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**Comprehensive Physical Therapy Management of a Patient with Decreased Shoulder
Function and a History of Breast, Lung, and Oral Cancer: A Case Report**

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The patient signed an informed consent allowing the use of her medical history and photo/video
footage for this case report. She received information from the university’s Health Insurance
Portability and Accountability Act (HIPPA) policies.

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conceptualization as well as Sarah Homich, DPT, for guidance and supervision with patient
management.

Key Words: Cancer, Oncology Rehabilitation, Resistance Training

28 **ABSTRACT**

29 Background: Cancer treatments can have late effects on the musculoskeletal, cardiopulmonary,
30 nervous, and integumentary systems. This case report describes comprehensive physical therapy
31 (PT) management of decreased shoulder function for a patient with a history of breast, lung, and
32 tongue cancers treated with surgery, chemotherapy, and radiation.

33 Case Description: The patient was a 71-year-old female referred to outpatient PT for right
34 shoulder and neck pain with the goals to reduce pain and increase functional mobility. Past
35 history included local cancer treatment occurred to the right upper quadrant for multiple cancers.
36 Outcome measures included the Upper Extremity Functional Scale (UEFS), the Numeric Pain
37 Rating Scale (NPRS), range of motion (ROM) assessment and Manual muscle (MMT) strength
38 testing. Interventions included manual therapy, therapeutic exercises, and aquatic therapy.

39 Outcomes: The patient received nine visits of skilled PT. At discharge, she demonstrated
40 improvement in right shoulder flexion active ROM (146 to 155 degrees) and shoulder flexion
41 strength on MMT (4/5 [good] to 4+/5 [good+]). She reported improvements in lifting overhead,
42 though her UEFS score improved minimally (72/80 to 74/80). On the NPRS, her pain decreased
43 (6/10 to 1/10).

44 Discussion: This case report described a comprehensive PT plan for decreased shoulder function
45 in a patient with a history of multiple cancers. Late effects of cancer treatment can have a
46 significant impact on a patient's ability to complete essential activities of daily living and
47 substantially decrease quality of life. Research has shown PT to be beneficial in mitigating these
48 late effects, and therefore, rehabilitation should be included in the comprehensive care of cancer
49 survivors.

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INTRODUCTION/BACKGROUND and PURPOSE

56 In the United States the lifetime risk for a diagnosis of cancer is 1 in 3 in men and
57 women.¹ However, multiple primary cancers are uncommon with an incidence rate of 2-17%
58 though incidence is increasing as improvements in survival continue to improve.² Cancer
59 presents in many forms, and treatments can vary widely due to the complexity and variables that
60 must be accounted for in managing this disease.³ Unfortunately, cancer treatments may have a
61 negative impact on the body.³ Complications of surgery, chemotherapy, hormone therapy, and
62 radiation can have short and long-term effects on the musculoskeletal, cardiopulmonary,
63 nervous, and integumentary systems resulting in decreased functional mobility and activity
64 tolerance.^{4,5} In lung cancer, lobectomies (removal of a lobe/section) can cause a decrease in lung
65 capacity resulting in decreased quality of life (QOL).^{5,6,7} Radiation can cause cellular and/or
66 vascular changes to tissues which can cause muscle weakness, nerve damage, decreased bone
67 density, and/or impaired blood flow.³ Chemotherapy can cause fatigue, muscle weakness,
68 peripheral neuropathy, cardiotoxicity, and impaired cognition leading to a decreased QOL.^{5,8}
69 Occasionally, these deleterious effects of cancer treatment go undiagnosed until years after
70 treatment.³

71 The rationale for this case study was associated with the complexity and rarity of a
72 patient's presentation after prior cancer treatment, which warranted documentation of physical
73 therapy (PT) intervention due to the uniqueness of the case. Due to previous treatments for
74 breast, lung, and head and neck cancer (HNC), there was the potential for significant
75 musculoskeletal impairments such as loss of strength, range of motion (ROM), and/or pain.⁹
76 These late symptoms of radiation and chemotherapy likely manifested into clinical findings that
77 presented as shoulder impingement in this case.

78 Two common labels given to shoulder impingement are *primary* and *secondary*

79 impingement. *Primary impingement* is defined as a bony deformity causing decreased space in
80 the subacromial space. *Secondary impingement* is defined as abnormal shoulder movement due
81 to laxity or stiffness caused by repeated overhead movements and/or weakness from the
82 parascapular musculature.^{10,11} Due to these impairments, pain, loss of ROM, and/or decreased
83 strength may lead to decreased function and decreased QOL.¹⁰ To re-establish proper scapular
84 and glenohumeral (GHJ) joint kinematics, manual therapy and therapeutic exercises are
85 encouraged to restore ROM and correct weakness allowing for increased function of the shoulder
86 and increased QOL.¹¹

87 Thus, the purpose of this case report was to describe a comprehensive physical therapy
88 plan, including manual therapy and therapeutic exercises, in the management of decreased
89 shoulder function for a patient with a history of breast, lung, and tongue cancer.

