

## RESEARCH ARTICLE

# Proof of Concept Trial of Diagnostic Ultrasound in the Orthopaedic Triage Setting

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## Abstract:

**Purpose:** This study aims to investigate the benefits of Point of Care (POC) ultrasound and Scheduled Ultrasound Clinics using a Proof of Concept approach in the orthopaedic triage setting.

**Materials and Methods:** The trial ran for a six week period sourcing all patients referred to the orthopaedic triage service. The trial collected three measurable outcomes i.e. two Patient Reported Outcome Measures: MSK-HQ and The Care Measure, and a Proof of Concept clinician survey via Survey Monkey. These were completed by the clinicians and patient cohort during the scheduled clinic and POC clinical contact.

**Results:** A total of 135 patients received a diagnostic ultrasound scan over the six week trial period. 34 patients received a diagnostic ultrasound scan from the Extended Scope Practitioner (ESP) Physiotherapist in a Scheduled Care setting. 101 patients received a diagnostic ultrasound scan from the ESP Podiatrist in orthopaedic triage over the six week period (74 in Scheduled care clinics and 27 at Point of Care). The outcome measure suggest that patients received a rapid diagnosis (n.135), implementation of appropriate treatment pathway (86.36%), a positive impact on Referral to Treatment (88.55%), appropriate implementation of conservative treatment (91.11%) and had excellent co-production during the trial with an 88% average CARE Measure Score. The MSK-HQ results suggested a wide variety of musculoskeletal conditions were assessed during the trial with a mean MSK-HQ score of 27.6 with a Standard Deviation of 12.

**Conclusion:** Results from clinician sourced Survey Monkey data, The CARE Measure and MSK HQ suggest that POC ultrasound and Scheduled care clinics offer a positive benefit for the patient's care pathway, are beneficial clinically and suggest adequate demand for the service.

**Keywords:** Point of Care, diagnostic ultrasound, service review, orthopaedic triage

## Introduction

Diagnostic ultrasound has been thought of as a rapid, accurate, repeatable, non-expensive, noninvasive and without the risk of radiation [1]. It has been used to focus clinical questions, improve differential diagnosis and direct patients to the most suitable treatment [2]. However there is a need to define the benefits of appropriate use and, limit any unnecessary imaging and its consequences [3]. It is becoming accepted practice for ultrasound diagnostics to expand beyond the borders of Radiology departments due to the evolving nature of clinical practice and the requirement of prudent healthcare principles [4,5]. The Clinical Musculoskeletal Assessment Triage Service (CMATS) is an orthopaedic triage service that assess primary care referrals into secondary care orthopaedic clinics. Assessment supported by appropriate imaging can often be utilised to ensure the implementation of the right pathway for patients at the earliest opportunity.

Historically, provision of MSK Ultrasound diagnostics has been via a referral to Radiology. However, there is increasing evidence that assessment, investigation and initiating treatment at the initial appointment are shown to be cost-effective and increase patient satisfaction [6]. Utilising this approach also reduces repeated hospital visits for further diagnostics and appointment times for results. The aim of using Point of Care (POC) ultrasound is to enhance the patient experience through instant access to diagnosis, timely implementation of most appropriate clinical pathway and achievement of the optimal outcome in the shortest possible time.

## Materials and Methods

Three clinicians attained a PGCert in Diagnostic Musculoskeletal Ultrasound (Consortium for the Accreditation of Sonographic Education Accredited - <http://www.case-uk.org/>) in 2015 and subsequently supported by Cwm Taf University Health Board Radiology Department underwent a 12 month mentorship programme. Two of these clinicians were directly involved in the trial. An Extended Scope Practitioner (ESP) Physiotherapist participated in one clinical session per week of a scheduled ultrasound clinic. An ESP Podiatrist participated in two clinical scheduled scanning sessions per week and in addition

to this utilised the ultrasound equipment in a POC setting. The patient caseload was sourced from the orthopaedic triage pathway.

Patients were allocated to the scheduled ultrasound scan clinics prior to the trial and the scanning clinics were populated. The trial ran for a six week period.

