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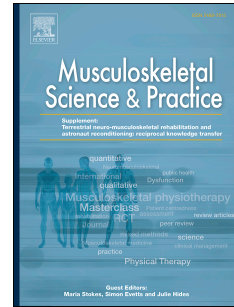
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Self-reported management among people with rotator cuff related shoulder pain: an observational study

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Title: Self-reported management among people with rotator cuff related shoulder pain: an observational study

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### Abstract

Background: Rotator cuff related shoulder pain is the most common cause of shoulder pain.

Whilst guidelines recommend conservative management prior to imaging, injection or surgical management, recent findings suggest that patients experience management contrary to guideline recommendations.

Objectives: The aim of this study was to investigate self-reported management among people with rotator cuff related shoulder pain and their beliefs towards management (RCRSP).

Materials and methods: Cross-sectional survey of people with RCRSP recruited when referred for imaging (n=120). Electronic survey about demographic factors, management people had had (including imaging, injections, surgery, exercise, adjuncts), and beliefs about treatments. The frequency of various treatments was reported (separately for each cohort and traumatic onset) as well as the timing of interventions related to first-line care.

Results: Most people had tried exercise (99/120, 82.5%) but only one in five people reported exercise was helpful, and one in six reported it was unhelpful or made their symptoms worse. Approximately a third of the cohort reported not receiving activity modification advice (34.2%, 41/120), those that did received inconsistent information.

People with both traumatic (imaging 31/43, 72.1%; injections 13/24, 52.2%, surgery 4/19, 21.1%) and atraumatic onset pain (imaging 43/77, 72.1%; injections 31/51, 60.7%, surgery 8/21, 38.1%) had similarly high rates of intervention prior to trialling conservative management. Patient beliefs in regards to management showed trends towards interventionalist care.

Conclusion: Patient reported management of RCRSP is often inconsistent with guideline recommended management.

**Keywords:** rotator cuff related shoulder pain, management, shoulder, rotator cuff tendinopathy, rotator cuff

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## Introduction

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Shoulder pain is one of the most common musculoskeletal conditions with an estimated prevalence of 15-30% of the population at any one time<sup>1,2</sup>. Shoulder pain is the third most common musculoskeletal reason that people consult their general practitioner in Australia, and rotator cuff related shoulder pain (RCRSP) is thought to be the most common presentation accounting for 70% of shoulder pain cases<sup>3</sup>.

As an umbrella term, RCRSP encompasses several pathoanatomical terms that are difficult to differentially diagnose, including; subacromial pain syndrome, rotator cuff tendinopathy and symptomatic rotator cuff tears<sup>4,5</sup>. Similar to other musculoskeletal conditions where definitive structural diagnosis is evasive, the term rotator cuff related shoulder pain (RCRSP), interchangeable with rotator cuff pain syndrome, is more appropriate<sup>5</sup>. As such RCRSP is a clinical presentation diagnosed from patient history and clinical examination, characterized by pain with active and resisted shoulder elevation, external rotation and maintained passive range of shoulder motion<sup>4,5</sup>.

People affected suffer functional limitations during activities of daily living (e.g. dressing, grooming, eating) and RCRSP can lead to substantial societal burden through utilization of healthcare resources and work absenteeism<sup>6</sup>. Recommended first-line treatment includes advice, activity modification and clinician guided exercise, for 6 – 12 weeks before considering imaging, injection or surgical opinion<sup>7-9</sup>. Imaging is not

24 required for the diagnosis of RCRSP unless red flag pathology is suspected or no  
25 improvement is seen with first-line management after several weeks <sup>7,8</sup>.  
26  
27 Recent surveys indicate that physiotherapists in Australia <sup>10</sup>, the United Kingdom <sup>11</sup>,  
28 Belgium and The Netherlands <sup>12</sup> deliver guideline based interventions for people with  
29 RCRSP. A recent Australia-wide survey <sup>13</sup> and a database study of RCRSP management  
30 <sup>14</sup> by general practitioners both demonstrate high rates of imaging referral prior to  
31 recommended non-invasive first-line care, and to a lesser extent injection and surgical  
32 referrals. It is important to understand treatment trends from the patient's  
33 perspective to determine whether they report receiving guideline recommended care  
34 (for example, trialing exercise prior to imaging) and understand their care experiences.  
35  
36 The aim of this study was to investigate self-reported management among people with  
37 RCRSP, their beliefs towards management, and the extent to which current  
38 management of RCRSP is consistent with guideline recommendations.

