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Breast Cancer Rehabilitation: Clinical Examination and Outcomes Assessment.

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Abstract:

Breast cancer is the most commonly diagnosed cancer in women in the United States. The treatment for breast cancer occurs along a protracted time period and includes many different disease treatment modalities. These treatments carry with them a large number of side effects that negatively impact function in both the short-term and long-term. It is necessary for rehabilitation providers to interface with patients being treated for breast cancer throughout the continuum of care so that interval assessments can be conducted to identify emerging impairments and alleviate disability. In order to achieve this, the rehabilitation provider must have an understanding of the clinical measurement tools best suited for examination and assessment of breast cancer-related impairments and disability. This article aims to provide a comprehensive overview of the evidence supporting the use of various clinical measurement tools for the breast cancer population and highlights the implementation of rehabilitation examination and assessment along the continuum of disease treatment.

Introduction

Breast cancer treatment carries with it a high risk for treatment side effects that may negatively impact physical and psychological function.¹ Surgery, chemotherapy, radiation therapy, targeted agents, and hormonal therapies precipitate both immediate and late side effects associated with diminished function. Functional sequelae may inhibit return to work and performance of activities of daily living.² The burden of functional impact is significant, with over 60% of patients reporting at least one functional impairment during or after treatment for breast cancer.³

Many common treatment side effects including; pain, lymphedema, fatigue, peripheral neuropathies and upper quadrant impairments, such as decreased shoulder range of motion and strength, faulty scapular mechanics, and reduced muscle length, are amenable to rehabilitation interventions.^{1,4} Rehabilitation interventions have additional efficacy in early identification and treatment of many of the aforementioned common breast cancer-related impairments.⁵ Further, there is a strong evidence base to suggest that rehabilitation plays an integral role across the lifespan for the cancer survivor.⁶

Providing interventions with demonstrable value is critically important in today's health care delivery system. Value is defined not only in cost outlays for an intervention, but in the efficacy realized for the cost of care rendered. Rehabilitation providers must demonstrate that the care delivered has positively impacted the functional outcome of a patient. A robust movement towards value-based outcomes measurement is evident in the regulatory realm among both private and public payers. While there is wide acceptance that breast cancer treatment side effects are amenable to rehabilitation intervention, the mandates being put forward in health care require providers not only to objectively demonstrate improvement over time but to show impact on improving function related to

the intervention provided. This manuscript will provide the practicing rehabilitation provider with tools to enable evidence-based measurement of common breast cancer treatment-related impairments and outline the recommended outcomes tools for use in the breast cancer population.

Rehabilitation across the continuum of cancer care

Breast cancer treatment occurs over a protracted timeline with varying disease treatment interventions provided along that continuum; each introducing a host of potential side effects that may negatively impact function. Some side effects will dissipate after treatment is complete but some will remain and become chronic conditions. Still other side effects may not present until years after treatment has been completed. Many of the side effects that negatively impact function are amenable to rehabilitation intervention. Some functional impairments can be detected early, in less severe stages, when rehabilitation examination techniques are employed proactively. Early surveillance and rehabilitation intervention may prevent some side effects and may greatly reduce the severity of others.⁷

The current model of care delivery for the patient with breast cancer frequently fails to address the negative functional side effects of cancer treatment until the patient reaches a critical threshold of disability. At this point the impairment is typically more severe and may even be chronic in nature. The current evidence supports rehabilitation examination and ongoing assessment for early detection of impairments. Delaying rehabilitation frequently results in functional deficits.^{8,9} An ideal model of care proactively addresses physical function from the point of cancer diagnosis throughout the continuum of disease treatment, through survivorship and endures across the remaining

lifespan.¹⁰ (Figure 1) Such a model of care would assure comprehensive, ongoing functional assessment regardless of the care setting, discipline of the care provider, or point along the lifespan continuum.

The prospective surveillance model as described by Stout and colleagues recommends a preoperative examination in all patients with breast cancer in order to assess pre-morbid level of function, prior physical impairments, current exercise habits and other co-morbidities as well as incorporating a battery of tests and measures to establish a baseline.⁷ This preoperative visit also allows for valuable education regarding postoperative rehabilitative exercises, advice for returning to activities during and after treatment as well as dialogue about known risk factors for adverse effects of the treatment plan. Evidence suggests that an early postoperative reassessment visit should take place within the first month after surgery.^{8,11-13} At this visit, baseline tests and measures can be repeated and continued education regarding exercise and return to activity can be provided. If functional limitations are present at this time, rehabilitation intervention can be initiated. If no impairments are detected, recommended ongoing surveillance should be continued at intervals that would correspond to specific treatments outlined in the patient's care plan.⁷

At each interval follow up visit, the rehabilitation provider must be familiar with the changing landscape of disease treatment. For patients with early stage breast cancer, these punctuated time periods occur more frequently; approximately every three months as new treatment modalities are introduced throughout the first post-operative year. After the completion of active disease treatment the interval between follow up becomes less clear.