90

91 **Patient History and Systems Review**

92 **Patient History**

93 The patient consented to participating in this case study. The patient was a 71-year-old
94 female who was referred to outpatient physical therapy (PT) for right shoulder pain. The
95 patient's past medical history (PMH) was relevant for invasive ductal carcinoma of the right
96 breast, malignant neoplasm of the right lung, malignant neoplasm of the tongue, arthritis of C6,
97 depression, and osteoporosis. Refer to Table 1 for complete information on patient's cancer
98 history and see Appendix 1 for the patient's timeline of her medical care.

99 At the IE the patient's main concerns were decreased ROM of her right shoulder and
100 neck, decreased strength in her right arm, and constant sharp pain in her neck and right arm
101 affecting her ability to cook, clean, and sleep at night. The patient's right shoulder pain began

102 five months prior to the initial evaluation (IE) and she noticed a decrease in strength and ROM
103 three months prior to IE. Her pain was a constant ache rated at 4/10 at best, using the Numeric
104 Pain Rating Scale (NPRS), and at worst a 6/10 where she described the pain as a sharp, shooting
105 pain into her hand and fingers.

106 She had a prior history of smoking (approximately two packs a week for 25 years) but
107 stopped after being diagnosed with breast and lung cancer. The patient provided a medications
108 list at IE (refer to Appendix 2). The patient was initially uncertain how much improvement
109 skilled PT would provide and was focused on how significant the pain was in her right upper
110 extremity.

111 **Systems Review**

112 During the IE, a systems review was completed (refer to Table 2). The patient had
113 impairments including posture, pain, decreased ROM of the neck and bilateral shoulders, skin
114 discoloration on the anterior neck, and impaired cognition.

115 **Examination – Tests and Measures**

116 **Examination**

117 Impairments identified during the history and systems review were examined to gain
118 further insight into the patient’s impairments (see Table 3). Clinically relevant findings showed
119 impaired and painful cervical and shoulder active range of motion (AROM),¹² weak and painful
120 right shoulder strength (on MMT performed in sitting), hypomobile and painful cervical and
121 right GHJ mobility (performed in supine)¹². Positive tests included: cervical distraction test,^{14,15}
122 Upper Limb Tension Test (ULTT) (Median Nerve),^{14,15} Lift Off test,^{15,16} Hawkins Impingement

123 Test,^{15,16} Painful arc,^{15,17} Infraspinatus Test,^{15,17} and Supraspinatus Test.^{15,16} The patient had
124 tenderness with palpation of the bilateral sub-occipitals, upper trapezius, anterior, middle, and
125 posterior scalenes, pectoralis major and minor, and greater tubercle of the right humerus. She had
126 a positive rating (above 0/10) for pain using the NPRS.¹⁸ As well, the UEFS was completed with
127 a score of 72/80 (10% impairment).¹⁹ Refer to Table 4 for psychometric properties and
128 descriptions of these tests.

129 **Clinical Impression**

130 The patient had experienced decreased function in the right arm for several months at the
131 time of IE. The problem list included increased pain, loss of motion in the cervical spine and
132 right shoulder, and decreased strength of the right shoulder. Based on the information gained in
133 the subjective history and systems review, the following tests and measures were chosen to
134 gather further information: goniometry, using a Baseline standard goniometer (Fabrication
135 Enterprises Inc., White Plains, NY); manual muscle testing (MMT); special tests to rule in/out
136 cervical radiculopathy or shoulder impingement; palpation; and joint play of the cervical spine
137 and right GHJ. The patient completed the Upper Extremity Functional Scale (UEFS) and the
138 NPRS to provide insight into functional limitations. The patient was an excellent candidate for a
139 case report as rehabilitation protocols for patients with a PMH significant for breast, lung, and
140 tongue cancer had not been represented in the literature.

141 The clinically relevant findings, signs, and symptoms were consistent with cervical
142 radiculopathy and shoulder impingement. ICD-10 code S46.811D (strain of other muscles, fascia
143 and tendons at shoulder and upper arm level, right arm, subsequent encounter) was given as the
144 medical/physical therapy diagnosis. No further referral or consultation was needed at the start of

145 the plan of care (POC). The patient remained an excellent candidate for the case study and
146 skilled PT due to the nature of the patient's signs, symptoms, and PMH.

147 The patient's prognosis was determined to be fair due to the significant PMH history of
148 multiple cancers, effects of chemotherapy and radiation, chronicity of pain, limited function, and
149 sedentary lifestyle.^{4,5,7,8,9} The POC for the patient was one to two visits per week for six weeks,
150 with each visit lasting 55 minutes. Skilled PT focused on patient education, manual traction, joint
151 mobilization, soft tissue mobilization, exercises to improve ROM, strength, and posture and
152 home exercise program (HEP) instruction.²⁰⁻²⁷ Short and long-term goals (refer to Appendix 3)
153 for the patient were set at three weeks and six weeks respectively, with re-evaluation as needed.
154 Progress notes were to be completed at six weeks or after ten visits, whichever occurred first.