39

40

## Methods

### Study design

42 A cross-sectional survey exploring patient experience of RCRSP management and their  
43 beliefs.

44

### Recruitment and sampling method

45

46 Participants were recruited from a radiology centre in Australia specialising in  
47 musculoskeletal imaging. Patients from the radiology centre who had imaging for  
48 shoulder pain between December 2018 to December 2019 and had consented to be  
49 contacted about research, were invited to complete the survey. Stage 1 screening:  
50 screening questions were included at the start of the survey, excluding those who had  
51 been diagnosed (by a health professional) with other shoulder conditions, including;  
52 adhesive capsulitis, dislocation, osteoarthritis and instability. Patients were also  
53 excluded if they had had shoulder pain for less than 6 weeks, they were under 18 years  
54 of age or their pain was not consistent with RCRSP, ie. their pain was: 1) not primarily  
55 in the antero-lateral aspect of the shoulder and upper arm; 2) brought on with cervical  
56 movement; 3) not made worse moving the arm overhead <sup>4</sup>. Stage 2 screening: the  
57 imaging reports were analysed to determine if they included rotator cuff tendon or  
58 subacromial bursal pathology as the primary findings. This enabled exclusion of  
59 participants with other primary pathologies (fracture, adhesive capsulitis, severe  
60 osteoarthritis) <sup>5</sup>. Despite RCRSP having a clinical (not imaging) diagnosis, this step  
61 ensured that obvious participant self-reporting inaccuracies (e.g. answering no to  
62 having trauma when they had a fracture reported on imaging) were identified.  
63 Participants were offered a \$20 gift voucher to compensate them for their time.

64

#### 65 Response and participation rates

66 The response rate was calculated (number of people consenting divided by the  
67 number of people invited). The completion rate was the number who completed the  
68 survey divided by the number consenting.



69

70 Survey instrument

71 The survey instrument (see Appendix 1) was constructed using Qualtrics software  
72 (Qualtrics, Provo, Utah) consisting of a maximum of 62 questions dependent upon  
73 patient answers. Questions about management for RCRSP and patient beliefs were  
74 developed by a subgroup of investigators based on clinical practice guidelines<sup>4, 7-9</sup>,  
75 systematic reviews<sup>15, 16</sup>, and qualitative studies among patients with this condition<sup>17</sup>,  
76<sup>18</sup>. The survey was subsequently pilot tested with a convenience sample of 5  
77 physiotherapists and 2 patients not involved in the study, to test for clarity and  
78 potential online operational issues. Minor subsequent amendments were made  
79 following feedback from the pilot test.

80

81 The survey instrument collected data on participant characteristics including age,  
82 gender, co-morbidities, duration of shoulder pain (selected from dropdown menu; 6-  
83 >52 weeks) and if they have had or were planning to have surgery for their shoulder  
84 pain. Participant intervention and management experience (imaging, injections,  
85 exercise, adjuncts and surgery) was explored with multiple choice and multiple answer  
86 questions. Where “other” was selected, participants were asked to provide a  
87 descriptive answer. Subsequent questions incorporated short answer questions  
88 exploring patient beliefs. We also asked about sources and preferred format of health  
89 information.

90

91 Determination of recommended care

92 To establish to what extent participant's management experiences were consistent  
93 with recommended management we compared their answers to a summation of  
94 relevant guidelines adapted from <sup>4, 7-9</sup>. A summary of recommendations about  
95 exercise, education, imaging, surgery and injections in these guidelines is shown in  
96 Appendix 2.

97

#### 98 Statistical analysis

99 All survey data was exported from Qualtrics to SPSS version 25 (IBM Corp., Armonk,  
100 NY, USA) data analysis software. Descriptive data included; age, gender, duration of  
101 shoulder pain, residential location, co-morbidities and traumatic onset. The frequency  
102 of different management options (exercise, imaging, injections, surgery, education and  
103 adjunctive treatments) were reported. Patient beliefs related to indications and the  
104 appropriateness of imaging and surgery were reported. Data for treatments (except  
105 for education) were separated based on whether people did and did not report a  
106 traumatic onset as this may influence management (e.g. surgery, imaging). The  
107 duration of symptoms and age of people who did (or scheduled to) and did not have  
108 surgery was compared (Mann Whitney U [non-parametric distributions]).

109

110 Every open-ended question response was transcribed verbatim with identifying data  
111 removed. Microsoft Excel (Microsoft excel, 2016) was used to manage the survey data  
112 and compare responses. A qualitative content analysis approach was employed  
113 allowing for large amounts of data to be reduced to concepts that describe the  
114 research <sup>19</sup>. Units of meaning were identified by two researchers analysing each

115 response, manually developing initial codes. These codes were then deductively  
 116 derived into categories informed by the open question's focus following collaborative  
 117 meetings and discussion between the researchers. Additionally, a frequency count of  
 118 the content was performed to aid interpretation. Any researcher perspective  
 119 differences were negotiated, and if necessary, regrouped and recoded until consensus  
 120 was reached. The final step examined relationships between categories to form  
 121 themes.

