Distal Radius Fracture
Clinical Practice Guideline

Linked to the International Classification of Function, Disability, and Health from the Hand Rehabilitation and Orthopaedic Sections of the American Physical Therapy Association

Preliminary work and future plans

Presented by Susan Michlovitz, PT, PhD, CHT
Ithaca, NY
APTA Combined Sections Meeting Febuary 5, 2015

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Financial disclosures

- I have no financial disclosures

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Methods for Developing CPG Distal Radius Fracture

Training at APTA (3 of team members- 2012 and 2013)

Selection of **team**

Outline- developed our outline (following format of 2 recent guidelines of Non-arthritic Hip Joint Pain and Ankle Ligament Sprains)

Search strategies for all categories

Selection of articles/review and assignment of **levels** and **grades**

Synthesis and consensus, **recommendations**

Review, revise, and final document

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Our team

- Susan Michlovitz, PT, PhD, CHT
- Christos Karagiannopoulos, PT, PhD, CHT
- Joy MacDermid, PT, PhD
- Saurabh Mehta, PT, PhD
- Jerry Huang, MD

4 PTs and one orthopaedic hand surgeon

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Susan Michlovitz, PT, PhD, CHT

- Cayuga Hand Therapy & PT, Ithaca, NY
- APTA Lifetime Member
- Associate Clinical Professor, McMaster University
- Clinical Associate Professor, Columbia University
- Editorial Advisory Board, Journal of Hand Therapy
- 2013 American Society of Hand Therapists (ASH)T President

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Christos Karagiannopoulos, PT, PhD, CHT

MEd (1997) in kinesiology, MPT (1999), CHT (2008)

PhD (2014) with research emphasis on sensori-motor impairment following DRF

Part-time faculty at Temple University (1999-2012)

Published in JOSPT and JHT

Manuscript reviewer for JHT 2013-2014

Clinical practice with ATI

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Saurabh Mehta, PT, PhD

B.PHY (1997); MSc (Rehab) (2008)

PhD (2012). Thesis Title: "Predicting Risk for Adverse Outcomes Following Distal Radius Fracture"

Assistant Professor, School of Physical Therapy, Marshall University, Huntington, WV: 2013-

Published in JOSPT, JHT, Spine

Manuscript reviewer for JHT 2011-present

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Joy MacDermid, PT, PhD

- Professor McMaster University
- Editor in Chief, Journal of Hand Therapy (begin July 2015)
- Associate Editor, JOSPT
- 2010 ASHT President
- Developed Patient- rated Wrist Evaluation
- PI on $2.4M grant to study DRF
- http://www.ncbi.nlm.nih.gov/pubmed/?term=macdermid+JC

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Jerry Huang, MD

Board Certified, Orthopaedic Surgery

CAQ in Hand Surgery

Associate Professor, University of Washington Medical Center

Program Director, UW Combined Hand and Microsurgical Fellowship

Member, ASSH Clinical Trials and Outcomes Committee (2011-2015)

Associate Editor, Journal of Hand Surgery 2013-Present

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Challenges in developing CPG for DRF

- Lack of uniformity of surgeons categorizing patients for their management
  - Patients treated by cast or splint; treated by ORIF
- Patients without complications/ with complications
- Patients with comorbidities and life style habits that complicate fracture healing and recovery of motion

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Levels of evidence grading

I Evidence obtained from high quality diagnostic studies, prospective studies, or randomized controlled trials

II Evidence obtained from lesser-quality diagnostic studies, prospective studies, or, randomized controlled trials (eg, weaker diagnostic criteria and reference standards, improper randomization, no blinding, less than 80% follow-up)

III Case controlled studies or retrospective studies

IV Case series

V Expert opinion

(http://www.cebm.net) for diagnostic, prospective, and therapeutic studies.

