

## OTA Choose Wisely Recommendations and Literature Support

### A. Pre Op Non-orthopaedic Evaluation

**Routine cardiology consult for geriatric patients - Avoid advanced cardiovascular evaluation in the preoperative geriatric fracture patient unless current ACC/AHA guidelines are specifically met.**

Luttrell, Kevin and Nana, Arvind. Effect of Preoperative Transthoracic Echocardiogram on Mortality and Surgical Timing in Elderly Adults with Hip Fracture. 2015. Accepted for publication J Am Geriatric Society.

Ricci WM, Della Rocca GJ, Combs C et al. The medical and economic impact of preoperative cardiac testing in elderly patients with hip fractures. *Injury* 2007;38(Suppl 3):S49–S52.

Friedman SM, Mendelson DA, Kates SL et al. Geriatric co-management of proximal femur fractures: Total quality management and protocol-driven care result in better outcomes for a frail patient population. *J Am Geriatr Soc* 2008;56:1349–1356.

### B. Pre Op Orthopaedic Evaluation

**Surgeon should be cautious about routine ordering of CT scans in fractures where the additional information is unlikely to change clinical decision making due to cost and increased radiation exposure.**

#### **CT scans of nondisplaced fractures –**

Ahmadinia K1, Smucker JB, Nash CL, Vallier HA. Radiation exposure has increased in trauma patients over time. *J Trauma Acute Care Surg*. 2012 Feb;72(2):410-5. doi: 10.1097/TA.0b013e31823c59ee.

Vallier HA1, Ahmadinia K, Forde FA, Ekstein C, Nash CL Jr, Tornetta P 3rd. Trends in musculoskeletal imaging in trauma patients: how has our practice changed over time? *J Orthop Trauma*. 2014 Oct;28(10):e236-41. doi: 10.1097/BOT.0000000000000076.

FDA link to risks of CT data: <http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/MedicalImaging/MedicalX-Rays/ucm115329.htm>

#### **CTAs for patients with injuries without soft or hard signs of vascular injury –**

CT angiography should be reserved for patients with obvious signs or high risk of vascular injury after a limb is aligned or joint reduced. *Orthopedics*. 2008 Aug;31(8):761-7.

Detecting vascular injury in lower-extremity orthopedic trauma: the role of CT angiography. Redmond JM1, Levy BA, Dajani KA, Cass JR, Cole PA. *Ann Surg.* 1991 Dec;214(6):737-41.

Can Doppler pressure measurement replace "exclusion" arteriography in the diagnosis of occult extremity arterial trauma? Lynch K1, Johansen K. *J Trauma.* 1991 Apr;31(4):515-9; discussion 519-22.

Non-invasive vascular tests reliably exclude occult arterial trauma in injured extremities. Johansen K1, Lynch K, Paun M, Copass M.

Screening for extremity arterial injury with the arterial pressure index. Levy BA, Zlowodzki MP, Graves M, Cole PA. *Am J Emerg Med.* 2005 Sep;23(5):689-95. Review. *J Trauma.* 2004 Jun;56(6):1261-5.

The value of the ankle-brachial index for diagnosing arterial injury after knee dislocation: a prospective study. Mills WJ1, Barei DP, McNair P.

### **Routine postop x-rays at 2 to 3-week for well-fixed fractures in reliable patients. –**

Routine postoperative radiographs after surgery often carry little important clinical information and had significant cost and radiation exposure. Routine radiographs should be avoided unless a concern for fracture or implant failure is present.

Haddad FS, Williams RL, Prendergast CM. The check x-ray: an unnecessary investigation after hip fracture fixation? *Injury.* 1996;27:351–352. 13.

Kurup HV, Michael AL, Beaumont AR. Check radiographs after dynamic hip screw fixations. Do we need them routinely? *J Bone Joint Surg Br.* 2006;88:171–172. 14.

Chakravarthy J, Mangat K, Qureshi A, et al. Postoperative radiographs following hip fracture surgery. Do they influence patient management? *Int J Clin Pract.* 2007;61:421–424. 15.