122

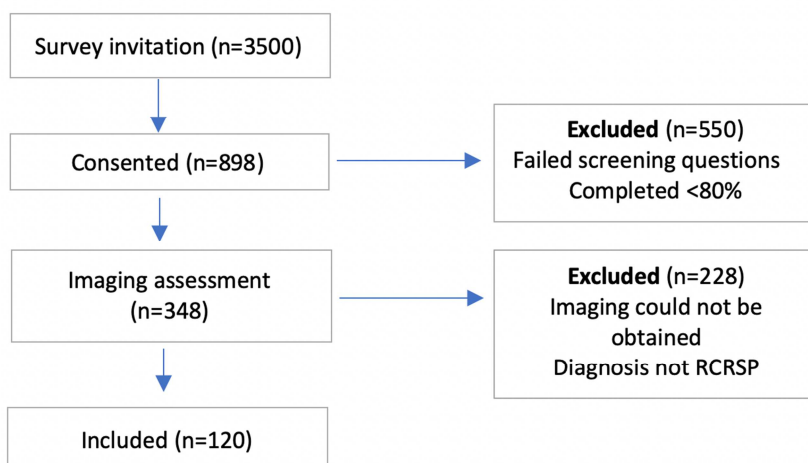
123

### Results

124 One hundred and twenty people with RCRSP were eligible and included in analysis.

125 Sixty-four clinicians from all around Melbourne, Australia (including physiotherapists,  
 126 osteopaths, chiropractors, sports doctors, surgeons) referred the 120 people included  
 127 into the imaging center. Figure 1 shows the recruitment process. The response rate  
 128 was 25.7% (898/3500) and the completion rate was 38.8% (348/898).

129



130

131 *Figure 1. Recruitment process*

132

133 Demographic data are shown for people with and without a traumatic onset (Table 1).

134 Median duration of symptoms was higher among people with a traumatic onset. Most

135 common co-morbidities were osteoarthritis and metabolic disease (hypertension and

136 Hypercholesterolemia). The most common professions consulted included

137 physiotherapists, general practitioners, sports physicians and orthopaedic surgeons.

138

139 Table 1. Respondent demographic and treatment information (‡mean and standard  
140 deviation, \*median and Interquartile range, otherwise frequency and %)

	<b>Trauma (n=43)</b>	<b>No trauma (n=77)</b>
<i>SPADI</i> ‡	na	na
<i>Age, yrs</i> *	50 (38 to 63)	52 (41 to 59)
<i>Symptom duration, wks</i> *	52 (24 to >52)	40 (22 to >52)
<i>Location</i>		
Major urban	30 (69.8)	64 (83.1)
Other urban	4 (9.3)	7 (9.1)
Rural	9 (20.9)	6 (7.8)
<i>Gender</i>		
Male	28 (65.1)	32 (41.6)
Female	15 (34.9)	44 (57.1)
Prefer not to state	0 (0.0)	1 (1.3)
<i>Co-Morbidities</i>		
Osteoarthritis	9 (20.9)	16 (20.8)
Rheumatoid arthritis	3 (7.0)	2 (2.6)
Psoriatic arthritis	1 (2.3)	0 (0.0)
Gout	4 (9.3)	3 (3.9)
Inflammatory bowel disease	3 (7.0)	1 (1.3)
Fibromyalgia	0 (0.0)	1 (1.3)
Hypertension	12 (27.9)	18 (23.4)
Hypercholesterolemia	10 (23.3)	10 (13.0)
Diabetes	1 (2.3)	3 (3.9)
Other	8 (18.6)	10 (13.0)
<i>Treating/advising practitioners</i>		
General practitioner	32 (74.4)	44 (57.1)
Physiotherapist	30 (69.8)	52 (67.5)
Osteopath	3 (7.0)	9 (11.7)
Chiropractor	2 (4.7)	3 (3.9)

Massage/Myotherapist	9 (20.9)	22 (28.6)
Exercise physiologist	2 (4.7)	6 (6.5)
Sports physician	19 (44.2)	35 (45.5)
Orthopaedic surgeon	24 (55.8)	29 (37.7)
Rheumatologist	1 (2.3)	2 (2.6)
Other medical professional	4 (9.3)	1 (1.3)

141

142 First-line management143 *Exercise and adjunctive therapy*

144 Table 2 shows the frequency of exercise and adjunctive treatments. Between 86.0%  
 145 (37/43, traumatic onset) and 80.5% (62/77, atraumatic onset) of people surveyed had  
 146 tried exercise. Similar proportions of people tried loaded and unloaded shoulder  
 147 exercise. Almost all participants reported trialing at least one adjunctive treatment.  
 148 Medications specified mostly included various anti-inflammatories (steroidal and non-  
 149 steroidal).