Dietz and colleagues outline a framework that takes a comprehensive perspective on the role of rehabilitation for the patient with cancer.¹⁴ Dietz cites four domains of rehabilitation as depicted in Figure 2. The model recognizes ongoing, lifespan needs of the cancer survivor and identifies a role for rehabilitation throughout that spectrum.

Considering the myriad needs of the cancer population both during and after treatment, the escalating number of cancer survivors and the evidence in support of rehabilitation as a means to improve overall functional mobility and quality of life, rehabilitation providers must utilize tools that validly assess and measure the impairments related to breast cancer treatment and further, must quantify their impact on function in order to demonstrate the value their interventions bring throughout the lifespan. The International Classification of Function enables rehabilitation providers to identify and measure the constructs and domains associated with disability for a given condition. A systematic classification system that promotes the use of valid tests and measures has great potential to positively demonstrate the value of rehabilitation interventions in the cancer population.

International Classification of Function

The International Classification of Functioning, Disability and Health (ICF) provides a construct for rehabilitation providers to identify the components of health and well-being of individuals. The framework enables a perspective on functioning and disability that is focused on the components of Body Functions and Structures and Activities and Participation as mechanisms to systematically classify a given health condition.¹⁵

The ICF framework, when implemented into evaluation and assessment of the oncology population, has great value to informing the establishment of a plan of care and

enabling the practitioner to identify clinical measurement tools that strongly demonstrate validity based on the given health condition.¹⁶

ICF Construct:

ICF Functioning and Disability has two parts that are most relevant to the rehabilitation provider in identifying the potential disability and measuring the constructs associated with disability.¹⁵ These components are defined as:

a. Body Functions and Body Structures – These are the physiological functions of body systems and the anatomical parts of the body. When these components demonstrate a significant deviation or loss, impairment results. These components focus on the mechanisms of action in the body.

b. Activities and Participation – These components include the execution of a task or action by an individual or their involvement in a life situation. When these components demonstrate a limitation or restriction, there is difficulty functioning at both the individual and societal level.

Each of the components has an extensive list of the domains of function that are encompassed within. These are outlined in Tables 1 and 2.

Table1. ICF Domains of Body Functions and Body Structures

Body Functions	Body Structures
<ul style="list-style-type: none"> • Mental Functions • Sensory functions and pain • Functions of the cardiovascular, hematological, immunological and respiratory systems • Functions of the digestive, metabolic and endocrine systems • Genitourinary and reproductive functions • Neuromusculoskeletal and movement-related functions • Functions of the skin and related structures 	<ul style="list-style-type: none"> • Structures of the nervous system • The eye, ear and related structures • Structures involved in voice and speech • Structures of the cardiovascular, immunological and respiratory systems • Structures related to the digestive, metabolic and endocrine systems • Structures related to the genitourinary and reproductive systems • Structures related to movement • Skin and related structures

Table 2. ICF Domains of Activities and Participation

Activities and Participation
<ul style="list-style-type: none"> • Learning and applying knowledge • General tasks and demands • Communication • Mobility • Self-Care • Domestic life • Interpersonal interactions and relationships • Major life areas • Community, social and civic life

Table 3. Common Breast Cancer Treatments and their impact on Activities and Participation

Breast Cancer Treatments	Body Functions and Structures	Activities and Participation	Clinical Measurements to Support Goals and Plan of Care
<p>Surgery: Breast</p>	<ul style="list-style-type: none"> • Skin and related structures • Structures related to movement • Sensory functions and pain 	<p>Mobility Changing and maintaining body position Carrying, moving and handling objects</p>	<ul style="list-style-type: none"> • Functional ROM • Joint active and passive movement • Muscle length, soft tissue extensibility, and flexibility • Postural alignment and position (static and dynamic), including symmetry and deviation from midline • Pain, soreness, and nociception • Pain in specific body parts • Muscle strength, power, and endurance during functional activities • Muscle tension
		<p>Self Care Washing Dressing Caring for body parts</p>	<ul style="list-style-type: none"> • Functional capacity • Level of ability to participate in variety of environments • Level of safety in self-care activities • Dexterity, coordination, and agility • Task analysis • Hand function • Physical space and environments routinely encountered
		<p>Interpersonal interactions and relationships Family relationships Intimate relationships</p>	<ul style="list-style-type: none"> • Caregiver capacity • Quality of life • Ability to assume or resume community, social, and civic activities with or without assistive technology
<p>Surgery: Lymph Node Dissection</p>	<ul style="list-style-type: none"> • Structures of the immunological system • Structures related to movement 	<p>Mobility Changing and maintaining body position Carrying, moving and handling objects</p>	<ul style="list-style-type: none"> • Functional ROM • Joint active and passive movement • Muscle length, soft tissue extensibility, and flexibility