Moskal JT, Diduch DR. Postoperative radiographs after total knee arthroplasty: a cost-containment strategy. *Am J Knee Surg.* 1998;11:89–93.

McDonald MR; Bulka CM; Thakore RV; Obremskey WT; Ehrenfeld JM; Jahangir AA, Sethi MK.. Ankle Radiographs in the Early Postoperative Period: Do They Matter? *Journal of Orthopaedic Trauma.* 28(9):538-41, 2014 Sep. UI: 24375274

### **CT scans done at referring hospitals. –**

Referring hospitals should refrain from time-consuming and expensive imaging if a patient is already designated to be transferred due to increased cost high likelihood of a repeat study and radiation exposure.

Ahmadinia K1, Smucker JB, Nash CL, Vallier HA. Radiation exposure has increased in trauma patients over time. *J Trauma Acute Care Surg.* 2012 Feb;72(2):410-5. doi: 10.1097/TA.0b013e31823c59ee.

Vallier HA1, Ahmadinia K, Forde FA, Ekstein C, Nash CL Jr, Tornetta P 3rd. Trends in musculoskeletal imaging in trauma patients: how has our practice changed over time? *J Orthop Trauma.* 2014 Oct;28(10):e236-41. doi: 10.1097/BOT.0000000000000076.

FDA link to risks of CT data: <http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/MedicalImaging/MedicalX-Rays/ucm115329.htm>

### **Routine screening for DVTs in multiple trauma patients –**

While screening protocols have captured increased rates of DVTs in polytrauma patients with skeletal injury (Stannard 2005), negative and positive predictive values for symptomatic PE is insufficient (Borer 2005, Knudson 1992). The poor diagnostic predictive utility for symptomatic PE couple with the already low rates of VTE from wide-spread appropriate use of hemoprophylaxis have lead to the demonstration of cost-ineffectiveness for routine VTE screening (Satiani 1997). Together, these data suggest that routine VTE screening in asymptomatic patients with low pre-test probability do not benefit our patients.

Stannard JP, Singhanian AK, Lopez-Ben RR, Anderson ER, Farris RC, Volgas DA, McGwin GR Jr, Alonso JE. Deep-vein thrombosis in high-energy skeletal trauma despite thromboprophylaxis. *J Bone Joint Surg Br.* 2005 Jul;87(7):965-8.

Borer DS, Starr AJ, Reinert CM, Rao AV, Weatherall P, Thompson D, Champine J, Jones AL. The effect of screening for deep vein thrombosis on the prevalence of pulmonary embolism in patients with fractures of the pelvis or acetabulum: a review of 973 patients. *J Orthop Trauma.* 2005 Feb;19(2):92-5.

Knudson MM, Collins JA, Goodman SB, et al. Thromboembolism following multiple trauma. *J Trauma.* 1992; 32: 2-11.

Satiani B, Falcone R, Shook L, Price J. Screening for major deep venous thrombosis in seriously injured patients: a prospective study. *Ann Vasc Surg.* 1997; 11: 626-629.

## **Interventions**

### **Routine internal fixation of isolated displaced clavicle fractures in all patients. –**

Multiple studies of compared operative versus nonoperative treatment of 100% displaced midshaft clavicle fractures. The studies all indicate that 75% of patients with this injury heal without operative intervention and normal shoulder function. 15% of patients develop a nonunion and 10% develop a malunion. 25% of patients who have operative fixation require a second operation for plate removal. Research is underway to determine which patients benefit most from operative intervention.

Canadian Orthopaedic Trauma Society. Nonoperative treatment compared with plate fixation of displaced midshaft clavicular fractures. A multicenter, randomized clinical trial. *J Bone Joint Surg Am.* 2007;89:1-10.

Virtanen KJ, Paavola MP, Remes VM, Pajarinen J, Savolainen V, Bjorkenheim JM. Nonoperative versus operative treatment of midshaft clavicle fractures: a randomized controlled trial. Read at the 75th Annual Meeting of the AAOS; 2010 Mar 9-12; New Orleans, LA. Paper no 331.