150

151 Table 2. Frequency and type of first-line treatment and interventional care

	Trauma (n=43)	No trauma (n=77)
	Frequency (%)	Frequency (%)
<b>Exercise treatment</b>	37 (86.0)	62 (80.5)
<i>Type of exercise</i>		
Without resistance	29 (67.4)	45 (58.4)
With resistance	28 (65.1)	47 (61.0)
Shoulder stretching	17 (39.5)	29 (37.7)
Other	8 (18.6)	7 (9.1)
<b>Adjunctive treatment</b>	43 (100.0)	74 (96.1)
<i>Type of other treatment</i>		
Massage/ manipulation	28 (65.1)	49 (63.6)
Taping	16 (37.2)	20 (26.0)
Acupuncture/ needling	14 (32.6)	22 (28.6)
Complete rest	28 (65.1)	35 (45.5)
Electrotherapy	8 (18.6)	9 (11.7)
Hot or cold therapy	10 (23.3)	17 (22.1)
Neck or back treatment	12 (27.9)	11 (14.3)

Medication	16 (37.2)	32 (41.6)
<b>Imaging</b>	43 (100.0)	77 (100.0)
<i>Type of imaging</i>		
X-ray	24 (55.8)	36 (46.8)
Ultrasound	31 (72.1)	57 (74.0)
MRI	33 (76.7)	56 (72.7)
<b>Injection</b>	24 (55.8)	51 (66.2)
<i>Type of injection</i>		
Steroid	21 (48.8)	45 (58.4)
Platelet rich plasma	1 (2.3)	2 (2.6)
Hydrodilatation	9 (20.9)	12 (15.6)
Other	0 (0.0)	2 (2.6)

152

153

154 *Shoulder rehabilitation exercise duration and reasons for stopping*

155 Among the respondents who had tried exercise treatment (82.5%, 99/120), one in  
 156 three people (30.3%, 30/99) had stopped exercises at the time of the survey.

157 Participants who had stopped exercise had persevered for a median of 11 weeks (IQR:

158 6 to 16). Reasons for stopping exercise or not doing the prescribed amount (59

159 participants volunteered answers) included; worsening pain (35.6%, 21/59, 'my

160 shoulder hurts too much to do the exercises' [P 106]); lack of improvement (28.8%,

161 17/59, 'it wasn't improving', [P 71]), lifestyle and personal barriers (20.3%, 12/59,

162 'forgetful, lazy and a lack of time', [P 96]), recovery of symptoms (13.6%, 8/59, 'I

163 stopped when the pain went away' [P 48]), told to stop by a clinician (8.5%, 5/59,

164 'sports physician told me to stop as the tendon was damaged' [P 108]) and beliefs

165 about the outcome (5.1%, 3/59, 'didn't think exercise would work' [P 28]).

166

167 Education

168 Two-thirds of people reported receiving activity modification advice (65.8%, 79/120)  
169 and three quarters reported receiving education regarding the cause and treatment  
170 for their shoulder pain (75.0%, 90/120). Activity modification advice commonly  
171 included avoiding overhead tasks (36.7%, 29/79, 'limiting using hands above my head'  
172 [P 59]), cessation of specific activity (21.5%, 17/79) including recreational activities  
173 ('told to stop playing golf' [P 3]) and work ('retire and stop working' [P 77]). Some  
174 people described advice to do more exercise (11.4%, 9/79, 'physio gave me exercise to  
175 strengthen my shoulder blade' [P 7]), make other activity or life modifications (15.2%,  
176 12/79, 'modify my workplace setup' [P 103]), or to 'avoid painful movements' 15.2%  
177 (12/79). Regarding education about acceptable pain during exercise, similar  
178 proportions were told to avoid any pain (39.4%, 39/99) and that some pain during  
179 exercise was acceptable (46.5%, 46/99).

180  
181 Common sources of health information were internet searches (52.5%, 63/120),  
182 consulting their general practitioner (91.7%, 110/120) or physiotherapist (49.2%,  
183 59/120). Less common responses included consulting a surgeon (24.2%, 29/120) or  
184 family and friends (14.2%, 17/120). Some selected 'other' (10%, 12/120) which  
185 included information from sports physicians, pharmacists, and chiropractors. Preferred  
186 formats for accessing health information included verbal information (73.3%, 88/120),  
187 followed by online written (55%, 66/120), printed information (52.5%, 63/120),  
188 infographics (31.7%, 38/120) and online videos (31.7%, 38/120).

