

Choosing Wisely: the lack of validity of ultrasound scans in the investigation of shoulder instability

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ABSTRACT

AIM: To test the clinical validity and financial implications of the proposed Choosing Wisely statement: “Using ultrasound as a screening test for shoulder instability is inappropriate in people under 30 years of age, unless there is clinical suspicion of a rotator cuff tear.”

METHOD: A retrospective chart review from a specialist shoulder surgeon’s practice over a two-year period recorded 124 patients under the age of 30 referred with shoulder instability. Of these, forty-one had already had ultrasound scans performed prior to specialist review. The scan results and patient files were reviewed to determine the reported findings on the scans and whether these findings were clinically relevant to diagnosis and decision-making. Comparison was made with subsequent MRI scan results. The data, obtained from the Accident Compensation Corporation (ACC), recorded the number of cases and costs incurred for ultrasound scans of the shoulder in patients under 30 years old over a 10-year period.

RESULTS: There were no cases where the ultrasound scan was considered useful in decision-making. No patient had a full thickness rotator cuff tear. Thirty-nine of the 41 patients subsequently had MRI scans. The cost to the ACC for funding ultrasound scans in patients under 30 has increased over the last decade and exceeded one million dollars in the 2020/2021 financial year. In addition, patients pay a surcharge for this test.

CONCLUSION: The proposed Choosing Wisely statement is valid. This evidence supports that ultrasound is an unnecessary investigation for patients with shoulder instability unless there is clinical suspicion of a rotator cuff tear. Ultrasound also incurs costs to the insurer (ACC) and the patient. We recommend x-rays and, if further imaging is indicated, High Tech Imaging with MRI and sometimes CT scans in these patients.

Choosing Wisely is an international initiative with the intention of helping clinicians choose care that is “supported by evidence, not duplicative of other tests or procedures already received, free from harm and truly necessary.”¹ The origin of the Choosing Wisely movement is the publication of Dr Howard Brody’s *Medicine’s Ethical Responsibility for Health Care Reform – The Top Five List*² in the *New England Journal of Medicine* in 2010. The Choosing Wisely initiative has been implemented in the USA, Canada, the United Kingdom, New Zealand, Australia and parts of Europe. In New Zealand, there has been support from many

organisations, including the New Zealand Medical Association, Medical Council of New Zealand, Association of Salaried Medical Specialists, New Zealand Medical Students’ Association, Cochrane New Zealand, New Zealand College of Midwives, PHARMAC, the Health Quality & Safety Commission, The Ministry of Health, Pacific Radiology and the Council of Medical Colleges.³

The New Zealand Orthopaedic Association is developing Choosing Wisely recommendations in partnership with the Accident Compensation Corporation (ACC). One of their proposed statements is: “Using ultrasound as a screening test for shoulder

instability is inappropriate in people under 30 years of age, unless there is clinical suspicion of a rotator cuff tear.”. Shoulder instability may involve complete dislocation of the glenohumeral joint or subluxation (partial dislocation) of the glenohumeral joint.

Although an ultrasound scan is not physically harmful, the authors feel it is unnecessary and unlikely to negate the need to perform the more commonly indicated MRI evaluation of the unstable shoulder. It also submits the patient and the ACC to an unnecessary financial expense (a patient surcharge applies).

The purpose of this paper is to see whether there is clinical and financial evidence to support the proposed Choosing Wisely statement. This research is a collaboration between clinicians from the New Zealand Orthopaedic Association and the ACC, and we provide ACC data on the costs of this procedure (when funded by the ACC) in patients under the age of 30 over a 10-year period.

Materials and methods

This study was performed as a retrospective chart review of patients at the senior clinical author’s orthopaedic shoulder practice in Christchurch in 2019 and 2020. The inclusion criteria were any patient who was referred with a clinical suspicion of shoulder instability and any patient who was operated on for shoulder instability in 2019 and 2020. Exclusion criteria were any patient aged 30 years or older at the time of referral with previous instability surgery on the shoulder of interest or clinically determined not to be an instability presentation or not clinically reviewed at the practice during the designated period (Figure 1). An audit of each patient’s notes was then undertaken with the senior clinical author.

The relevant data from the patient management software yielded 194 individual patients. Seventy individual patients were excluded because they met at least one of the exclusion criteria. One hundred and twenty-four patients were eligible to be reviewed. The clinical records and radiology referrals of these patients were analysed. Forty-one patients were found to have

undergone an ultrasound to investigate their shoulder instability prior to referral to a specialist shoulder practice.

Having assessed the reported ultrasound findings, we analysed the correlation to clinical presentation for each patient. We determined whether the ultrasound findings likely had any influence on clinical decision-making at the time each patient presented.