155

156 **Intervention and Plan of Care**

157 Patient-related instructions at IE consisted of discussing examination findings, the POC,
158 the HEP, and the importance of exercise. The patient agreed to the POC. Patient education at the
159 IE and subsequent visits consisted of: the effects of chemotherapy, radiation, and lobectomy; the
160 patient's current impairments; and pain management. All information regarding the patient's
161 case was documented using TheraOffice (TheraOffice, Westmont, IL.), an electronic medical
162 record system. The patient's POC and progress were coordinated with and communicated to the
163 referring physician.

164 The patient was seen once or twice weekly for 55 minutes for five weeks at which point
165 her visits were then one visit every two weeks. Interventions were based on the patient's
166 symptom presentation and consisted of manual therapy, therapeutic exercise, and aquatic therapy
167 to improve the patient's cervical spine and right shoulder active ROM and right shoulder
168 strength. No co-interventions were provided.

169 **Manual Therapy**

170 Based on observation, the patient had noticeably increased tone bilaterally in the
171 scalenes, upper trapezius, sternocleidomastoid and levator scapula musculature simply with
172 observation. This could have been due to the patient's decreased lung capacity, history of
173 radiation therapy, and/or stress. Manual therapy was chosen to decrease pain and increase tissue
174 extensibility. Manual therapy initially included soft tissue massage (STM), cervical distraction,
175 and cervical spine joint mobilizations. Muscle energy technique (MET) was added at visit five.
176 STM and MET were used to restore cervical ROM and potentially reduce shoulder pain due to
177 nerve entrapment through increasing extensibility of the musculature.²⁰⁻²² Visits one through five,
178 excluding visit four, consisted of 20 minutes of manual therapy. STM was performed to trigger
179 points at the origin, muscle belly, and/or insertion of the upper trapezius, levator scapula,
180 sternocleidomastoid, and scalenes. Posterior to anterior (P/A) and upslope, to the right and left,
181 joint mobilizations were performed on C3-C7 to increase vertebral motion. MET was performed
182 for bilateral upper trapezius, scalenes, and pectoralis minor. The parameters for each MET were
183 a 20 second static hold with a four second contraction repeated four times. As the patient began
184 to report decreased pain and exhibit increased function, manual therapy was decreased in
185 duration to approximately 15 minutes with the focus being on MET of the bilateral upper
186 trapezius, scalenes, and pectoralis minor.

187 **Therapeutic Exercise**

188 Therapeutic exercises were prescribed to improve ROM of the cervical spine and right
189 shoulder and improve the strength of parascapular musculature: rhomboids, middle and lower
190 trapezius, and serratus anterior and rotator cuff musculature: the supraspinatus, infraspinatus,
191 teres minor, and subscapularis. The purpose of strengthening these muscles was to re-establish
192 proper scapular and GHJ kinematics and improve the patient's function.²³⁻²⁷ The exercises used

193 for each visit can be seen in Table 5. Each exercise varied between two to three sets and 10-20
194 repetitions. Exercises were progressed each session appropriately with resistance increased first,
195 then repetitions in later sessions. Form was monitored and corrected as needed to avoid
196 compensations or abnormal kinematics of the shoulder or neck. If an exercise increased pain, it
197 would be held for the session. A randomized controlled trial by McNeely ML et al,²⁵ and a
198 follow up randomized controlled trial by McNeely ML et al,²⁵ showed positive results using a
199 tailored progressive resistance exercise prescription compared to standard treatment for patients
200 who had been diagnosed with HNC.^{25,26} The positive results of these two trials helped support
201 the exercises and parameters selected.

202 **Aquatic Therapy**

203 For half of visits four and five, aquatic therapy was trialed. At the beginning of visit six,
204 the patient stated that she wished to move back to land-based physical therapy (LBPT) as she
205 was feeling better and did not find the pool to be too cold.

206 **HEP**

207 The patient's HEP was developed on the first visit for the patient to improve cervical
208 spine flexion, extension, side bending, and rotation, as she demonstrated good form and
209 understanding of the exercises and their purpose. Other exercises prescribed at the facility to
210 improve the patient's shoulder ROM and strength were only added after the patient demonstrated
211 the ability to complete the exercises with proper form. Please refer to Appendix 4 for the
212 patient's HEP.

213 **OUTCOMES**

214 Through the course of skilled PT, the patient was seen for a total of nine visits over seven
215 weeks. She reported adherence to her HEP and demonstrated proficiency in the exercises

216 prescribed through treatment. Through the course of treatment, there were no adverse or
217 unanticipated events related to treatment; however, she was having dental procedures completed
218 that affected scheduling and minor adherence to HEP between weeks five, six, and seven.

219 At the time of discharge, final measurements were taken. She demonstrated improvements in
220 cervical and shoulder active ROM with decreased pain with movement. Her pain decreased from
221 6/10 (sharp, constant pain) to 1/10 (ache with movement) on the NPRS which is considered
222 significant.¹⁷ She reported improvement in function of her right shoulder since IE with improved
223 ease in reaching overhead and lifting items such as a gallon of milk. Her UEFS score improved
224 two points from 72/80 to 74/80, which is not considered significant.¹⁸ Refer to Table 3B for
225 values obtained at discharge. Following discharge, she planned to continue following the HEP
226 that had been established, utilize one free month of gym use at the facility, and work with a
227 personal trainer to continue improving function of her right shoulder and start to focus on overall
228 strengthening of her lower extremities.