Smith CA, Rudd J, Crosby LA. Results of operative versus nonoperative treatment for 100% displaced midshaft clavicle fractures: a prospective randomized clinical trial. Read at the 16th Annual Open Meeting of the American Shoulder and Elbow Surgeons; 2000 Mar 18; Orlando, FL. Paper no 31.

Witzel K. [Intramedullary osteosynthesis in fractures of the mid-third of the clavicle in sports traumatology]. *Z Orthop Unfall.* 2007;145:639-42. German.

Judd DB, Pallis MP, Smith E, Bottoni CR. Acute operative stabilization versus nonoperative management of clavicle fractures. *Am J Orthop (Belle Mead NJ).* 2009;38:341-5.

### **Open reduction and internal fixation of Upper Extremity fractures in Elderly patients: Distal radius, olecranon, proximal humerus fractures.**

Avoid routine surgical fixation of isolated upper extremity fractures (distal radius, olecranon and proximal humerus) in the elderly unless there are clear indications, goals and benefits. - Elderly Wrist Fractures– These comparative studies of distal radius fractures in elderly patients indicate that there is little functional difference between operative and nonoperative treatment.

#### **Distal Radius Fractures**

Ju JH, Jin GZ, Li GX, Hu HY, Hou RX. Comparison of treatment outcomes between nonsurgical and surgical treatment of distal radius fracture in elderly: a systematic review and meta-analysis. *Langenbecks Arch Surg.* 2015 Oct;400(7):767-79. doi: 10.1007/s00423-015-1324-9. Epub 2015 Aug 30.

Arora R1, Gabl M, Gschwentner M, Deml C, Krappinger D, Lutz M. A comparative study of clinical and radiologic outcomes of unstable colles type distal radius fractures in patients older than 70 years: nonoperative treatment versus volar locking plating. *J Orthop Trauma*. 2009 Apr;23(4):237-42. doi: 10.1097/BOT.0b013e31819b24e9.

Arora R1, Lutz M, Deml C, Krappinger D, Haug L, Gabl M. A prospective randomized trial comparing nonoperative treatment with volar locking plate fixation for displaced and unstable distal radial fractures in patients sixty-five years of age and older. *J Bone Joint Surg Am*. 2011 Dec 7;93(23):2146-53. doi: 10.2106/JBJS.J.01597.

Egol KA1, Walsh M, Romo-Cardoso S, Dorsky S, Paksima N. Distal radial fractures in the elderly: operative compared with nonoperative treatment *J Bone Joint Surg Am*. 2010 Aug 4;92(9):1851-7. doi: 10.2106/JBJS.I.00968.

### **Olecranon Fractures**

Elderly Olecranon Fractures— These case series of olecranon fracture in elderly patients indicate that low demand elderly patients have satisfactory results with nonoperative treatment of displaced and nondisplaced olecranon fractures

Gallucci GL; Piuze NS; Slullitel PA; Boretto JG; Alfie VA; Donndorff A; De Carli P. Non-surgical functional treatment for displaced olecranon fractures in the elderly *Bone & Joint Journal*. 96-B(4):530-4, 2014 Apr.

Duckworth AD; Bugler KE; Clement ND; Court-Brown CM; McQueen MM. Nonoperative management of displaced olecranon fractures in low-demand elderly patients. *Journal of Bone & Joint Surgery - American Volume*. 96(1):67-72, 2014 Jan 1.

Veras Del Monte L; Sirera Vercher M; Busquets Net R; Castellanos Robles J; Carrera Calderer L; Mir Bullo X. Conservative treatment of displaced fractures of the olecranon in the elderly *Injury*. 30(2):105-10, 1999 Mar.

### **Proximal Humerus Fractures**

Proximal humerus Fractures— Outcomes of operative versus nonoperative treatment of proximal humerus fractures in elderly patients have shown little difference with higher reoperation rates and complications in the operative group. Surgeons need to consider patients functional demands and potential benefits from surgical intervention.