We recorded which patients went on to undergo High Tech Imaging in the form of MRI. The reported findings on these imaging modalities were assessed. Utilising the findings on High Tech Imaging, we were then able to describe false-positive and false-negative results on the previous ultrasound scans where direct comparison was applicable.

We obtained ACC data for ultrasound scans performed under the U30 shoulder ultrasound code for the 10-year period 1 July 2011 to 30 June 2021. We then further analysed the subgroup of patients under 30 years of age at the time of their scan.

Results

Of the 124 patients that were eligible for analysis, 41 were found to have undergone an ultrasound scan in the workup for their shoulder instability (33%). Twenty-three were referred for ultrasound by a physiotherapist (56%), 15 were referred by a general practitioner (37%) and three were referred by sports physicians (7%). One patient had two scans ordered, one by a physiotherapist and one by a general practitioner (Figure 2).

Regarding the ultrasound findings, 14/41 (34%) reported no abnormality and 27/41 (66%) had one or more abnormalities reported. The abnormalities reported in these 27 ultrasound scans are summarised in Table 1.

“Other” reported findings included joint effusion (3), suggestion of a Hill-Sachs lesion (2), dynamic subluxation (2) and fatty atrophy of teres minor (1).

In no case did ultrasound scan definitely benefit a clinical diagnosis of instability. Nor in any case did ultrasound definitively demonstrate the significant tissue pathology of instability or assist in treatment decision-making. Ultrasound reported partial

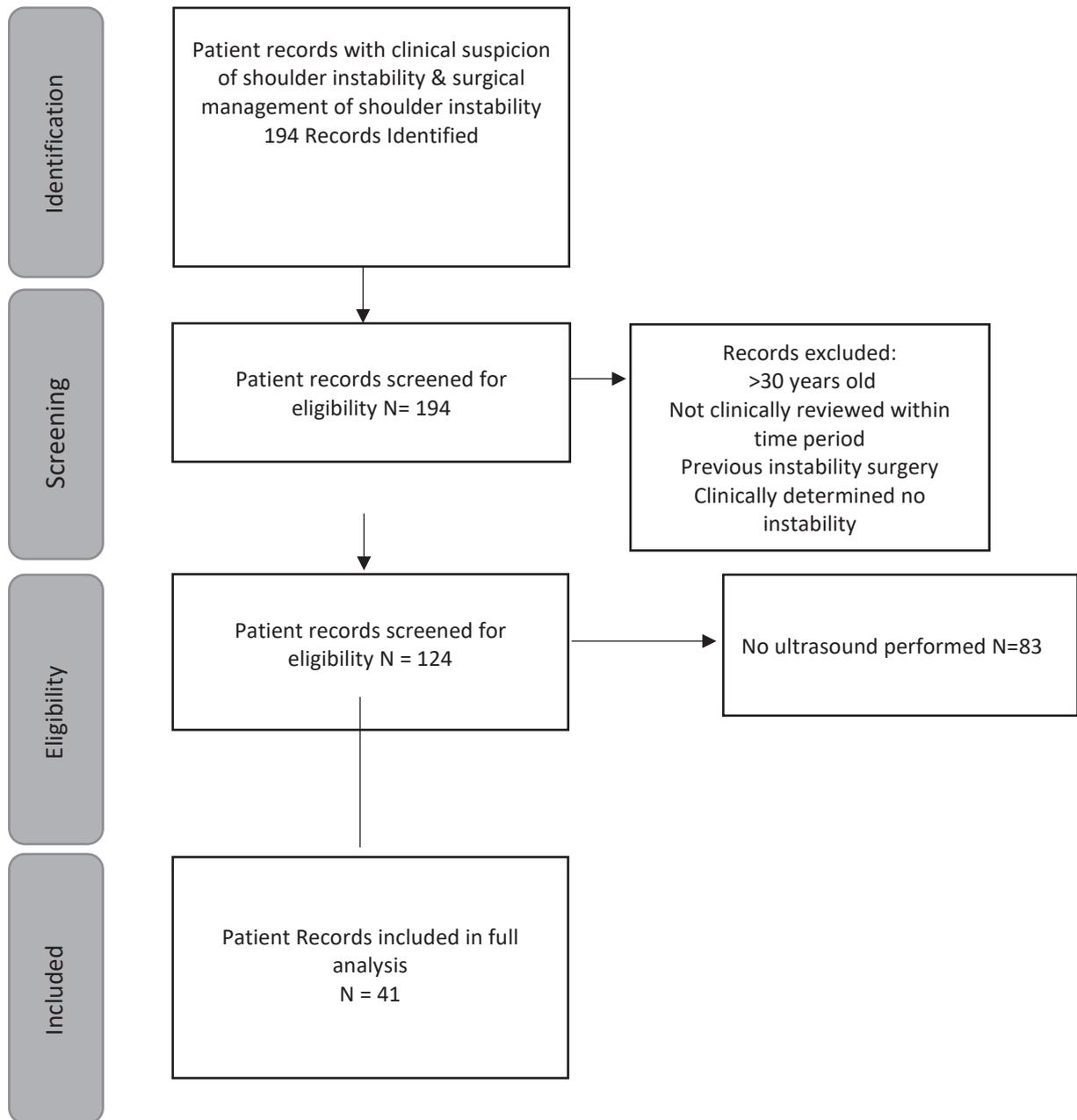
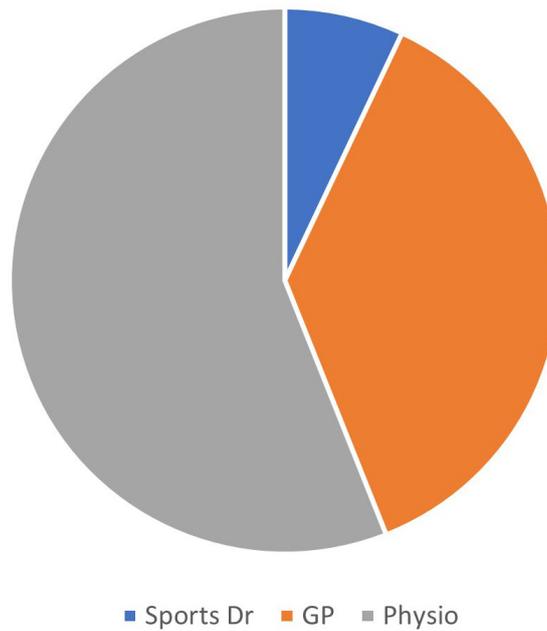
Figure 1: Flow chart showing screening process, eligibility and included results.