			<ul style="list-style-type: none"> • Postural alignment and position (static and dynamic), including symmetry and deviation from midline • Pain, soreness, and nociception • Muscle strength, power, and endurance during functional activities • Muscle tension • Lymphatic symptoms • Edema
		Self Care Washing Dressing Caring for body parts	<ul style="list-style-type: none"> • Functional capacity • Level of ability to participate in variety of environments • Level of safety in self-care activities • Dexterity, coordination, and agility • Task analysis • Hand function
		Domestic life Household tasks Caring for household objects and assisting others	<ul style="list-style-type: none"> • Ability to gain access to home environments • Ability to assume or resume activities related to home management activities • Safety in performing home management activities
Chemotherapy: Adriamycin	<ul style="list-style-type: none"> • Cardiovascular functions • Immunological functions • Mental Functions 	Mobility Walking and moving around	<ul style="list-style-type: none"> • Age-appropriate activity levels • Balance measures • Dexterity, coordination, and agility • Falls risk factors • Frailty assessment to determine at-risk populations • Movement transition qualities • Reaction times • Locomotion during functional activities with or without the use of assistive technology • Aerobic Capacity/Endurance
		Domestic life Household tasks	<ul style="list-style-type: none"> • Ability to gain access to home environments

		Caring for household objects and assisting others	<ul style="list-style-type: none"> • Ability to assume or resume activities related to home management activities • Safety in performing home management activities • Functional activities of daily living
		Major life areas Work and employment	<ul style="list-style-type: none"> • Cognition, including ability to process commands • Communication • Consciousness and orientation • Motivation • Recall, including memory and retention • Environmental access
Chemotherapy: Cyclophosphomide	<ul style="list-style-type: none"> • Reproductive functions • Mental functions • Immunological functions 	Self Care Looking after one's health	<ul style="list-style-type: none"> • Consciousness and orientation • Education regarding condition and self management of side effects
		Learning and applying knowledge Focusing attention Thinking Calculating Making decisions Listening Other purposeful sensing	<ul style="list-style-type: none"> • Cognition, including ability to process commands • Communication • Consciousness and orientation • Motivation • Recall, including memory and retention
		Major life areas Work and employment	<ul style="list-style-type: none"> • Cognition, including ability to process commands • Communication • Consciousness and orientation • Motivation • Recall, including memory and retention • Environmental access
		Domestic life Household tasks Caring for household objects and assisting others	<ul style="list-style-type: none"> • Ability to gain access to home environments • Ability to assume or resume activities related to home management activities

			<ul style="list-style-type: none"> • Safety in performing home management activities • Functional activities of daily living
Chemotherapy: Taxane (taxol, taxotere)	<ul style="list-style-type: none"> • Structures of the nervous system • Immunological functions 	Mobility Changing and maintaining body position Carrying, moving and handling objects Walking and moving around	<ul style="list-style-type: none"> • Age-appropriate activity levels • Balance measures • Dexterity, coordination, and agility • Falls risk factors • Frailty assessment to determine at-risk populations • Movement transition qualities • Reaction times
		Domestic life Household tasks Caring for household objects and assisting others	<ul style="list-style-type: none"> • Ability to gain access to home environments • Ability to assume or resume activities related to home management activities • Safety in performing home management activities • Functional activities of daily living
Radiotherapy	<ul style="list-style-type: none"> • Skin and related structures • Structures related to movement • Immunological functions 	Mobility Carrying, moving and handling objects	<ul style="list-style-type: none"> • Functional ROM • Joint active and passive movement • Muscle length, soft tissue extensibility, and flexibility • Postural alignment and position (static and dynamic), including symmetry and deviation from midline • Pain, soreness, and nociception • Pain in specific body parts • Muscle strength, power, and endurance during functional activities • Muscle tension
		Self Care Looking after one's health	<ul style="list-style-type: none"> • Classification of wound based on etiology and description of depth of tissue destruction

			<ul style="list-style-type: none"> • Positioning and postures that aggravate the wounded tissue or that produce or relieve trauma • Scar tissue characteristics • Signs of infection • Skin characteristics
		Major life areas Work and employment	<ul style="list-style-type: none"> • Cognition, including ability to process commands • Communication • Consciousness and orientation • Motivation • Recall, including memory and retention • Environmental access
		Domestic life Household tasks Caring for household objects and assisting others	<ul style="list-style-type: none"> • Ability to gain access to home environments • Ability to assume or resume activities related to home management activities • Safety in performing home management activities • Functional activities of daily living
Hormonal Therapy: Selective Estrogen Receptor Modifier (Tamoxifen, Raloxifene)	<ul style="list-style-type: none"> • Metabolic functions • Endocrine functions 	Mobility	<ul style="list-style-type: none"> • Age-appropriate activity levels • Balance measures • Dexterity, coordination, and agility • Falls risk factors • Frailty assessment to determine at-risk populations • Movement transition qualities • Reaction times
		Self care Looking after one's health	<ul style="list-style-type: none"> • Consciousness and orientation • Education regarding condition and self management of side effects
		Domestic life Household tasks Caring for household objects and assisting others	<ul style="list-style-type: none"> • Ability to gain access to home environments • Ability to assume or resume activities related to home management activities • Safety in performing home management activities