Handoll H, Brealey S, Rangan A, et al. Protocol for the ProFHER (PROximal Fracture of the Humerus: Evaluation by Randomisation) trial: a pragmatic multi-centre randomised controlled trial of surgical versus non-surgical treatment for proximal fracture of the humerus in adults. *BMC Musculoskelet Disord* 2009;10(572 140).

Rangan A; Handoll H; Brealey S; Jefferson L; Keding A; Martin BC; Goodchild L; Chuang LH; Hewitt C; Torgerson D; PROFHER Trial Collaborators. Surgical vs nonsurgical treatment of

adults with displaced fractures of the proximal humerus: the PROFHER randomized clinical trial. *JAMA*. 313(10):1037-47, 2015 Mar 10

### **Physical Therapy**

Due to the positive effects of physical therapy for patients with hip fractures, patients should be mobilized as soon as possible post operatively and allowed to be full weight bearing on injured hip.

Post op Care Routine physical therapy for geriatric hip fracture patients – Complications of bed rest Harper CM, Lyles YM. Physiology and complications of bed rest. *J Am Geriatr Soc* 1988;36:1047–1054.

Penrod JD, Boockvar KS, Litke A, Magaziner J, Hannan EL, Halm EA, Silberzweig SB, Sean Morrison R, Orosz GM, Koval KJ, Siu AL. Physical therapy and mobility 2 and 6 months after hip fracture. *J Am Geriatr Soc*. 2004 Jul;52(7):1114-20.

Harada ND, Chun A, Chiu V, et al. Patterns of rehabilitation utilization after hip fracture in acute hospitals and skilled nursing facilities. *Med Care* 2000;38:1119–1130.

Hoenig H, Rubenstein LV, Sloane R, et al. What is the role of timing in the surgical and rehabilitative care of community-dwelling older persons with acute hip fracture? *Arch Intern Med* 1997;157:513–520.

### **Vitamin D and Calcium for Geriatric Fractures**

Vitamin D and Calcium in all Geriatric patients with fractures – Gundrum Minimize the potential detrimental effects of musculoskeletal malacia (including sarcopenia, osteopenia, secondary hyperparathyroidism, at base-line or as sequelae of injury) in geriatric fracture patients by providing Vitamin D and Calcium repletion/supplementation.

Sprague S, Petrisor B, Scott T, Devji T, Phillips M, Spurr H, Bhandari M, Slobogean G. What is the role of Vitamin D supplementation in acute fracture patients? A systematic review and meta-analysis of the prevalence of hypovitaminosis D and supplementation efficacy. *J Orthop Trauma* 2015 Sept 22, Epub ahead of print.

Pooled data found that 70% of acute fracture patients are Vitamin D deficient

Oral supplementation with Vit D results in increased serum levels safely

Weaver CM, Alexander DD, Boushey CJ, Dawson-Hughes B, Lappe JM, LeBoff MS, Liu S, Looker AC, Wallace TC, Wang DD. Calcium plus vitamin D supplementation and risk of fractures: an updated meta-analysis from the National Osteoporosis Foundation. *Osteoporosis Intl* 2015 Oct 28, Epub ahead of print.

Meta-analysis of published studies from 2011 - 2015 reporting 15% reduced risk of total fractures and 30% reduced risk of hip fractures with calcium/Vit D supplementation

Gaffney-Stomberg E, Lutz LJ, Rood JC, Cable SJ, Pasiakos SM, Young AJ, McClung JP. Calcium and vitamin D supplementation maintains parathyroid hormone and improves bone density during initial military training: a randomized, double-blind, placebo controlled trial. Bone 2014 Nov;68:46-56.

Oral supplementation with calcium and Vitamin D during a 9 week period of high physical activity resulted in increase in bone marrow density of 14% as measured by DEXA

Supports the utility of weightbearing activity in addition to nutritional supplementation in encouraging bone formation