This study utilised three measures to assess the benefits of diagnostic ultrasound service provision. The outcome measures are outlined in the following section and include Clinician Input data on Survey Monkey (Fig.1), and patient questionnaires (The CARE Measure (Fig2) and MSK-HQ (Fig.3)).

## Results

The total number of patients who received a scan in this study were 135, of which 45% were New Assessments and 55.55% Follow Ups. The total number from ESP Physiotherapist planned scanning session was 34, and the total number from ESP Podiatrist planned scanning session was 74. The total number of patients who received a scan at Point of Care was 27. The average number of scans per week was 22.5. For the six week period 267 patient contacts were made in the orthopaedic triage setting by the ESP Podiatrist and 101 of these received an ultrasound scan. Results from each measure are indicated below.

### Survey Monkey clinician survey

Results obtained from the Survey Monkey clinician survey for the period of the study (Fig a). A total of 135 patients received a diagnostic ultrasound scan over the six week period. 83.36% of scans resulted in a change of patient pathway, suggesting the diagnostic ultrasound scan identified an appropriate pathway for the patient. The largest amount of scans completed were of the foot and ankle due to the ESP Podiatrist utilising the diagnostic ultrasound at POC and the number of scheduled scanning clinics. A small number (8.15%) of patients received a rapid referral to orthopaedics referral following their ultrasound scan. A significant number of scans resulted in appropriate implementation of conservative treatment, allowed the provision of specific advice / empowerment and ensured better co-production, improved patient decision making and a positive impact on referral to treatment (Fig a).

Quantitative or qualitative	Data Description	Data Source	Total Number
Quantitative	Total Number of US scans carried out	Survey Monkey	135
	Total number that would have been referred to Radiology (in the absence of ultrasound equipment).	Survey Monkey	135
	Percentage of additional scans with POCT	Calculation	20%
	Number of patients whose pathway changed as a	Survey	

	consequence of the scan	Monkey	86.36%
	Number of shoulders scanned	Survey Monkey	25
	Number of Hip scanned	Survey Monkey	1
	Number of Knees scanned	Survey Monkey	2
	Number of wrists/hand scanned	Survey Monkey	5
	Number of Foot and Ankle Scanned	Survey Monkey	101
	Number of Diagnostics	Survey Monkey	139
Quantitative			
	Number of patients where the scan changed the patient care pathway.	Survey Monkey	83.36%
	Number of patients where the scan signposted for rapid attendance at an alternative service. E.g. Rheumatology	Survey Monkey	2.22%
	Number of patients where the scan signposted for rapid referral to Orthopaedics	Survey Monkey	8.15%
	Number of patients where the scan resulted in appropriate implementation conservative treatment.	Survey Monkey	91.11%
	Number of patients where the scan identified the need for further investigation	Survey Monkey	17.29%
	Number of patients where the scan recognised a serious pathology.	Survey Monkey	0%
Qualitative			
	Number of patients where the scan informed the diagnosis and facilitated provision of specific advice / empowerment and ensured better co-production	Survey Monkey	99.21%
	Clinician's opinion that undertaking the scan as part of the consultation changed the clinical decision for this patient.	Survey Monkey	100%
	Clinicians opinion that delay in receiving the scan would have resulted in poorer outcome (See appendix 1 for details)	Survey Monkey	57.78%
	Clinician's opinion that the scan had a positive impact on the Referral to Treatment	Survey Monkey	88.55%

Fig a: Survey Monkey data results.

## MSK-HQ Results

The MSK-HQ is a validated musculoskeletal health questionnaire which measures key health domains i.e. pain severity, physical function, work, fatigue, emotional health, physical activity, independence, understanding, confidence to self manage and overall impact. The highest possible outcome score for MSK-HQ is 56, the least outcome being 0 [7].

The study population had a mean MSK-HQ score of 27.6 which is almost a 50% reduction in MSK health domains. This is indicative of a population of significant MSK health issues affecting not only physical but emotional and general wellbeing.