229 **DISCUSSION**

230 This case report aimed to describe a comprehensive PT plan using manual therapy,
231 therapeutic exercises, and aquatic therapy in the management of decreased shoulder function for
232 a patient with a history of breast, lung, and oral cancer. The POC was developed to reduce pain
233 and increase right shoulder function. The patient reported both a decrease in pain and
234 improvement in function at the time of discharge.

235 The outcomes of this case for a patient with a complex PMH and impairments related to
236 cancer and cancer treatments may help to improve clinical decision making and exercise
237 application for rehabilitation specialists.

238 As previously stated, there is evidence to support the prescription of exercise to improve

239 an individual's QOL following cancer treatment.²⁵⁻²⁷ The multitude of potential impairments
240 following treatment can vary in timing of presentation and severity. Impairments associated with
241 cancer of the breast, lung, and oral cavity may include weakness, myalgia, fatigue, pain and loss
242 of ROM.^{3,4,7,8,9,28} These impairments are appropriate targets for physical therapy interventions to
243 improve the individual's QOL.

244 A common trend is for patients to be physically inactive following treatment due to the
245 rigorous regimens of chemotherapy and radiation, which can be extremely taxing on the body
246 and mental health.²⁹ With the level of inactivity following treatment, these patients are at an
247 increased risk for other potential injuries/impairments due to reduced strength, balance, and
248 flexibility which could result in future hospitalizations.³⁰ With the potential negative side-effects
249 of cancer, cancer related-treatment, and inactivity, physical activity should be considered the
250 cornerstone of every cancer survivor's life to increase QOL. However, there continues to be
251 obstacles to patients receiving skilled PT and engaging in safe physical activity. One of these
252 obstacles is patients continue to be under-referred to skilled PT. Current literature has
253 demonstrated the under-referral to rehabilitation and lack of skilled PT for patients undergoing,
254 or having completed, cancer treatment.^{28,30} A second obstacle is patients are not properly
255 educated on the late-effects of treatment and the benefits of physical activity.²⁹ With physical
256 therapists being present during patient rounds in the hospital, physical therapists could educate
257 the patient on potential signs and symptoms of cancer related and treatment-related impairments
258 and how skilled PT can help to decrease the severity of the impairments. These obstacles were
259 present in this case study as the patient was not referred for skilled PT following surgery,
260 chemotherapy, or radiation and was not educated on the possible late-effects associated with
261 treatment. Possibly if appropriate measures had been taken at the time of cancer diagnosis, and
262 proper education had been given, these impairments may have been mitigated at an earlier stage.

263 One limitation to this case study was an incomplete medical record. The patient was able
264 to provide some details and limited records to help gain insight into her past cancer medical
265 history, however a full medical/pathological history was unobtainable. A full pathological or
266 surgical report was not provided, which did not allow for full understanding of the multiple
267 primary cancers and the extent of the surgeries (e.g. lymph node biopsies, dissections), which is
268 critical information. Other important information that was missing included the dosages of
269 chemotherapy, for all regimens, and radiation, for lung and breast cancer, and the number of
270 cycles of chemotherapy the patient had received following her multiple cancer diagnoses.
271 Additionally, the use of endocrine therapy for the breast cancer was also unclear.

272 As research and treatment has advanced, the survival rate of patients diagnosed with
273 cancer has increased. This, in turn, will require the number of referrals to rehabilitation
274 specialists to increase. For future research, studies conducted on referral patterns of physicians,
275 physiatrists, medical oncologists and radiation oncologists per region would be beneficial to help
276 improve advocacy for skilled PT. By understanding the patterns of referral, pathways would be
277 able to be established to ensure patients are properly screened for impairments at time of
278 diagnosis and receive appropriate care. This would then allow physical therapists to establish a
279 baseline level of function, provide information on exercise, and educate the patient about cancer
280 and cancer-related impairments to be aware of and how skilled PT can help to ameliorate said
281 impairments.

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403 **TABLES and FIGURES (Max of six total)**

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405 **Table 1: Patient Cancer History**

Region	Pathology	Surgery	Radiation Therapy	Medical Oncology	Staging
Right Breast	Invasive ductal Adenocarcinoma	Lumpectomy; Lymph Node Biopsy	External Beam Radiation	Chemotherapy: Carboplatin and Paclitaxel Hormone Therapy-unknown	Ia
Right Lung	Non-small cell carcinoma	Lobectomy of Right Upper and Middle Lobes	External Beam Radiation	Chemotherapy: Carboplatin and Paclitaxel	IIIa
Root of Tongue	Non-small cell carcinoma	Biopsy	External Beam Radiation: 7600 Gy	Chemotherapy: Cisplatin	III

406 Note: Pathology reports were not available. All information was obtained through prior available medical records
407 and patient interviewing.