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Grades of recommendation

GRADES OF RECOMMENDATION BASED ON		STRENGTH OF EVIDENCE
A	Strong evidence	A preponderance of level I and/or level II studies support the recommendation. This must include at least 1 level I study
B	Moderate evidence	A single high-quality randomized controlled trial or a preponderance of level II studies support the recommendation
C	Weak evidence	A single level II study or a preponderance of level III and IV studies, including statements of consensus by content experts, support the recommendation
D	Conflicting evidence	Higher-quality studies conducted on this topic disagree with respect to their conclusions. The recommendation is based on these conflicting studies
E	Theoretical/ foundational evidence	A preponderance of evidence from animal or cadaver studies, from conceptual models/principles, or from basic sciences/bench research supports this conclusion
F	Expert opinion	Best practice based on the clinical experience of the guidelines development team

Our group will grade according to guidelines described by Guyatt et al as modified by MacDermid et al

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Incidence of DRF

- **Most common fracture of distal UE**
  - Especially for females > 65 years
- @ 18% fractures in emergency care
- Lower incidence 2nd – 4th decades of life
  - Males > females by 1.4 times
- **Sharp incidence increase 5th decade of life**
  - **Females > males by 15 times**
- Max incidence 6th decade of life
  - Females 30% greater probability

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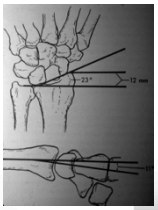
Pathoanatomic features of distal radius fracture

- Radial shortening
- Loss of palmar tilt
- Radial inclination
- Articular gap or step-off
- Distal radioulnar joint stability
- ±Concomitant ulnar styloid fracture



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Risk factors: Distal radius fracture

- Osteopenia/osteoporosis
- Low impact
  - Fall on an outstretched hand (FOOSH) from standing height
- High impact
  - Fall from a height
  - High velocity accident- skiing, snowboarding, motorcycling
- Fall risks/Reduced balance

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Imaging studies for

- making the diagnosis and detecting potential associated injuries/co-morbidities
- determining success of anatomic reduction
- assisting to determine prognosis/predicted outcome?
- (maybe to) determine fracture healing to progress weight-bearing and torque activities

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Imaging studies

- Plain radiographs
- CT
- MRI

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Classifications Diagnosis

Diagnosis of Fracture
Diagnosis of Associated Injuries
Fracture Pattern Classification
Fracture Rehabilitation Classification

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Diagnosis of Fracture

- Clinical deformity
- Open vs. closed injury
- Standard 3 view radiographs of the injured wrist

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Diagnosis of Associated Injuries

- Ulnar styloid fracture
- Distal radioulnar joint
- Soft tissue injuries (up to 70%)
  - TFCC tears (40-50%)
  - Intercarpal injury (Scapholunate or Lunotriquetral) (30%)

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Diagnosis of Associated Injuries

- MRI vs. MR Arthrogram
- Role of wrist **arthroscopy** for diagnosis and treatment of **intra-articular ligament injuries**
- No correlation between clinical outcomes for untreated partial SL or LT ligament tears
- Complete TFCC tears generally have DRUJ instability while partial tears are usually stable

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Prognosis – Pain and Functions

Demographic, Health, and Clinical Characteristics	What is the Evidence
Socioeconomic status and education level	Poor socioeconomic status and less than high school level education is shown to impact outcomes (Paksima 2014; MacDermid 2002)
Injury compensation, presence of comorbidities	May play a small role in pain and functional outcomes 1 year post-DRF (Grewal 2007)
Age	Controversial role; increased risk of delayed recovery with advancing age (Roh et 11 2014) VERSUS perceived disablement may be low in elderly (Grewal 2007)
Clinical Exam Pain	**Baseline pain of >35/50 on PRWE pain scale elevates risk of chronic pain (Mehta 2015)** Baseline PRWE scores of >70/100 indicate prolonged times loss from work post-DRF (MacDermid 2007)

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Classification: ICD-9 and 10 Codes Distal radius fracture

ICD-9 code: 813.42

ICD-10 codes for health conditions:

- S52.5 Fracture lower end of radius

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Classification: ICD-10

- Other ICD 10 codes for associated health conditions
- S63.0 Dislocation of distal radioulnar joint
- S52.7 Fracture and dislocation of radius and ulna
- S63.3 Traumatic rupture of ligament of wrist

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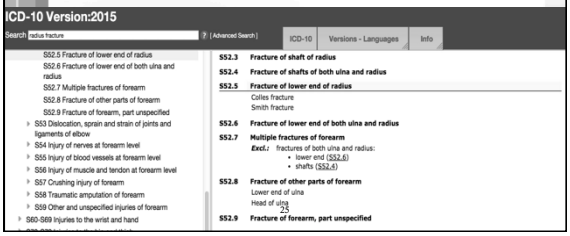
Search for ICD-10 radius fracture