189

190 Interventional management

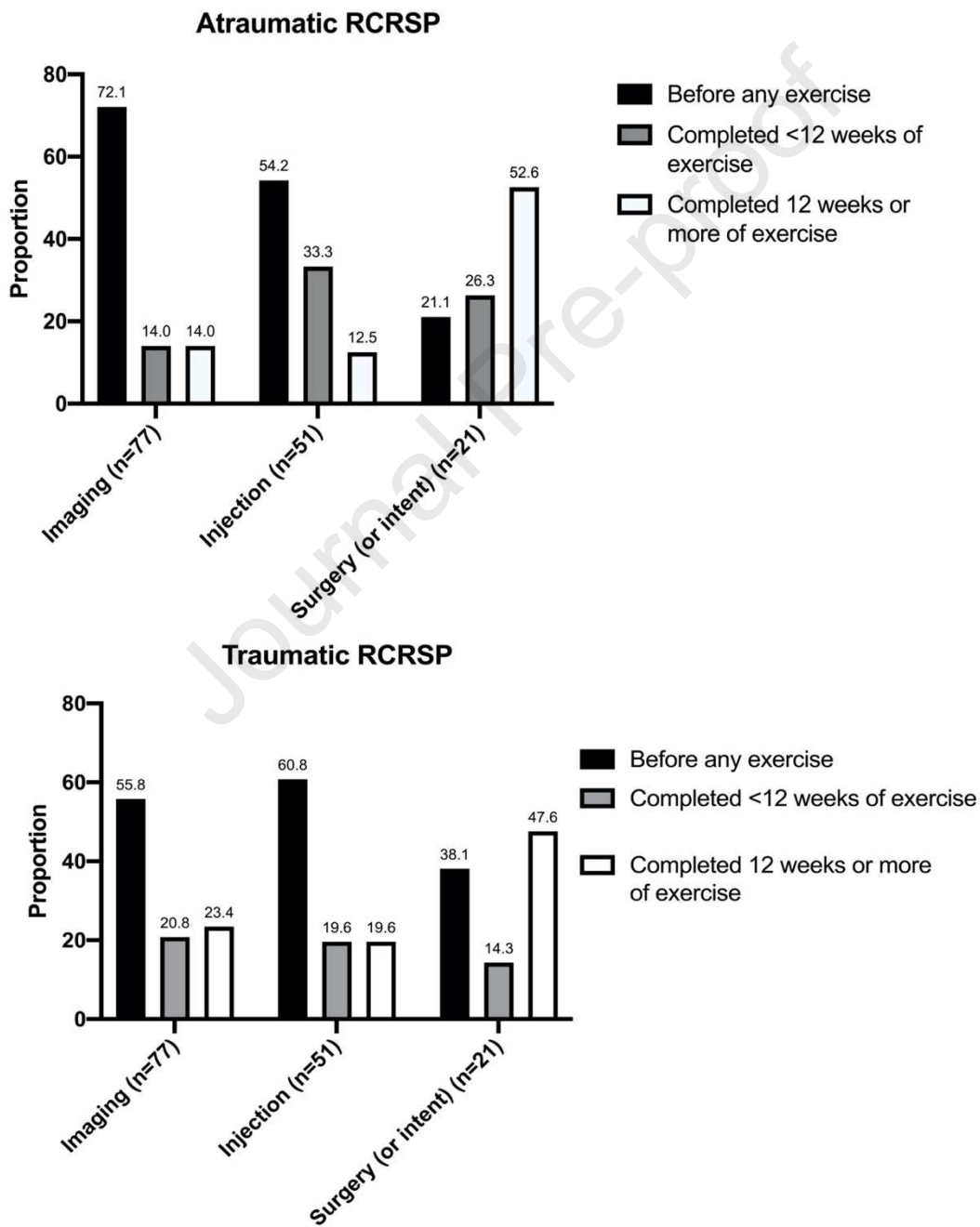
191 *Imaging*

192 Table 2 provides imaging data. Most common imaging modalities were ultrasound and

193 MRI. Between 55.8% (43/77, atraumatic onset) to 72.1% (31/43, atraumatic onset) had

194 imaging prior to any exercise (Figure 2).

195



196



197 *Figure 2. Timing of imaging, injections and surgery in relation to exercise for people*  
198 *who did and did not have a traumatic onset*

199

#### 200 *Injection*

201 Table 2 provides injection data for each cohort. Between 55.8% (traumatic onset) and  
202 66.2% (atraumatic onset) of people had had an injection, most commonly steroid or  
203 hydrodilatation. More than half of respondents (54.2%, 13/24, atraumatic onset;  
204 60.0%, 31/51, traumatic onset) had an injection prior to any exercise (Figure 2).

