audigé L, Kellam JF, Lambert S, et al.** The AO Foundation and Orthopaedic Trauma Association (AO/OTA) scapula fracture classification system: focus on body involvement. *J Shoulder Elbow Surg*. 2014 Feb;23(2):189–196.
19. **Jaeger M, Lambert S, Sudkamp NP, et al.** The AO Foundation and Orthopaedic Trauma Association (AO/OTA) scapula fracture classification system: focus on glenoid fossa involvement. *J Shoulder Elbow Surg*. 2013 Apr;22(4):512–520.
20. **Dunan CP, Haddad FS.** The Unified Classification System (UCS): improving our understanding of periprosthetic fractures. *Bone Joint J*. 2014 Jun;96-b(6):713–716.
21. **Vaccaro AR, Schroeder GD, Kepler CK, et al.** The surgical algorithm for the AOSpine thoracolumbar spine injury classification system. *Eur Spine J*. 2016 Apr;25(4):1087–1094.
22. **Bellabarba C, Schroeder G, Kepler C, et al.** The AOSpine Sacral Fracture Classification. *Global Spine J*. 06(S 01). 2016 April DOI: 10.1055/s-0036-1582696.
23. **Kristiansen B, Andersen UL, Olsen CA, et al.** The Neer classification of fractures of the proximal humerus. An assessment of interobserver variation. *Skeletal Radiol*. 1988;17(6):420–422.
24. **Bernstein J, Adler LM, Blank JE, et al.** Evaluation of the Neer system of classification of proximal humeral fractures with computerized tomographic scans and plain radiographs. *J Bone Joint Surg Am*. 1996;78:1371–1375.
25. **Flikkilä T, Nikkila-Sihto A, Kaarela O, et al.** Poor interobserver reliability of AO classification of fractures of the distal radius. Additional computed tomography is of minor value. *J Bone Joint Surg Br*. 1998;80: 670–672.
26. **Humphrey CA, Dirschl DR, Ellis TJ.** Interobserver reliability of a CTbased fracture classification system. *J Orthop Trauma*. 2005;19:616–622.
27. **Barker L, Anderson J, Chesnut R, et al.** Reliability and reproducibility of dens fracture classification with use of plain radiography and reformatted computer-aided tomography. *J Bone Joint Surg Am*. 2006;88:106–112.
28. **Dirschl DR, Adams GL.** A critical assessment of factors influencing reliability in the classification of fractures, using fractures of the tibial plafond as a model. *J Orthop Trauma*. 1997;11 :471–476.
29. **Petrisor BA, Bhandari M, Orr RD, et al.** Improving reliability in the classification of fractures of the acetabulum. *Arch Orthop Trauma Surg*. 2003;123:228–233.
30. **Schipper IB, Steyerberg EW, Castelein RM, et al.** Reliability of the AO/ASIF classification for peritrochanteric femoral fractures. *Acta Orthop Scand*. 2001;72:36–41.
31. **Walton NP, Harish S, Roberts C, et al.** AO or Schatzker? How reliable is classification of tibial plateau fractures? *Arch Orthop Trauma Surg*. 2003;123:396-398.
32. **Andersen DJ, Blair WF, Steyers CM, Jr, et al.** Classification of distal radius fractures: an analysis of interobserver reliability and intraobserver reproducibility. *J Hand Surg Am*. 1996 Jul;21(4):574–582.
33. **Swiontkowski MF, Sands AK, Agel J, et al.** Interobserver variation in the AO/OTA fracture classification system for pilon fractures: is there a problem? *J Orthop Trauma*. 1997;11:467–470.
34. **Kreder HJ, Hanel DP, McKee M, et al.** Consistency of AO fracture classification for the distal radius. *J Bone Joint Surg Br*. 1996;78:726–731.
35. **Oskam J, Kingma J, Klasen HJ.** Interrater reliability for the basic categories of the AO/ASIF's system as a frame of reference for classifying distal radial fractures. *Percept Mot Skills*. 2001;92:589–594.
36. **Audigé L, Bhandari M, Kellam J.** How reliable are reliability studies of fracture classifications? A systematic review of their methodologies. *Acta Orthop Scand*. 2004;75:184–194.
37. **Audigé L, Bhandari M, Hanson B, et al.** A concept for the validation of fracture classifications. *J Orthop Trauma*. 2005;19:401–406.
38. **International Cartilage Repair Society.** ICRS SCORE/GRADE: ICRS Clinical Cartilage Injury Evaluation System. Available at: <http://cartilage.org/society/publications/icrs-score/>

# 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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