408 Abbreviations: Gy – Gray

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410 **Table 2: Systems Review – Initial Evaluation**

Systems Review	
Cardiovascular/Pulmonary	No data collected.
Musculoskeletal	Gross Cervical ROM: Impaired Gross Shoulder ROM: Impaired bilaterally Gross Symmetry: Impaired Posture: Impaired
Neuromuscular	Coordination: unimpaired Balance: impaired
Integumentary	Integrity: Unimpaired Skin color/discoloration: Impaired Scar formation: impaired
Communication	Unimpaired
Affect, Cognition, Language, Learning Style	Affect: Pleasant Cognition: Impaired Learning style: Requires visual and verbal demonstration.

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420 **Table 3: Tests & Measures- A. Initial Evaluation and B. Discharge**
 421 **A. Initial Evaluation**

Cervical Spine – Active Range of Motion				
Flexion		23°		
Extension		15°*		
Sidebend		Right: 19°*/ Left: 6°*		
Rotation		Right: 46°/ Left: 44°*		
Cervical Spine Special Tests				
		Right		Left
Distraction Test		Positive		Positive
Cervical Spine – Joint Mobility				
	Force	Grade	End-Feel	Symptoms
C3	P/A Central	3/6	Firm	None
C4	P/A Central	2/6	Firm	Increased pain
C5	P/A Central	2/6	Firm	Increased pain
C6	P/A Central	2/6	Firm	Increased pain
C7	P/A Central	2/6	Firm	Increased pain
C8	P/A Central	2/6	Firm	Increased pain
Shoulder - Active Range of Motion				
		Right		Left
Flexion		146°*		147°
Extension		79°*		78°
Abduction		141°*		159°
Horizontal Adduction		35°*		35°*
Internal Rotation		68°*		78°
External Rotation		68 degrees		68 degrees
Active IR/EXT/ADD		L4*		T10
Active ER/FLEX/ABD		Not tested due to pain		C8
Shoulder- Manual Muscle Testing				
		Right		Left
Flexion		4/5*		4+/5
Abduction		3+/5*		4/5
Internal Rotators		4-/5*		4+/5
External Rotators		3+/5*		4/5
Shoulder - Special Tests				
		Right		Left
Lift Off test		Positive		Negative
Hawkins Impingement Test		Positive		NT
Painful arc		Positive		Negative
Supraspinatus Test		Positive		NT
Infraspinatus Test		Positive		Negative
ULTT (Median Nerve)		Positive		Negative
Shoulder - Joint Mobility				
	Force Direction	Grade	End-Feel	Symptoms
Glenohumeral	Posterior Glide	2/6	Firm	Increased pain
Glenohumeral	Anterior Glide	2/6	Firm	Increased pain
Glenohumeral	Inferior Glide	3/6	Normal	Fingers went numb
Glenohumeral	Distraction	2/6	Firm	Increased pain (could not go into higher grade due to pain)
Patient Reported Outcomes				
Numeric Pain Rating Scale		At rest: 6/10 – sharp and constant		With movement: 6/10 – sharp and constant
Upper Extremity Functional Scale		72/80		

422 Abbreviations: Degrees: °; Pain:*; P/A – posterior to anterior; 3+/5 – Fair+ – Full ROM against gravity, slight resistance given;
 423 4/5 – Full ROM against gravity, mild resistance given; 4+/5 – Full ROM against gravity, almost full resistance given; 2/6 -
 424 Slightly hypomobile joint mobility; 3/6 – Normal joint mobility; ROM – Range of Motion; IR – Internal Rotation; EXT –
 425 Extension; ADD – Adduction; ER – External Rotation; FLEX – Flexion; ABD – Abduction; ULTT – Upper Limb Tension Test
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429 **B. Tests and Measures: Discharge**

Cervical Spine – Active Range of Motion				
Flexion	60°			
Extension	22°			
Sidebend	Right: 24°*/ Left: 15°*			
Rotation	Right: 43°/ Left: 49°*			
Cervical Spine Special Tests				
	Right		Left	
Distraction Test	Positive		Positive	
Cervical Spine – Joint Mobility				
	Force	Grade	End-Feel	Symptoms
C3	P/A Central	3/6	Firm	None
C4	P/A Central	3/6	Firm	None
C5	P/A Central	3/6	Firm	None
C6	P/A Central	2/6	Firm	Increased pain
C7	P/A Central	2/6	Firm	Increased pain
C8	P/A Central	3/6	Firm	None
Shoulder - Active Range of Motion				
	Right		Left	
Flexion	155°		147°	
Extension	79°		78°	
Abduction	143°*		159°	
Horizontal Adduction	41°*		35°*	
Internal Rotation	79°		78°	
External Rotation	78°		68°	
Active IR/EXT/ADD	T10		T10	
Active ER/FLEX/ABD	T1		T1	
Shoulder- Muscle Testing				
	Right		Left	
Flexion	4+/5		4+/5	
Abduction	4-/5*		4/+5	
Internal Rotators	4+/5		4+/5	
External Rotators	4+/5		4+/5	
Shoulder - Special Test				
	Right		Left	
Lift Off test	Negative		Negative	
Hawkins Impingement Test	Positive		NT	
Painful arc	Positive		Negative	
Supraspinatus Test	Positive		NT	
Infraspinatus Test	Positive		Negative	
ULTT (Median Nerve)	Positive		Negative	
Shoulder - Joint Mobility				
	Force Direction	Grade	End-Feel	Symptoms
Glenohumeral	Posterior Glide	3/6	Firm	Increased pain
Glenohumeral	Anterior Glide	3/6	Firm	None
Glenohumeral	Inferior Glide	3/6	Normal	None
Glenohumeral	Distraction	3/6	Firm	Reduction of pain
Patient Reported Outcomes				
Numeric Pain Rating Scale	At rest: 0/10		With movement: 1/10 - ache	
Upper Extremity Functional Scale			74/80	