			<ul style="list-style-type: none"> • Functional activities of daily living
Hormonal Therapy: Aromatase Inhibitor (Arimidex, Aromasin)	<ul style="list-style-type: none"> • Endocrine functions • Structures related to movement 	Mobility	<ul style="list-style-type: none"> • Age-appropriate activity levels • Balance measures • Dexterity, coordination, and agility • Falls risk factors • Frailty assessment to determine at-risk populations • Movement transition qualities • Reaction times
		Self Care Looking after one's health	<ul style="list-style-type: none"> • Consciousness and orientation • Education regarding condition and self management of side effects • Ability to assume or resume activities related to self-care • Signs of decreased bone mineral data • Signs and symptoms of interrupted bony integrity
		Domestic life Household tasks Caring for household objects and assisting others	<ul style="list-style-type: none"> • Ability to gain access to home environments • Ability to assume or resume activities related to home management activities • Safety in performing home management activities • Functional activities of daily living

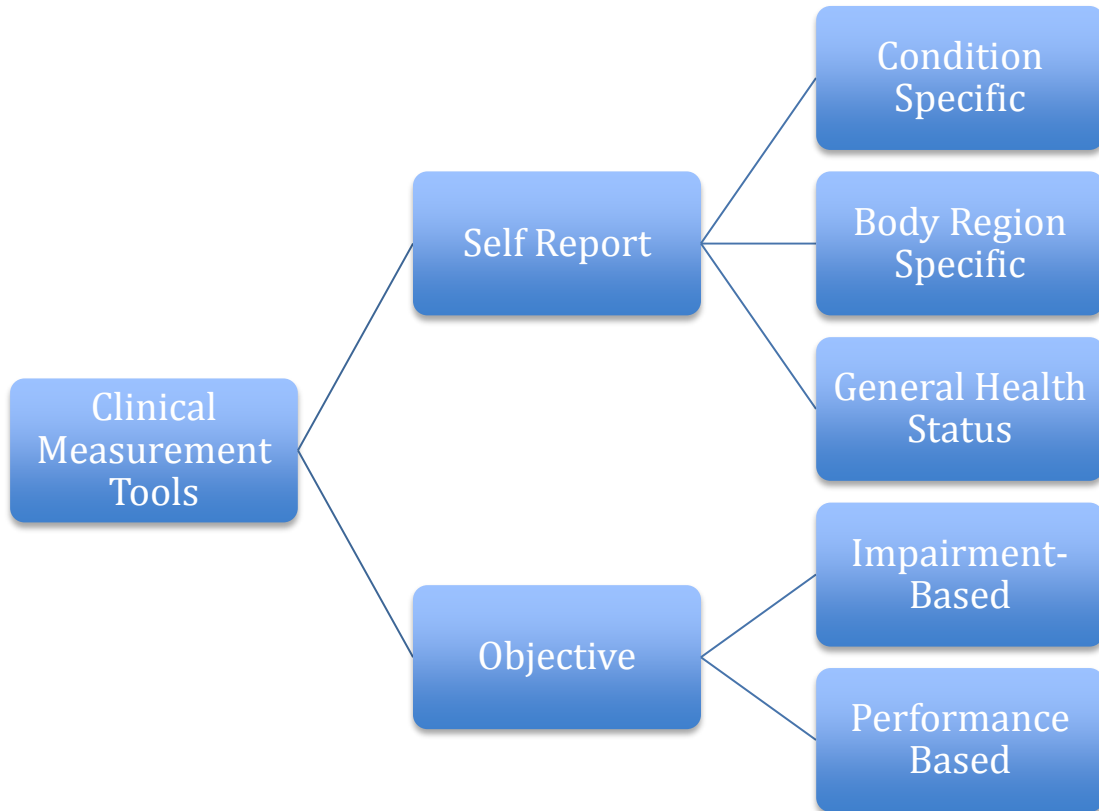
Choosing Clinical Measurement Tools

In order for the rehabilitation provider's clinical examination to identify potential effects that may be associated with breast cancer treatment, specific tests and measures should be performed. Tests and measures should be based on where the patient is along the disease treatment continuum, knowledge of the common side effects of treatment and impairments they may cause, and any presenting impairment in body function, structure or activity and participation limitation. Based on Table 3, there are targeted domains that can be measured to support the goals and plan of care for a patient with breast cancer-related functional loss. Tests and measures are indicated that encompass: assessment of upper extremity strength, joint range of motion (ROM), limb volume, pain, fatigue and aerobic capacity, chemotherapy induced peripheral neuropathy (CIPN), arthralgias, and bone density. In addition, patient self-reported measures are important clinical tools as they provide insight from the patient's perspective on their level of functioning with daily activities and work tasks. Choosing clinical measurement tools that capture the presenting impairments and reflect patient self-reported function, specific to breast cancer is imperative.