- http://apps.who.int/classifications/icd10/browse/2015/en#/S52.5



Diagnosis: Fracture classification systems/paradigm

- **Many to describe**
  - AO/ASIF and Fernandez-Jupiter most commonly used
  - Rikli-Regazzoni 3-column approach
  - Broader framework of fracture characteristics
- **Do these help direct care?**
- **Limited and equivocal evidence exists:**
  - **Diagnostic value**
  - **Predictive value for functional recovery**
  - **Poor intra- and inter-rater reliability**

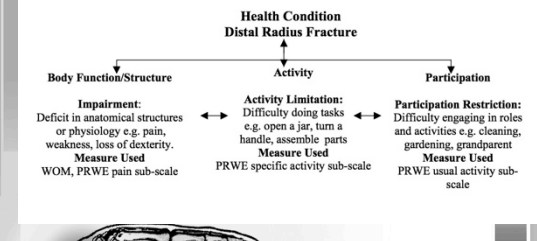
Fracture classification systems/ paradigm

Colles' Fracture	1814: earliest classification
Barton's Fracture	1838: Intra-articular: volar/dorsal displacement
Gartlant & Werley	1951: Intra-articular components
Lidstrom	1959: Degree of distal fragment displacement
Older et al	1965: Radius shortening/angulation severity
Frykman	1967: Intra-articular & distal ulna Fx patterns
Melone	1984: Intra-articular components
Smith's fracture	1988: Sub-classify volar/non-articular displaced
McMurtry & Jupiter	1991: Intra-articular fragment size
AO/ASIF	1991: Extra/Simple/Complex intra-articular patterns
Fernandez	1993: Five distal radius fracture mechanisms

CLINICAL GUIDELINES: *Impairment/Function-Based Diagnosis*

Fracture rehabilitation classification- ICF

Comprehensive ICF Core Set for Hand Conditions



Harris, MacDermid, Roth 2005

ICF Set for DRF

Preliminary review by MacDermid and Michlovitz

- b body function
- s body structure
- d disability
- e environment

Will assign to examination and interventions as we develop guideline

ICF: Body Function DRF

b260 proprioceptive function

b265 touch function

b840 sensation related to the skin

b280 sensation of pain

b7100- mobility of single joint

b7101 mobility of several joints

b715 stability of joint functions (DRUJ)

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ICF: Body Function DRF

b7300 power of isolated muscles and muscle groups

b7301 power of muscles of one limb

b740 muscle endurance functions

b760 control of voluntary movement functions

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ICF Body structure: DRF

s7301 structure of forearm

S770 additional musculoskeletal structures related to movement

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ICF Activities and Participation DRF

d234 Carrying out daily routine

d360 Using communication devices and techniques

d430 Lifting and carrying objects

d4400 Picking up

d4402 Manipulating

d4450 Pulling

d4451 Pushing

D4453 Turning or twisting the hands or arms

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ICF Activities and Participation DRF

d470 Using transportation

d475 Driving

d430 Toileting

d630 Preparing meals

d640 Doing housework

d920 Recreation and leisure

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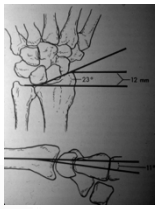
WHAT IS THE CLINICAL MANAGEMENT BY SURGEON

Non operative

- Cast/splint

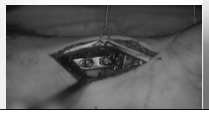
Operative

- ORIF volar plate
- Percutaneous pinning K wires



Goal: restore anatomy

- Decision making



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CLINICAL GUIDELINES: *Examinations*

Outcomes Measures
Physical Impairment
Activities and Participation

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Examination: Outcome Measures

- Patient-rated Wrist Evaluation
- Work and performing arts/sports modules
- Quick DASH
- Patient Specific Functional Scale

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Examination: Activities and Participation

Outcome Measure	Inception	Measure for Assessing Activity and Participation in DRF
Patient-Rated Wrist Evaluation	MacDermid et al 1998	Goldhahn 2014
Disabilities of Arm, Shoulder, and Hand	Hudak et al 1996	Dixon 2008
QuickDASH	Beaton 2005	Goldhahn 2014
Patient-Specific Functional Scale	Stratford 1995	Fairbairn 2012

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Examination: Physical Impairment

- Edema- Figure-of-8, volume displacement
- Pain- NRS
- Sensibility
  - Ten-test screen
  - Semmes-Weinstein monofilaments
  - Static 2-point
  - Moving 2-point

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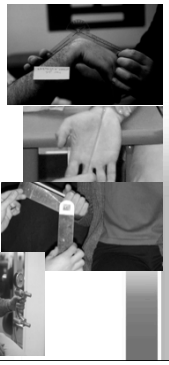
Examination: Physical Impairment

- Range of motion
- Dexterity
  - FDT
- Joint position sense
  - Karagiannopoulos et al 2013
- Grip strength
  - Max grip vs. sustained grip force
- Push off test
  - Israel et al 2014



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Examination: Physical Impairment Dexterity

Jebsen-Taylor Hand Function Test has poor validity and responsiveness when applied to surgically-treated hand patients, including those with DRFs.