430 Abbreviations: Degrees: °; Pain:*; P/A – posterior to anterior; 4/5 - Full ROM against gravity, mild resistance given; 4+/5 - Full
 431 ROM against gravity, almost full resistance given; 2/6 – Slightly hypomobile joint mobility; 3/6 - Normal joint mobility; ROM –
 432 Range of Motion; IR – Internal Rotation; EXT – Extension; ADD – Adduction; ER – External Rotation; FLEX – Flexion; ABD –
 433 Abduction; ULTT – Upper Limb Tension Test
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441 **Table 4: Description and Psychometric Properties of Tests and Measures**

Test Name	Description of Test	Psychometric Properties
Cervical Distraction Test ^{13,14}	The patient is in a supine position. Hands are placed on the posterior aspect of the head near the occipital shelf. A traction force is applied, and the patient's symptoms are assessed. A positive test is reduction in the patient's reported symptoms.	Sensitivity: 0.39 Specificity: 0.94 Positive Likelihood Ratio: 6.1 when cervical rotation of less than 60 degrees and positive ULLT-Median Nerve are present.
Upper Limb Tension Test (ULLT) – Median Nerve ^{13,15}	The patient is in a supine position. The shoulder girdle is blocked to prevent elevation. The sequence of movements to patient's tolerance are: shoulder external rotation, abduction to 110 degrees, forearm supination, wrist and hand extension, and elbow extension. Cervical side bending to and away from the tested side can be used as sensitization maneuvers to confirm neural basis of patient's symptoms.	Sensitivity: 0.39 Specificity: 0.94 Positive Likelihood Ratio: 6.1 when cervical rotation of less than 60 degrees and positive cervical distraction are present.
Hawkins-Kennedy Impingement Test ^{14,15}	The patient is seated on the plinth. The patient's arm is placed into 90 degrees flexion and 90 degrees internal rotation. The examiner places one hand on the superior aspect of the scapula while the other hand applies internal rotation pressure. A positive test is reproduction of the patient's pain.	Sensitivity: 0.74 Specificity: 0.57 Positive Likelihood Ratio: 1.70
Supraspinatus Test ^{14,15}	The patient is in the seated position. The patient moves the arm to 90 degrees flexion and 30 degrees adduction (scapular plane). The patient then resists the examiners downward pressure with thumbs up and thumbs down. A positive test is greater weakness with thumbs down than thumbs up, pain, or both.	Sensitivity: 0.69 Specificity: 0.52 Positive Likelihood Ratio: 1.81
Lift Off Test ^{14,15}	The patient assumed a seated position on the exam table. The patient is then asked to their arm behind their back. The patient is then asked to lift their arm off their back. Positive test is inability to move their arm off the back or pain.	Sensitivity: 0.42 Specificity: 0.97 Positive Likelihood Ratio: 16.47
Painful Arc ^{14,16}	The patient assumed a standing position. The patient is then instructed to abduct the involved shoulder. A positive test is a reproduction of patient's pain between 60-120 degrees	Sensitivity: 0.75 Specificity: 0.67 Positive Likelihood Ratio: 2.25
Infraspinatus Test ^{14,16}	The patient was seated on the plinth. The elbow was adducted against the body and flexed to 90 degrees with neutral forearm rotation. Internal rotation pressure was applied with the patient attempting to resist the pressure. A positive test was either pain or weakness of the side being tested.	Sensitivity: 0.56 Specificity: 0.87 Positive Likelihood Ratio: 4.39
Numeric Pain Rating Scale (NPRS) ¹⁷	The NPRS is an 11-point scale measuring the patient's pain intensity. 0 means no pain and 10 means worst pain imaginable.	Excellent internal consistency, concurrent validity, construct validity, and face validity.
Upper Extremity Functional Index (UEFI) ¹⁸	The test is a 20-question patient reported outcome (PRO) measuring the functional status of the patient with an upper extremity impairment. The PRO questions are rated on a 0-4 scale with 0 measuring extreme difficulty and 4 measuring no difficulty. The best possible score is 80/80.	Reliable and valid PRO to measure upper extremity impairment on function.