The study population had a standard deviation (Standard Deviation P) of MSK-HQ scores of 12. This is indicative that the sample scores have high variance and the mean score results are an inaccurate representation of the population scores. There is therefore great variability of the MSK-HQ scores within the population sampled suggesting a wide variety of MSK condition sampling within the study. (See Fig. b)

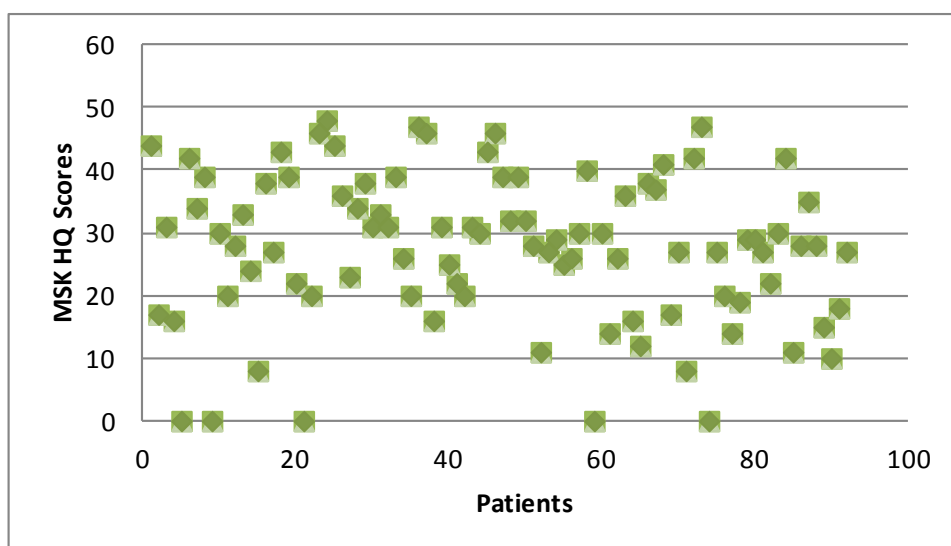


Fig b: MSK-HQ Scores Standard Deviation

There was no significant correlation between MSK-HQ scores and amount of physical activity measured as a component of the MSK-HQ questionnaire. The Mean daily Physical Activity level of the measured population was 1.67 days which is less than the recommended weekly physical activity recommendations recommended by the World Health Organisation [7]. However, the standard deviation of the population measured was 12 which is indicative of a varied spread of physical activity within the population.

## The Care Measure Outcome

The CARE measure (Consultation And Relational Empathy Measure) is a person-centered process measure that was developed and researched at the

Departments of General Practice in Glasgow and Edinburgh Universities supported by the Scottish Government. The CARE Measure is a quick (10 questions), clear and easy to complete patient-completed questionnaire. It measures empathy in the context of the therapeutic relationship during a one-on-one consultation between a clinician and a patient. Originally developed and rigorously tested for use by General Medical Practitioners, it has since been successfully used by other medical staff, allied health professionals and nurses.

Question	Answers %				
	Poor	Fair	Good	Very Good	Excellent
Making you feel at ease	0	0	0	11	88.15
Letting you tell your story	0	0	0.74	14.81	84.44
Really Listening	0	0	1.53	12.21	86.26
Being Interested in you as a whole person	0	0	2.31	10	87.69
Fully understanding your concerns	0	0	2.27	7.58	90.15
Showing care and compassion	0	0	1.54	6.92	91.54
Being Positive	0	0	3	12	85
Explaining things clearly Helping you take control	0	0	1.63	6.5	91.87
Helping you take control	0	0.78	0.78	10.94	85.94
Making a plan of action with you	0	0.74	0.74	8.15	89.63

Fig c: Care Measure Results

Results of The Care Measure indicate an average “Excellent” score of 88% of patients. Suggestive that an excellent therapeutic relationship was measured and experienced by the patient.

## Conclusion

It is recognised that appropriate use of ultrasound has the potential to improve quality of care but robust clinical governance is required to ensure that procurement and deployment of equipment is appropriate, service provision is evidence based and delivered by qualified and competent clinicians. Patients are the primary benefactors of POC ultrasound with improved diagnostic accuracy, faster and appropriate implementation of treatment pathways and demonstrating excellent co-production with the patient population. Radiology is also a co-benefactor with the likely reduced referral rates to the service.