Clinical measurement tools are valid mechanisms by which a clinician attempts to provide a quantifiable assessment of an impairment or disability. The Guide to Physical Therapist Practice V 3.0 highlights two primary types of clinical measurement tools (Figure 3) commonly used in physical therapist practice:¹⁷ 1) Patient Self-Report measures, which may address the patient's general health status, a specific condition or body region

impacted by a condition, 2) Objective measures, which may be impairment-based or performance-based.

Figure 3. Classification of Clinical Measurement Tools



Rehabilitation outcomes measurement is an important part of clinical practice. However, rehabilitation providers face many challenges in identifying and choosing optimal tools to objectively quantify function and to demonstrate change over time. First, there are numerous tools available, many with varying applicability to the breast cancer population. Choosing among the various tools requires knowledge of the domain that needs to be assessed, an understanding of valid tools available and to complete the assessment, and consideration for the patient's preferences which guide the plan of care and anticipated outcomes of care.

It is also important to consider the timing of the assessments. Measurement is conducted to gauge change over time and to demonstrate how this change has impacted functioning. Selecting tools that are sensitive to detecting change over time, specific to the condition being measured is the first consideration for clinicians. Timing is also a challenge for rehabilitation providers, as the clinical setting often does not afford unrestricted time to incorporate a multitude of clinical measurement tools. Therefore it is critical for the rehabilitation provider to identify the primary functional limitation of focus and precisely identify tools that closely align with measuring the limitation. Figures 4a and 4b provide a guide to assist the rehabilitation provider in identifying what type of measurement tool is most beneficial to use with consideration for the impairment presentation and the primary functional limitation.(ref guide to PT practice)

The Section on Research of the American Physical Therapy Association (APTA) initiated work among the specialty sections to create an Evidence Database to Guide Effectiveness (EDGE), specifically with the intent to identify measures that have strong psychometric properties for use in rehabilitation.¹⁸ Useful outcome measures must demonstrate validity, reliability, be responsive to change, and preferably have identified minimal detectable change (MDC) and minimally clinically important difference (MCID) values. The EDGE Taskforce of the Oncology Section of APTA has completed multiple systematic reviews of clinical measurement tools and classified these tools based on their level of supporting evidence using the EDGE rating system. Using this system, (Table 4) a rehabilitation provider can easily identify the clinical measurement tool with the strongest evidence for use in clinical practice with the breast cancer population. Tools rated 3 and 4 are recommended for clinical use.

Table 4: Oncology Section Breast Cancer EDGE Task Force Rating Scale¹⁸

4	Highly Recommend	Highly recommended; the outcome has excellent psychometric properties and clinical utility; the measure has been used in research on individuals with or post breast cancer.
3	Recommend	Recommended; the outcome measure has good psychometric properties and good clinical utility; no published evidence that the measure has been applied to research on individuals with or post breast cancer.
2A	Unable to Recommend at this time	Unable to recommend at this time; there is insufficient information to support a recommendation of this outcome measure; the measure has been used in research on individuals with or post breast cancer.
2B	Unable to Recommend at this time	Unable to recommend at this time; there is insufficient information to support a recommendation of this outcome measure; no published evidence that the measure has been applied to research on individuals with or post breast cancer.
1	Do not Recommend	Poor psychometrics &/or poor clinical utility (time, equipment, cost, etc.)

Breast Cancer Specific Objective Tests and Measures

Shoulder girdle muscle weakness is a commonly reported side effect from breast cancer treatment.^{8,19-23} A recent EDGE task force systematic review recommends using hand held dynamometry by means of a maximal voluntary isometric contraction to measure strength in a clinical setting.²⁴ Tools to assess strength are outlined in Table 5. Research suggests assessing scapula abduction and upward rotation, scapula depression and adduction, glenohumeral flexion, internal rotation, scaption and horizontal adduction strength as these were highly correlated with upper extremity functional loss in women diagnosed with breast cancer.²⁵ It is recommended that strength assessments be performed in a standardized manner such as published in Kendall or Hislop and Montgomery.^{26,27}