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Table 5: Therapeutic Exercises

Exercises	Visit 1 IE	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6	Visit 7	Visit 8	Visit 9 D/C
AAROM Shoulder Flex	3x10								
AAROM ER	3x10								
Unilateral Doorway Pec stretch	3x20” each side								
Seated ER with TheraBand	3x10 Red TB	3x15 Red TB						3x12 Blue TB	
Seated ABD with TheraBand	3x10 Red TB	3x15 Red TB							
Supine Chin Tucks	3x5	3x10							
Standing Anterior neck stretch against a wall	3x30”								
Upper Trapezius and Levator Scapula Stretch	3x20” each side		3x20” each side						
Cable Column Rows		2x10 25#							
Standing Rows with scap retraction hold			2x10 with 3” hold Yellow TB			2x10 with 3” hold Red TB	2x10 with 3” hold Green TB	3x10 with 3” hold Green TB	
Aquatic Therapy				X	X				
Standing ER with TheraBand			3x10 Red TB			3x10 Green TB	3x15 Green TB		
Bicep Curls						2x10 4#			2x10 8#
Shoulder Flexion in Scaption with DB			2x5 1#				3x10 1#	3x10 4#	3x10 5#
Shoulder ABD with DB			2x5 1#				2x10 1#	2x10 4#	3x10 4#
Single arm Lat Pulldown							3x10 Green TB	3x10 Blue TB	
Sidelying ER								3x12 2#	

Chongaway, Management of Decreased Shoulder Function

PNF D2 EXT								3x10 Red TB	3x10 Green TB
Standing High Rows								2x10 2#	
Supine band ABD at forehead level									2x10 Green TB
Seated band Horiz ABD									2x10 Green TB
Standing AAROM Flexion									3x10 3# around PVC pipe

447 X=Aquatic therapy consisted of: shoulder range of motion in flexion, extension, internal rotation, external rotation, abduction,
 448 and adduction using aquatic resistance paddles. Strengthening consisted of standing shoulder: external rotation, extension, rows,
 449 and abduction using a red TheraBand. During the second aquatic visit sets and repetitions were 3x10.

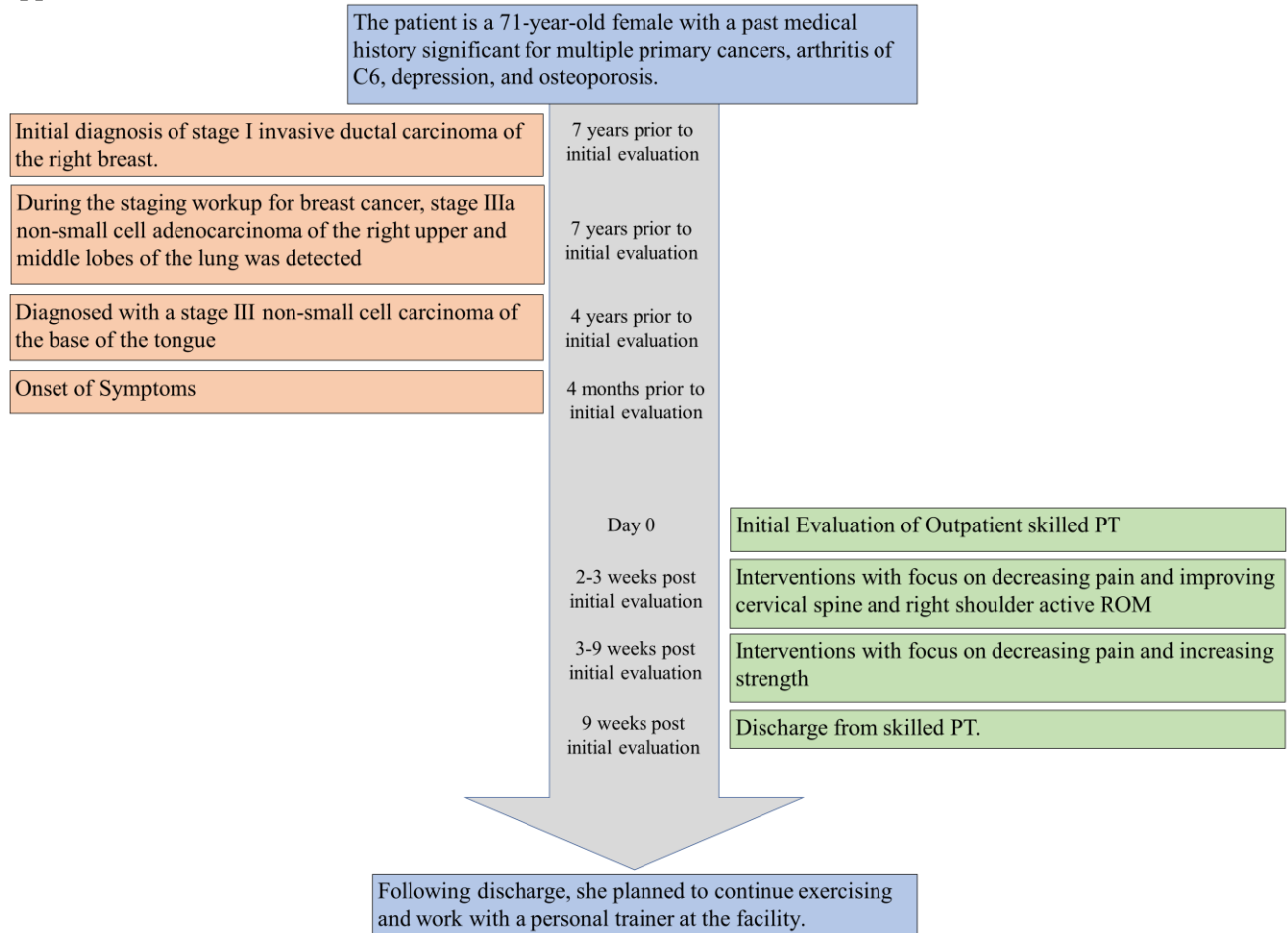
450 Abbreviations: AAROM – Active Assisted Range of Motion; ER – External Rotation; ABD – Abduction; DB – Dumbbell; PNF
 451 – Proprioceptive Neuromuscular Facilitation EXT – Extension; TB – TheraBand (TheraBand, Akron, Ohio)