205

#### 206 *Surgery*

207 A third of respondents (33.3%, 40/120) had undergone or were scheduled to have  
208 surgery (subacromial decompression [SAD] or rotator cuff repairs +/- SAD). Age (Mann  
209 Whitney U=1463, p=0.447) and duration of symptoms (Mann Whitney U = 1289, p =  
210 0.283) were not different between people in the imaging cohort who did or did not  
211 have surgery. Among people who already had surgery, the median duration since their  
212 operation was 15 weeks (IQR 7 to 39). More people reporting a traumatic onset had  
213 surgery (48.8% ,21/43) compared with people with an atraumatic onset (24.7%,  
214 19/77). Between 21.1% (4/19, traumatic onset) and 38.1% (8/21, atraumatic onset) of  
215 people had surgery prior to any exercise treatment (Figure 2).

216

#### 217 Participant beliefs related to RCRSP

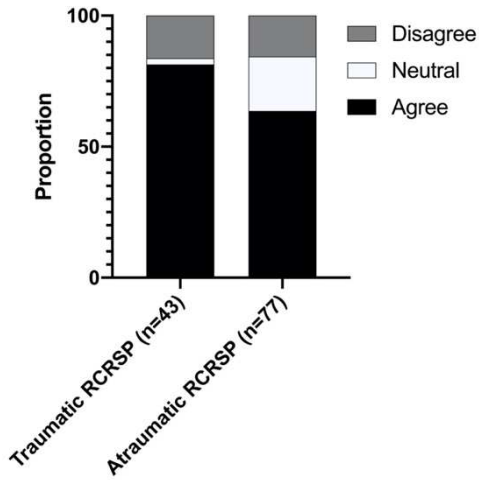
218 Responses to questions about imaging and treatment beliefs are shown in Figure 3.

219 The cohorts were more likely to agree that imaging was necessary for diagnosis (63.6%

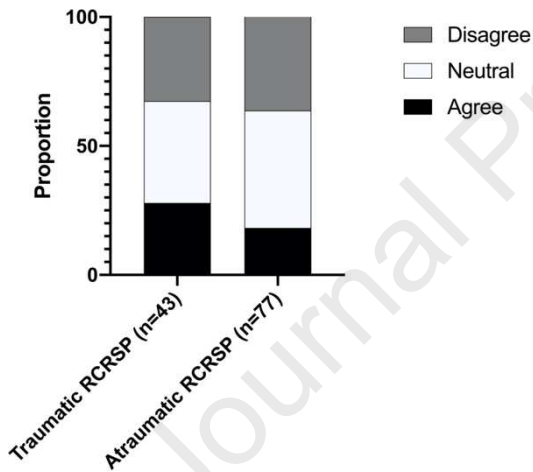
220 to 81.4% - highest in the traumatic cohort), surgery was the best treatment for  
221 damaged tendons (16.4% to 27.9% - highest in the traumatic cohort), and agree to  
222 surgery even if they had no symptoms (27.9% to 35.1% - highest in the traumatic  
223 cohort).

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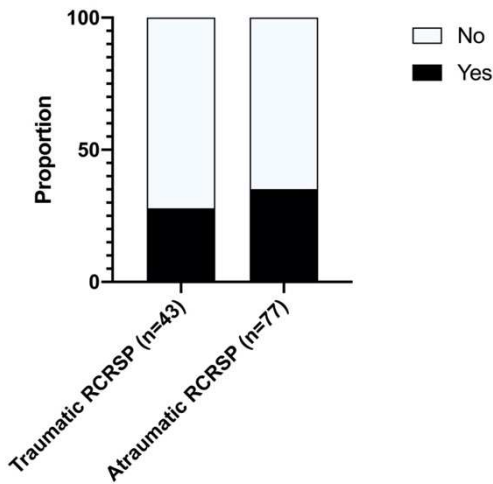
*I would only feel confident about my diagnosis causing shoulder pain if I had a scan*



*If the tendons in the shoulder are damaged, then the best treatment for this is surgery*



*If a scan such as an ultrasound or an MRI reported abnormalities in the shoulder tissues, would you be willing to undergo surgery even if you had NO symptoms (pain, stiffness etc.)*



225 Figure 3. Beliefs about imaging, treatment for damaged tendons and indication for  
226 surgery

227

### 228 *Helpful treatments*

229 Most of the cohort (94.2%, 113/120) responded to the open question about helpful  
230 treatments. Treatments that reduced pain were generally perceived as helpful. Many  
231 respondents reported injections were helpful (30.1%, 34/113, 'cortisone because it  
232 helped get rid of the pain' [P 60]), followed by exercise (20.4%, 23/113, 'exercises were  
233 the best [P 51]) and adjunctive therapy (16.8%, 19/113, 'massage because I can feel  
234 the pain diminishing' [P 59]). Only 7.1% (8/113) of respondents felt no treatment they  
235 had received was helpful ('nothing has been helpful' [P 97]).