Several studies have reported restricted shoulder motion in women who have received treatment for breast cancer.^{8,20,28-31} Table 5 reflects the recommended tools for measuring ROM by the EDGE task force. Passive ROM using goniometry has superior psychometric properties over active ROM.³² A recent study recommends assessing bilateral shoulder flexion, 90°ER and extension as results showed that women treated for breast cancer demonstrated significant limitations in these motions six months after breast surgery on the involved side when compared to matched healthy controls.²⁰ It is advised that ROM assessments be performed in a standardized manner.³³

Limb volume is essential to measure as breast cancer-related lymphedema is a concern for many women diagnosed with breast cancer.³⁴⁻³⁶ The incidence of breast cancer-related lymphedema varies from 6% to 65% depending on the assessment tool and length of follow-up.³⁷⁻³⁹ Circumferential measurement, water displacement and bioelectrical impedance spectroscopy are highly recommended methods for assessment of limb volume as noted by the EDGE task force systematic review and highlighted in Table 6.⁴⁰ The simplest of these three measures for clinical use is circumferential measurement. It is recommended that the individual be seated with their forearm pronated, and the upper extremity placed on a treatment table or measurement board in approximately 90° of forward flexion or abduction.^{41,42} Using 4cm increments proximal and distal to the olecranon is reliable.⁴² In order to convert circumferential measurement to a volumetric measure, the truncated Frustum formula is recommended.^{40,43}

Pain is one of the most commonly reported impairments after breast cancer treatment affecting anywhere from 16% to 73% of women treated for breast cancer.^{44,45} When assessing pain in women with breast cancer, it is important to determine whether a

uni-dimensional or multidimensional tool is more appropriate.⁴⁶ Administering the visual analog scale, numeric rating scale or pressure pain threshold is recommended if using a uni-dimensional tool is desired. When a multidimensional tool is needed, the McGill Pain Questionnaire, McGill Pain Questionnaire – Short Form, Pain Disability index, Brief Pain Inventory, or Brief Pain Inventory – Short Form could be utilized.⁴⁶ Table 7 highlights the tools evaluated by the EDGE task force for both uni-dimensional and multi-dimensional pain scales.

Chemotherapy-induced peripheral neuropathy (CIPN) is a common side effect of chemotherapy and biotherapy drugs often used to treat breast cancer.⁴⁷ CIPN can lead to emotion distress, a decrease in functional ability, social role impairment and physical distress from neuropathic pain.⁴⁷ Numbness and/or tingling in the distal extremities are typical complaints reported by patients with neuropathy. Pain may or may not be a component of peripheral neuropathy. A recent study conducted by Griffith and colleagues⁴⁸ suggest administering the Functional Assessment of Cancer Therapy/Gynecologic Oncology Group – Neurotoxicity (FACT/COG-Ntx) and the shortened version of the total neuropathy score (TNS)⁴⁹

Aromatase inhibitors, a standard part of adjuvant hormone therapy for postmenopausal women diagnosed with breast cancer, are implicated in a myriad of impairments.⁵⁰ A common side effect of Aromatase inhibitors are joint arthralgias, which negatively affect daily function.^{51,52} Common reported areas of arthralgias in women treated for breast cancer include: knee, wrist/hand, back, and ankle/foot. Currently, there are no well-validated measures specifically for Aromatase induced arthralgias. A recent study recommends asking the following questions to assess the presence of arthralgias:

“have you had any joint pain/stiffness in the past week?” “Did this joint pain/stiffness get worse after initiating therapy with an Aromatase inhibitor, and “Did you have joint pain/stiffness which started after initiating therapy with an Aromatase inhibitor?”⁵²

Several randomized clinical trials have found that a variety of breast cancer treatments, particularly those that induce a therapeutic premature menopause or lower postmenopausal estrogen concentration, are associated with bone loss.⁵³ Women diagnosed with breast cancer are nearly five times more likely to experience a vertebral fracture in the year after their treatment when compared to healthy controls.⁵⁴ Both the American Society of Clinical Oncology (ASCO) and the National comprehensive Cancer Network (NCCN) have guidelines for identification, monitoring and management of bone health in women diagnosed with breast cancer.⁵⁵ These include bone mineral density screening for women treated for breast cancer who have had premature ovarian failure, Aromatase inhibitor use, adjuvant hormone therapy that reduces estrogen or interferes with estrogen action.^{56,57}

Breast Cancer-Specific Patient Self-Reported Measures

As the population of women living after breast cancer continues to increase, overall quality of life has become an essential focus during and after initial treatment. There are a number of scales that assess breast cancer-specific quality of life. The recommended tools for use in this population are outlined in Table 8.

The ability to use the upper extremity is essential for activities of daily living as well as for many occupational demands. Many women treated for breast cancer exhibit a loss of shoulder function in the sub-acute stages after their primary treatment.^{20,58,59} There

are a number of self-reported scales that capture the impact of pain, limited upper extremity mobility and strength on overall function as outlined in Table 9.