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491 **APPENDICES (Supplemental tables and figures beyond max of six)**

492 **Appendix 1: Medical Care Timeline**



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494 **Appendix 2: Medications**

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Medication	Indications
Albuterol Inhaler	Bronchodilator used for the management of asthma exacerbations or other chronic obstructive airway diseases.
Wellbutrin tablet	Antidepressant used for seasonal affective disorder (SAD)
Famotidine	Antacid used for Gastroesophageal reflux disease
Glucosamine	Supplement used for Osteoarthritis
Lorazepam (PRN)	Sedative used for anxiety and epilepsy
Trazodone	Antidepressant used for major depression, generalized anxiety disorder, and insomnia.
Tumeric root extract	
B-Complex with Vitamin C tablet	
Ginger	
Glucosamine	
Green Tea Extract	

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498 **Appendix 2 – Short- and Long-Term Goals**

Length	Status	Goal
Short-term, Three weeks	Met	Patient will be independent with home exercise program within three visits to self-manage symptoms between visits.
Short-term, Three weeks	Met	Patient will report decrease in pain from 4/10 to 1/10 to allow for increased tolerance with AROM of right shoulder.
Long-term, Six weeks	Not Met	Patient will report pain free AROM in right shoulder to allow for improved ability to reach overhead and behind the back.
Long-term, Six weeks	Partially Met	Patient will present with at least 4+/5 and pain free MMT of right shoulder to allow for improved ability to complete overhead ADLs
Long-term, Six weeks	Not Met	Patient will increase score on UEFS from 72/80 to 80/80 to demonstrate improvement in functional activity and participation.

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501 **Appendix 4: Home Exercise Program**

	<p>Retraction/ Chin Tuck</p> <p>3x10 with 3 second hold</p>		<p>Cervical Side Bend</p> <p>3x20 second hold each side</p>
	<p>Cervical Extension with towel.</p> <p>6x10 second hold</p>		<p>Cervical Rotation</p> <p>10x5 second hold each side</p>

510 Photos courtesy of HEP2go.com

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520 CARE Checklist

521 *Final Parts One & Two, PTH708:* Completed for the final submission to document the locations of key case report components.

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CARE Content Area	Page
1. Title – The area of focus and “case report” should appear in the title	1523
2. Key Words – Two to five key words that identify topics in this case report	1524
3. Abstract – (structure or unstructured) a. Introduction – What is unique and why is it important? b. The patient’s main concerns and important clinical findings. c. The main diagnoses, interventions, and outcomes. d. Conclusion—What are one or more “take-away” lessons?	2525 526
4. Introduction – Briefly summarize why this case is unique with medical literature references.	3-4
5. Patient Information a. De-identified demographic and other patient information. b. Main concerns and symptoms of the patient. c. Medical, family, and psychosocial history including genetic information. d. Relevant past interventions and their outcomes.	4
6. Clinical Findings – Relevant physical examination (PE) and other clinical findings	5-6
7. Timeline – Relevant data from this episode of care organized as a timeline (figure or table).	24
8. Diagnostic Assessment a. Diagnostic methods (PE, laboratory testing, imaging, surveys). b. Diagnostic challenges. c. Diagnostic reasoning including differential diagnosis. d. Prognostic characteristics when applicable.	6-7
9. Therapeutic Intervention a. Types of intervention (pharmacologic, surgical, preventive). b. Administration of intervention (dosage, strength, duration). c. Changes in the interventions with explanations.	7-9
10. Follow-up and Outcomes a. Clinician and patient-assessed outcomes when appropriate. b. Important follow-up diagnostic and other test results. c. Intervention adherence and tolerability (how was this assessed)? d. Adverse and unanticipated events.	9-10
11. Discussion a. Strengths and limitations in your approach to this case. b. Discussion of the relevant medical literature. c. The rationale for your conclusions. d. The primary “take-away” lessons from this case report.	10-12
12. Patient Perspective – The patient can share their perspective on their case.	4-5
13. Informed Consent – The patient should give informed consent.	4