236

### 237 *Unhelpful treatments*

238 About two-thirds of participants (67.5%, 81/120) responded to the open question  
239 about unhelpful treatments. Many (42.0%, 34/81) reported they found no treatments  
240 unhelpful. Some reported injections (13.6%, 11/81, 'cortisone injection in the bursa  
241 didn't reduce the pain', [P 45]), exercise (12.3%, 10/81) or physiotherapy (11.1%, 9/81)  
242 to be unhelpful because of 'no improvement' (P 102) or 'more pain after the  
243 treatment' (P 100).

244

### 245 *Harmful treatments*

246 Only 14.2% (17/120) responded to the open question about harmful treatments.

247 Respondents reported that exercise (52.9%, 9/17), physiotherapy (35.3%, 6/17),

248 adjunctive therapy (17.7%, 3/17) and osteopathy (5.9%, 1/17) were harmful. This  
249 negative experience was based on worsening pain and/or condition. For example, 'the  
250 exercises are aggravating my shoulder making it worse' (P 102) and 'I had reduced  
251 movement afterwards' (P 28).

252

253

### Discussion

254 The aim of this study was to investigate self-reported management among people with  
255 rotator cuff related shoulder pain (RCRSP). We found that most people with RCRSP  
256 recruited had tried exercise to manage their shoulder pain but very few reported that  
257 exercise was beneficial, and some reported exercise was not helpful or harmful. Advice  
258 on activity modification, recommended as part of first line management, was  
259 reportedly not received by over a third of participants. There was also a substantial  
260 proportion of people who reported having imaging, injections and surgery prior to  
261 trying any exercise, even people who did not have a traumatic onset to their RCRSP,  
262 contrary to guideline recommended management.

263

#### *First-line care*

264 Guidelines recommend that people with RCRSP trial several weeks (6 to 12) of exercise  
265 and advice (including activity modification) prior to interventionalist care <sup>7, 8, 20, 21</sup>.  
266 Consistent with these recommendations, most people surveyed (82.5%) had tried  
267 exercise for their RCRSP. Those who had stopped at the time of the survey had  
268 persevered with exercise for a median of 11 weeks. However, only one in five people  
269 reported exercise was helpful, and one in six reported exercise was unhelpful or  
270

271 harmful. Among the people who had stopped exercise, common reasons were lack of  
272 improvement or worsening pain. Recent evidence<sup>22, 23</sup> suggests that specific  
273 parameters (i.e. progressive and resisted exercise) may confer greater benefits for  
274 people with RCRSP but robust evidence is required to refute or confirm this.

275

276 Further, there is debate even among shoulder management 'experts' regarding the  
277 optimal exercise parameters for RCRSP<sup>20, 21</sup>. This debate includes whether exercise  
278 should be painful or painfree<sup>20</sup>, and this was reflected in the advice about pain during  
279 exercise reported by people in our cohort. Variability in exercise approaches and  
280 ideology was also reflected in a recent survey of physiotherapist practice in Australia  
281<sup>10</sup>. Clearly there is no accepted exercise approach for RCRSP and this may impact on  
282 exercise outcomes.

283

284 Contrary to guideline recommendations, a third of people reported that they did not  
285 receive advice about activity modification. People who did receive activity modification  
286 advice reported diverse recommendations that ranged from cessation of specific  
287 activities to (e.g. golf or work) to modification based on pain. Further, about 50% of  
288 people (see Table 2) were advised to 'completely rest' which is generally not  
289 recommended<sup>7, 8, 20, 21</sup>. A recent qualitative study among expert shoulder clinicians  
290 highlighted the importance of education (including activity modification) to facilitate  
291 exercise and self-management for people with RCRSP<sup>24</sup>. In contrast, people with  
292 RCRSP in this survey appeared to receive inconsistent messages about activity  
293 modification and advice that may not be recommended.

294

295 *Timing of interventions*

296 Guidelines for RCRSP recommend imaging if serious pathology is suspected, or after

297 failure of up to 12 weeks of first-line care that includes exercise <sup>4,7,8</sup>. Similarly,

298 interventions such as surgery but also injections are generally recommended only after

299 first-line care has failed <sup>4,7,8</sup>. Consistent with these recommendations, 72.1% of people

300 who had trauma had a scan prior to any exercise. However, when removing people

301 with a traumatic onset, 55.8% had imaging prior to exercise care. It is possible that in

302 some instances imaging was indicated by the clinical presentation (e.g. severe

303 unremitting severe pain). We did not assess disease severity because many were

304 surveyed months after they sought treatments. Alternatively, some of the imaging

305 observed in this study may not have been guideline recommended. Prior database and

306 National surveys in Australia have found that between 43.5% and 82% of general

307 practitioners recommend imaging for RCRSP when it is not recommended by

308 guidelines, often on first presentation <sup>13,14</sup>.