Cancer related fatigue is a disabling symptom reported by women diagnosed with breast cancer to significantly impact quality of life.⁶⁰⁻⁶² Similar to pain assessment, it is important to determine whether a uni-dimensional or multidimensional tool is better suited to assess fatigue in a particular patient population. A recent systematic review suggests using the Brief Fatigue Inventory when planning to administer a uni-dimensional tool or the Multidimensional Fatigue Symptom Inventory - Short Form when wanting to implement a multidimensional tool.⁶³ Table 10 outlines the uni-dimensional and multi-dimensional assessment tools evaluated by the EDGE task force to assess fatigue.

Table 9. Patient self-reported measures of upper quadrant function¹⁸

<i>EDGE Rating Score</i>	<i>Clinical Measurement</i>
4	Disability of Arm Shoulder and Hand (DASH)
4	Shoulder Pain and Disability Index (SPADI)
4	Shoulder Rating Questionnaire (SRQ)
4	Penn Shoulder Score (PSS)
3	QuickDASH
2 A	10 Questions by Wingate
2 A	Modified Behavioral Rating Scale for Breast Cancer
2 A	Shoulder Disability Questionnaire (SDQ)
2 A	Upper Limb Disability Questionnaire (ULDQ)
2 B	American Shoulder and Elbow Surgeons Score (ASES)
2 B	Constant Shoulder Score
2 B	Flexilevel Scale of Shoulder Function (FLEX-SF)

2	B	Simple Shoulder Test (SST)
2	B	Upper Limb Functional Index (ULFI)
2	B	Oxford Shoulder Score (OSS)
1		Functional Impairment Test- Head, and Neck/Shoulder/Arm (FIT-HaNSA)
1		Kwan's Arm Problem Scale (KAPS)
1		Mobility Activities Measure
1		UCLA Shoulder Scale
1		Upper Extremity Functional Scale (UEFS)

* Only those measures rated 3 or 4 are recommended for clinical practice

Table 5. Measures of upper extremity neuromuscular and movement-related functions ^{23,24,64}

<i>EDGE Rating Score</i>	<i>Clinical Measurement</i>
Functions of the joints and bones	
4	Goniometry – passive range of motion
3	Goniometry – active range of motion
3	Inclinometer – active and passive range of motion
3	Assessment of “stiffness” at the GHJ
3	Pectoralis Minor muscle length assessment
3	Pectoralis minor Index, Scapular index described by Borstad
2 B	Passive range of motion measurements to determine a capsular pattern of GH joint
2 B	Assignment of end feel based on Cyriax continuum at the GH joint
1	Supine pectoralis minor muscle test as described by Kendall
1	Latissimus dorsi muscle length assessment test by Kendall
1	Shoulder internal rotation assessment
1	Shoulder external rotation assessment
1	Pectoralis minor muscle assessment described by Lewis

1	Latissimus dorsi muscle length assessment described by Borstad
Muscle Functions	
3	Hand Grip Strength
3	Hand-held Dynamometry
2 A	Muscle Endurance
2 B	Manual Muscle Test
2 B	1 Repetition Maximum

(GHJ- Gleno-humeral Joint)

* Only those measures rated 3 or 4 are recommended for clinical practice

Table 8. Health-Related Quality of Life (HRQOL) Measures⁶⁵

<i>EDGE Rating Score</i>	<i>Clinical Measurement</i>
Breast Cancer-Specific HRQOL	
4	EORTC Quality of Life Questionnaire-Breast (EORTC QLQ-B23)
4	BREAST-Q
4	Functional Assessment of Cancer Therapy-Breast (FACT-B)
4	FACT-B+4
2 A	Breast Cancer Questionnaire (BCQ)
2 A	Long-term Quality of Life-Breast Cancer (LTQOL-BC)
1	Brief Cancer Impact Assessment (BCIA)
Cancer-Specific HRQOL	
4	EORTC Quality of Life Questionnaire-Cancer (EORTC QLQ-C30)
4	Functional Assessment of Cancer Therapy-General (FACT-G)
4	Functional Living Index-Cancer (FLIC)
4	Ferrans and Powers Quality of Life Index-Cancer Version (QLI-CV)
2 A	Cancer Rehabilitation Evaluation System (CARES)

2	A	Quality of Life Assessment of Cancer Patients Receiving Chemotherapy (QOL-ACD)
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* Only those measures rated 3 or 4 are recommended for clinical practice

Table 6. Breast Cancer-Related Lymphedema Measurement⁴⁰

<i>EDGE Rating Score</i>	<i>Clinical Measurement</i>	
Clinical Outcomes Measures		
4	Functional Assessment of Cancer Therapy – Breast + 4 (FACT B+4)	
4	Disability of Arm, Shoulder and Hand Questionnaire (DASH)	
2	A	Upper Limb Lymphedema Measure (ULL-27)
2	A	Lymphoedema Functioning, Disability and Health Questionnaire (Lymph-ICF)
1		Lymph Quality of Life Measure for Limb (LYMQOL)
Limb Volume Measures		
4		Circumference measurement
4		Water Displacement
4		Bioelectrical Impedance Spectroscopy
2	A	Tonometry
2	A	Perometer
2	A	Lymphedema and Breast Cancer Questionnaire (LBCQ)
2	A	Visual Analogue Scale (VAS)