Table 1: Ultrasound (USS) reported abnormalities.

Abnormality	Bursitis/bursal thickening	Impingement/bursal bunching	Partial thickness rotator cuff tear	Other
Number of USS containing this finding	8	10	4	9
% of USS containing this finding	20%	24%	10%	22%

Figure 2: Referrers for shoulder ultrasound scans.



thickness rotator cuff tear in one case with pain symptoms and some resolution of instability symptoms, which may have been relevant, although an MRI scan was still performed.

Reviewing the ultrasound-reported abnormalities, bursitis, bursal thickening, bursal bunching and impingement are not of clinical decision-making relevance for the management of a dislocating or subluxing unstable shoulder in a young adult. A Hill-Sachs bony lesion of the humeral head is better appreciated on plain x-ray, MRI or CT scan. Dynamic subluxation of the shoulder is not commonly diagnosed with ultrasound scan by clinicians, being a clinical diagnosis from patient assessment. Teres minor atrophy is better appreciated on MRI and the case reporting this on ultrasound scan was found to be a false-positive report when compared to the subsequent MRI scan.

Of the 124 patients analysed, 111 (90%) had High Tech Imaging performed on their shoulder with an MRI scan. MRI or MRI arthrography was performed on 39 (95%) of the 41 patients who had previously undergone an ultrasound scan. The number of respective abnormalities detected across the MRI results of those patients

who had previously had an ultrasound are summarised in Table 2.

We used the High Tech Imaging results to identify several false-positive and false-negative findings in the ultrasound reports. Two of the four partial thickness rotator cuff tears on ultrasound were false-positive results (i.e., not present on MRI). There was one partial thickness cuff tear missed on ultrasound (false-negative). Three of eight ultrasound findings of bursitis were false-positives when compared to MRI. There was one case where bursitis was not reported on ultrasound. The single case finding of fatty atrophy to teres minor on ultrasound was deemed to be a false-positive when compared to the assessment on High Tech Imaging.

The ACC-funded U30 payments for patients under 30 years of age reports a cost to the ACC over the decade of \$8,829,650 excluding GST (Table 3).

Discussion

The diagnosis of shoulder instability is a clinical diagnosis that usually involves a history of dislocation or partial dislocation (subluxation). The commonly injured structures in patients under 30 years of

Table 2: MRI-reported abnormalities in those patients who previously had ultrasound scans.

	Abnormality – number reported (%)	Probable abnormality – number reported (%)
Labral tear	26 (67%)	5 (13%)
Bony Bankart	12 (31%)	1 (3%)
Chondral defect	14 (36%)	1 (3%)
Hill-Sachs lesion	12 (31%)	
Rotator cuff tear (partial thickness)	3 (8%)	
Bursitis	4 (10%)	
Cyst	3 (8%)	
Tendinosis	1 (3%)	
Synovitis	1 (3%)	
AC arthropathy	1 (3%)	

Table 3: Shoulder ultrasound scans in patients under 30 years of age funded by ACC using U30 code, by financial year.