309

310 Some people also had injections (54.2% to 60.0%) prior to any exercise. This is not

311 surprising for steroid injection given some guidelines are unclear on their timing (e.g. <sup>4</sup>)312 whereas others recommend after failure of first-line care (e.g. <sup>7</sup>). This is different to

313 surgical management that is consistently recommended by guidelines only after failure

314 of first-line care for atraumatic RCRSP. In contrast to this recommendation, 38.1% of

315 people with an atraumatic onset had surgery prior to any exercise care. This is

316 potentially concerning given equivalent efficacy of exercise compared to surgery for

317 RCRSP<sup>16</sup>, recent evidence that subacromial decompression (a common surgery for  
318 RCRSP) may be no better than placebo<sup>25</sup>, and the risks involved with surgery<sup>25</sup>.  
319 Further, there has been doubling in population-adjusted rates of RCRSP related  
320 surgeries (subacromial decompression and rotator cuff repair) between 2001 and 2013  
321 respectively in Western Australia<sup>26</sup>, and there are similar trends of increasing surgical  
322 rates for RCRSP in the UK, US and Denmark<sup>26</sup>.

323

#### 324 *Beliefs about imaging and surgery*

325 A majority of people agreed that imaging was necessary for diagnosis (63.6% to  
326 81.4%), that surgery was the best treatment for damaged tendons (16.4% to 27.9%),  
327 and would agree to surgery if tendons were damaged even if they had no symptoms  
328 (27.9% to 35.1%). Among people with musculoskeletal pain, greater disease severity is  
329 associated with greater fear-avoidance and catastrophizing beliefs<sup>27</sup> that may also be  
330 related to beliefs about imaging and surgery. Kromer et al.<sup>28</sup> reported a positive  
331 association between fear avoidance belief and disability severity among people with  
332 subacromial impingement (another term for RCRSP). An alternative explanation is that  
333 beliefs that these interventions are necessary may result in healthcare seeking  
334 behavior<sup>29</sup>. People with RCRSP believe that their pain has a biomedical cause, such as  
335 damage to the tissues<sup>17,18</sup> and some have expressed this has motivated surgery<sup>17,30</sup>.  
336 It is also possible that because our cohort was recruited from an imaging centre, they  
337 were more likely than other people with RCRSP to believe that imaging is necessary for  
338 diagnosis of this condition.

339



340 *Strengths and limitations*

341 This survey provides a novel patient perspective in relation to self-reported  
342 management and beliefs among people with RCRSP. There are several limitations that  
343 should be highlighted. First, our data may not be generalisable beyond people being  
344 referred to imaging at the imaging center in Melbourne. Although it is one of the  
345 largest specialist musculoskeletal imaging facilities in Australia and the 120 people  
346 surveyed from this centre were referred by 64 separate multidisciplinary clinicians, this  
347 data may be specific to this context. Second, some of the responses may be at risk of  
348 recall bias, but this is only likely when participants were asked to think about events in  
349 the past such as duration of symptoms. Third, given response rate was less than 25%  
350 this may introduce selection bias if respondents are different in some unknown way to  
351 the population. Fourth, we acknowledge that the addition of imaging to confirm the  
352 diagnosis is not necessary for RCRSP. This was added because of the potential  
353 limitations of our online screening for RCRSP and involved excluding cases of obvious  
354 participant self-reporting inaccuracies<sup>5</sup>. Fifth, although a very small proportion, we  
355 acknowledge that some people (7.5%, 9/120) in our cohort had rheumatoid or  
356 psoriatic arthritis which may present an indication for imaging prior to first-line care,  
357 and may explain some cases where exercise management was not effective.

358

359 *Future directions*

360 Future work should seek to confirm the findings from this survey, particularly the  
361 apparent poor response to exercise care and high rates of earlier than recommended  
362 interventions such as imaging, injections, and surgery. These interventions are costly,

363 and some may be avoided with recommended first-line care. Exploration of the  
364 reasons that drive poor response to exercise care and potential alternative treatments  
365 (including different exercise approaches) is also warranted.

366

### 367 Conclusion

368 In our cohort most people with RCRSP had tried exercise and there were  
369 heterogeneous opinions about efficacy . Some receive no activity modification advice  
370 and advice provided is inconsistent. Regardless of traumatic onset, some people have  
371 interventions such as imaging, injections, and surgery prior to trying exercise.

372

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376

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463

Highlights:

- Patient opinions on exercise treatment are heterogenous
- Many patients have imaging, injection or surgery earlier than recommended
- Education received is inconsistent with recommended care
- Patient beliefs regarding intervention and diagnosis are varied

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