The results of this study suggest that POC ultrasound in orthopaedic triage has a positive outcome on the patient care pathway and experience.

## Conflict of Interest

The authors declare that they have no conflict of interest.

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## Appendix 1

Clarification of statement: “If the patient had to wait 6 months for this scan would this have resulted in poor treatment outcomes?”

### Clinician Comments:

- Chronic tendinopathy
- Synovitis acute joint damage
- Patient concordance
- Patient immobilising
- Incorrect diagnosis
- Patient in severe pain
- High pain levels
- Patient was immobilising and developing chronic pain
- Inappropriate conservative intervention
- Patient immobile
- Patient doing inappropriate self Physio
- Rapid diagnosis and referral
- Definitive staging of tendinopathy
- Off-loading for 6 months until diagnosis completed
- Inappropriate treatment without scan
- Chronic tenosynovitis

- Patient treated for plantar fasciopathy and has back problem
- Chronic pain
- Possible need for surgical intervention
- Risk of nerve compression and long term damage
- Delayed diagnosis would delay appropriate treatment to restore function
- Poor function with previous treatment ineffective, Correct and prompt diagnosis allows early treatment and restoration of function
- Very poor function, would become chronic waiting for diagnosis
- Inappropriate conservative management
- Central Sensitisation
- Irreversible changes to tendon
- Increasing neovascularity
- Assist mobilising in advanced rehab
- Ongoing pain and disability. Chronic tendon changes
- Patient was immobilising. Scan resulted in mobilising.
- Partial tear of Achilles
- Needs surgical management of muscle tear.
- Reduced function due to pain
- Poor function leading to chronic movement restriction
- Delay in management of injection treatment and restoring function
- Incorrect diagnosis: New pathway spinal ESP
- Incorrect diagnosis from orthopaedics
- Incorrect diagnosis from GP: Vague differential diagnosis
- Diagnosis improved management of condition
- Patient doing wrong exercises aggravating tendon
- Chronic fasciopathy
- Delayed care and implementation of treatment
- Active synovitis could cause tendon damage
- Attenuated tendon
- Immediate implementation of conservative treatment
- Complete attenuation of tibialis posterior with risk to integrity of foot
- Acute on chronic tendinopathy
- Pt being treated for tendinopathy but actually arthropathy
- More appropriate pathway. Prudent.
- Chronic tendinopathy
- Ongoing pain and discomfort
- Severe mechanical foot changes
- Patient now requires orthopaedic surgical management due to dislocation of Long head of Biceps which would cause damage to underlying muscle
- Would have delayed injection and physio management causing further stiffness and loss of function
- Poor function and capsular restriction were the patients main complaint and the ultrasound scan ruled out a diagnosis which would have warranted ortho referral
- Calcification was diagnosed initially and may have resulted in barbotage procedure when not needed which may have resulted in delay of physio management which was outcome of exam



- Chronic pain
- Patient currently frustrated with lack of diagnostics
- Achilles Tendon rehab rupture
- Immobile in boot
- Upscaling of pain mechanisms
- Chronic tendinopathy. suffering and distress of patient.
- Clearer management of chronic tendinopathy
- Chronic pain. chronic tendinopathy
- Chronic pain and deformity in STJ - change in foot position
- Chronic Changes in tendon
- Ruptured Achilles Tendon
- Severely degenerative peroneal tendons. at point of rupture
- Sensitisation, poor rehab, longer conservative management

## Appendix 2

Individual Patient Feedback from Care Measure written in section “Do you have any further comments”:

“Felt very much at ease”

“truly satisfied”

“excellent support”

“Very helpful & excellent treatment. Very good advice and putting my mind at ease”

“Excellent Service”

“Very satisfied and happy with treatment”

“Very understanding about the condition and giving me the confidence that a plan is set in place to help with pain relief. Thank you. “

“Absolutely very helpful and happy to help, understands everything”

“Very helpful and explained many things thoroughly”

“Well looked after”

“Excellent service received. Thank you very much”

“Having the ultrasound equipment here was ideal. All done in one go!”

“Very positive consultation. Many Thanks”