Measure	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	Ten-year total
Number of payments	3,951	4,523	4,854	5,326	5,486	5,657	5,648	5,677	4,989	6,330	52,441
Number of claims paid	3,861	4,384	4,761	5,201	5,363	5,521	5,498	5,556	4,876	6,185	50,343
Spend (excluding GST)	\$645,198	\$740,284	\$798,628	\$887,520	\$913,091	\$953,945	\$958,756	\$975,169	\$860,351	\$1,096,708	\$8,829,650
Percent of total spend	11%	11%	11%	11%	11%	11%	11%	10%	9%	10%	11%

age include bone (the glenoid rim and humeral head) and the labrum. In some cases, the capsule may tear at its humeral insertion. These lesions, known as “HAGL lesions” (Humeral Avulsion of Glenohumeral Ligament), are relevant when planning treatment. They are examined with MRI and sometimes CT scans. Ultrasound is not a useful modality to examine the glenohumeral bone contours or the labrum and capsule. We agree with the opinion of Porcellini et al,⁴ that “The diagnosis of shoulder instability involves a workup that begins with plain x-rays and is completed with magnetic resonance imaging.”

Ultrasound scan is a useful study to examine the rotator cuff for rotator cuff tears. However, in a child, adolescent or young adult with shoulder instability, injury to the intraarticular structures have significance in decision-making and these are best examined with MRI scans, and sometimes CT, for more detailed examination of bony injury. The rotator cuff may also be evaluated by MRI scans.

Rotator cuff tears are an uncommon sequelae of shoulder instability in children, adolescents and young adults. Shoulder instability is a phenomenon that has a bimodal age distribution, with peaks of incidence in both the young and the elderly. Tearing of the rotator cuff following traumatic glenohumeral dislocation is more commonly seen in the older cohort of patients. In a study of 3,633 shoulder dislocations, Robinson⁵ found 10% of patients to have a concomitant rotator cuff tear. The mean age of those with a tear was 69 years. The mechanism of injury was a low-energy fall in 87% of those who suffered a tear and sports injury in only 2%.

In an analysis of 167 first-time traumatic anterior shoulder dislocations, Berbig et al⁶ found 53 full thickness rotator cuff tears (32%). Only one such tear was found across 66 dislocations in those aged 10–49 years in the cohort, an incidence of 1.5% in this age group. The remaining 52 full-thickness tears occurred across 101 dislocations in those aged 50–99, an incidence of 51% in this older age group.

In New Zealand, patients with an injury covered by the ACC may have their associated imaging paid for by the ACC under the Cost of Treatment Regulations. In some instances, including shoulder ultrasound

scans, the patient also pays a surcharge. The imaging is used by clinicians for diagnosis and treatment decision-making. Appropriate imaging and their reports also play a significant role in whether people who have an accident can obtain further entitlement from ACC.

Shoulder ultrasound scans may be obtained through the ACC service codes U30 (ultrasound shoulder) or U31 (ultrasound musculoskeletal). The majority of shoulder ultrasound scans are billed to the ACC under the U30 code. Very few are billed to the ACC under the U31 code. Not all of these shoulder ultrasound scans will have been performed for instability. Apart from instability, other shoulder injuries seen in this age group include fractures and acromioclavicular joint injuries. X-rays are more common and appropriate initial investigations for these injuries. Shoulder symptoms not caused by accident are not covered for payment of investigations by the ACC.

We obtained ACC data for 10 consecutive financial years: 1 July 2011 to 30 June 2021. During this time, the number of shoulder ultrasound scans funded by the ACC in people under the age of 30 rose steadily. The number of shoulder ultrasound scans increased from 3,951 in 2011/12 to 6,330 in 2020/21. The annual cost over this period increased from \$645,198 to \$1,096,708. The cost of performing shoulder ultrasound scans in people under the age of 30 consistently represented around 10% of the total ACC spend on these scans. In Christchurch in 2021, the cost to private clients was approximately \$295 and the surcharge for ACC patients was \$75.

Conclusions

This review supports the Choosing Wisely statement that “Using ultrasound as a screening test for shoulder instability is inappropriate in people under 30 years of age, unless there is clinical suspicion of a rotator cuff tear.” An audit of a specialist shoulder surgeon’s practice revealed that approximately one third of patients under 30 referred to the practice with shoulder instability had already had a shoulder ultrasound scan. None of these ultrasound scans helped diagnosis or treatment decisions. The vast majority of these patients then went on to receive High Tech Imaging. The ACC

data demonstrate that an increasing number of ultrasound scans are being performed in this age group, now at a cost of over a million dollars a year to the ACC. Additionally, there is a surcharge to each patient.

If further imaging beyond plain x-ray is required for decision-making or treatment in patients with shoulder instability, we recommend performing MRI scans, and in some cases CT scans.

Competing interests:

Nil.

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