

Background

- Utilization of Magnetic Resonance Imaging (MRI) and Computed Tomography (CT) increases annually, raising concerns about overuse
- Imaging appropriateness guidelines have the potential to standardize decisions regarding imaging based on best evidence, which might reduce unhelpful or potentially misleading imaging
- We studied expert use of advanced imaging for musculoskeletal illness compared to published appropriateness recommendations

Methods

- 15 imaging guidelines with recommendations for advanced imaging of the upper extremity were collated
- Members of the Science of Variation Group (SOVG) were invited to participate in a survey of 11 patient scenarios of common upper extremity illnesses and asked whether they would recommend MR or CT imaging
- Guideline recommendations for imaging were compared to surgeon recommendations using Fisher exact tests

Variable	Value
N	108
Sex	
Male	95 (88%)
Female	8 (7.4%)
Location of practice	
United States	63 (58%)
Europe	20 (19%)
Other	20 (19%)
Years in practice	
0-5	24 (22%)
6-10	27 (25%)
11-20	31 (29%)
21-30	21 (19%)
Subspecialty	
Hand and/or wrist	70 (65%)
Shoulder and elbow	30 (28%)
Other	3 (2.8%)
Supervising trainees	84 (82%)

Continuous variables as mean ± standard deviation, discrete variables as number (percentage). Five surgeons (4.6%) had missing data.

	Surgeons		Guidelines†		P value
	Yes	Total	Yes	Total	
Is CT useful for...					
Suspected nonunion of a diaphyseal fracture of the clavicle or humerus?	78 (72%)	11 (92%)	12	0.183	
Is MRI useful for...					
A patient with shoulder pain, full or near full motion, crepitus with forward elevation, radiograph demonstrating superior subluxation of the humeral head and articulation with the acromion (a presentation consistent with rotator cuff defect arthropathy)?	41 (39%)	14 (93%)	15	<0.001	
An adult with wrist pain, not related to an injury, symmetric wrist motion, normal radiographs (a presentation consistent with nonspecific wrist pain)?	39 (36%)	10 (100%)	10	<0.001	
A patient with a radiographically documented first time traumatic anterior shoulder dislocation?	37 (34%)	12 (86%)	14	<0.001	
A patient with a superficial bump around the shoulder that looks and feels like a lipoma under 5 centimeter diameter?	37 (34%)	14 (93%)	15	<0.001	
A patient with less than 1 centimeter bump below the subcutaneous tissues in the finger or hand and the surgeon and patient have agreed on surgical excision. Imaging prior to excision?	25 (23%)	13 (100%)	13	<0.001	
A patient with restricted passive motion, normal radiographs, no history of fracture or dislocation (a presentation consistent with idiopathic adhesive capsulitis)?	20 (19%)	10 (71%)	14	<0.001	
A new patient with shoulder pain, age 40 and over, full motion, no history of fracture or dislocation, and no lag signs or weakness of the rotator cuff muscles (a presentation consistent with rotator cuff tendinopathy without a large defect)?	18 (17%)	13 (93%)	14	<0.001	

	Surgeons		Guidelines†		P value
	Yes	Total	Yes	Total	
Is MRI useful for...					
An adult with a discrete firm bump in the expected location and with the expected consistency of a dorsal wrist ganglion with wrist pain with forceful wrist extension (e.g. doing push-ups or yoga)?	11 (10%)	12 (92%)	13	<0.001	
An adult patient (aged 35 to 65) with lateral elbow pain, pain with resisted wrist extension, and tenderness over the lateral epicondyle with no prior fracture or dislocation (A presentation consistent with outer elbow enthesopathy or tennis elbow/lateral epicondylitis)?	5 (4.6%)	12 (92%)	13	<0.001	
An adult (aged 35 to 65) with medial elbow pain, pain with resisted wrist flexion, and tenderness over the medial epicondyle with no prior fracture or dislocation (a presentation consistent with inner elbow enthesopathy or golfer's elbow/medial epicondylitis)?	5 (4.6%)	12 (92%)	13	<0.001	

† Guideline recommendations were based on the Referral guidelines for Medical Imaging by the European Commission, American College of Radiology, AIM Specialty Health, Radiation Protection 118, Australian government, Canadian Association of Radiologists, United Healthcare, Exion, Texas Medical & Healthcare Partnership, Magellan Healthcare/RedMD, Cofaris Sinai, Japan Radiological Society, MetSolutions, the Center for Diagnostic imaging, and the Musculoskeletal Imaging Handbook.

Results

- For the 11 scenarios, most imaging appropriateness guidelines suggested that MRI or CT is useful while most surgeons (n=108) felt it was not
- There was no correlation between surgeons and guidelines recommendations for imaging ($\rho = 0.28$; $P = 0.40$).
- There was slight agreement among surgeons regarding imaging recommendations (kappa: 0.17, 95% Confidence interval: 0.023 to 0.32).

Conclusions

- The available imaging appropriateness guidelines appear to be too permissive and therefore seem to have limited clinical utility for upper extremity surgeons
- The notable surgeon-to-surgeon variation (unreliability) in recommendations for advanced imaging in this and other studies suggests a role for strategies to ensure that patient decisions about imaging are consistent with their values (what matters most to them) and not unduly influenced by patient misconceptions about imaging or by surgeon beliefs and habits.