* Only those measures rated 3 or 4 are recommended for clinical practice

Table 7. Breast Cancer-Related Sensory Function and Pain Measures⁴⁶

<i>EDGE Rating Score</i>	<i>Clinical Measurement</i>
Pain Intensity/Sensitivity	
4	Visual Analog Scale
4	Numeric Pain Rating Scale

4	Pressure Pain Threshold
2 A	Gaston – Johansson Painometer
Pain Quality	
4	McGill Pain Questionnaire
4	McGill Pain Questionnaire – Short Form
2 A	Neuropathic Pain Scale – CIN
Pain-related Disability	
4	Pain Disability Index
Combined Pain Measures	
4	Brief Pain Inventory
4	Brief Pain Inventory – Short Form

* Only those measures rated 3 or 4 are recommended for clinical practice

Table 10. Breast Cancer-Related Fatigue Measures⁶³

<i>EDGE Rating Score</i>	<i>Clinical Measurement</i>
One-Dimensional	
4	Brief Fatigue Inventory (BFI)
3	Bi-Dimensional Fatigue Scale (BFS)/Chalder/Fatigue Questionnaire
3	Functional Assessment of Chronic Illness Therapy – Fatigue (FACIT-F)
3	Visual Analog Scale
3	Wu Cancer Fatigue Scale (WCFS)
2 A	Ecological Momentary Assessment of Fatigue
2 A	EORTC-F
2 A	Fatigue Assessment Scale (FAS)
2 A	Oncology Nursing Society Fatigue Scale (ONS-FS)
2 A	Rhoten Fatigue Scale (RFS)
2 A	MD Anderson Symptom Inventory (MDASI)
2 B	Cancer Linear Analogue Scale (CLAS)/Linear Analogue Self-Assessment Scale (LSAS)

2	B	Cancer-Related Fatigue Distress Scale (CRFDS)
2	B	Edmonton Symptom Assessment System (ESAS)
2	B	Fatigue Severity Scale (FSS)
2	B	NCCN Intensity Scale (NCCN-IS)
2	B	NCI Common Terminology Criteria for Adverse Events
2	B	Pearson-Byars Fatigue Feeling Tone Checklist (PBFFTC)
2	B	Rotterdam Symptom Checklist (RSC)
2	B	Symptom Distress Scale
2	B	Zung Self-Rating Depression Scale
Multi-Dimensional		
4		FACT B
4		Multidimensional Fatigue Symptom Inventory (MFSI)
3		Diagnostic Interview for Cancer Related Fatigue (DICRF)
3		Fatigue Symptom Inventory (FSI)
3		MOS-SF36/Rand/Vitality
3		Piper Fatigue Scale Revised (PFS-R)
3		Profile of Mood States Fatigue/Vigor and Fatigue/Inertia Subscales (PMSFVS/PMSI)
2	A	Cancer Fatigue Scale (CFS)
2	A	Lee Fatigue Scale (formerly VAS for Fatigue) (LFS/VAS-F)
2	A	Multidimensional Assessment of Fatigue/Global Fatigue Index (MAS/GFI)
2	A	Multidimensional Fatigue Inventory (MFI-20/MFI)
2	A	Schwartz Fatigue Scale (Revised SCFS)
2	B	Fatigue Assessment Questionnaire (FAQ)
2	B	Fatigue Impact Scale (FIS)
2	B	Fatigue Symptom Checklist (FSC)
2	B	Fatigue Symptom Control Checklist
1		Clinical Survey for CRF (QFAS)

1	Fatigue Item Bank (FIB)
1	Fatigue Management Barriers Questionnaire
1	Schedule of Fatigue and Anergia
1	Sphere

* Only those measures rated 3 or 4 are recommended for clinical practice

Summary

The evaluation and treatment of patients during and after breast cancer treatment requires the rehabilitation provider to have knowledge about the common treatment side effect associated with disease treatment. An optimal approach to managing patients with breast cancer relies on utilizing a model of care that puts the rehabilitation provider at an interface with the patient from the point of diagnosis and continues throughout the trajectory of treatment. This model provides for interval examination and assessment of the patient to promote early identification of impairments and promotes reduced morbidity and disability long-term. There is also a need for providers to use evidence-based practice to choose the best clinical measurement tools to assess their patient's level of impairment and disability and to gauge change over time when using a prospective surveillance model. An understanding of the ICF and its ability to enable providers in better aligning their plan of care around functioning is critical.

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