Sears and Chung 2010

Dexterity- what measure to suggest?

Functional Dexterity Test?

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Examination: Physical Impairment
Active wrist JPS test

- Simple protocol: Passive positioning/Active reproduction

Score = Reference angle – Reproduced Angle

- Most clinically meaningful test for SM impairment following DRF
- Strongly correlated with function (PRWE) and pain

Karagiannopoulos, Sitler, Michlovitz, Tierney. . JHT, 2013; 26(3); 204-215.

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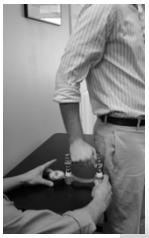
Examination: Physical Impairment

Ability to weight bear

Push off test

When weight bearing permitted



Vincent JI, Macdermid JC, Michlovitz SL, et al The push-off test: Development of a simple, reliable test of upper extremity weight-bearing capability J Hand Ther. 2014

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CLINICAL GUIDELINES: *Interventions*

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DRF Rehabilitation phases

Early protection (fracture healing) phase:
- Patient education and counseling
- Pain management
- Edema management
- Sensibility management
- Post-operative scar management
- PROM/A/AAROM
- Conscious proprioception: JPS training

Later Mobilization phase:
- Neuromuscular training
- Strengthening
- ADLs and work re-integration

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INTERVENTION DRF: PATIENT EDUCATION AND COUNSELING

Path to recover
Educating about pain

Counseling patients at high risk for (another) fracture

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INTERVENTION DRF: DIAGNOSIS SPECIFIC INSTRUCTIONS

- Incorporating home exercise programs

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INTERVENTION DRF: MANUAL THERAPY

- Joint mobilization?
- Scar mobilization?

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INTERVENTION DRF : THERAPEUTIC EXERCISE AND ACTIVITIES




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INTERVENTION DRF: NEUROMUSCULAR RE-EDUCATION

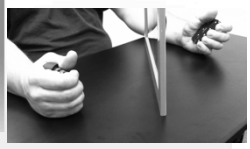


Figure 75-4 Powerball exercise challenges neuromuscular control of the wrist because it generates random multidirectional forces to the forearm and

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INTERVENTION DRF Splints and/or Custom Orthoses

- Protect structures during fracture healing
- Restore motion
- Provide stability

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INTERVENTION DRF PAIN AND EDEMA CONTROL MODALITIES

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Intervention: Supervised therapy compared to Home exercise program

- **Studies that compared patients with complications following DRF have not been found**
- In patients without complications no difference in outcomes between supervised clinic based versus

Valdes K, Naughton N, Michlovitz S. Therapist supervised clinic-based therapy versus instruction in home exercise program following distal radius fracture. J Hand Ther 2014: 27(3): 165-73

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There have been challenges to supervised in clinic therapy following DRF

American Academy of Orthopaedic Surgery v1.0 12-05-2009

A home exercise program is an option for patients prescribed therapy after distal radius fracture.

- Strength of Recommendation: Weak

The five studies reviewed excluded, by design, patients with complications (finger stiffness, CRPS)

The summary reflects the effect of therapy in DRF that were healing without any adverse events.

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Challenges to supervised therapy Surgeon-instructed HEP "better" than OT?

-

A Prospective Randomized Controlled Trial Comparing Occupational Therapy with Independent Exercises After Volar Plate Fixation of a Fracture of the Distal Part of the Radius

J. Sebastiaan Souer, MD, Geert Buijze, MD, and David Ring, MD, PhD

Investigation performed at the Orthopaedic Hand and Upper Extremity Service, Massachusetts General Hospital, Boston, Massachusetts

Patients with surgeon instructed home program compared to supervised OT had better ROM wrist flexion and extension at 6 months

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Discussion? Questions? Comments?

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