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Early Detection of Performance Deficits in Patients Receiving Breast Cancer-Related Treatment

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Abstract

Surgical treatment for breast cancer can lead to decreased upper extremity range of motion and strength, and increased risk of developing lymphedema. These factors can hinder an individual's ability to perform necessary activities of daily living such as dressing, bathing, and grooming. Such side effects post-operatively may also impair a patient's ability to receive life-extending radiation treatment due to difficulty achieving appropriate shoulder positioning, as well as ability to maintain positioning throughout the duration of treatment. The purpose of this screening program was to detect upper extremity performance deficits and signs of lymphedema in patients receiving breast-cancer related treatment in order to obtain a referral to outpatient occupational therapy. This screening program aimed to serve to a population in need, as a large percentage of breast cancer patients did not receive an OT consultation post-operatively. Patients that participated in the program were screened pre- and post-operatively. Screenings included measurements of ROM, grip strength, arm circumference, and the administration of the Patient Specific Functional Scale (PSFS) to identify deficits in ADLs/IADLs. The Kwan's Arm Problem Scale (KAPS) was also utilized post-operatively to assess upper extremity occupational performance factors. Results showed that one out of the three participants presented with upper extremity deficits that greatly impaired occupational performance. Thus, they were referred to outpatient occupational therapy services to receive a more comprehensive evaluation. Upon completion of the doctoral capstone experience, the upper extremity screening program was presented to the therapy manager. This program is being considered for future implementation within the outpatient therapy department.

Early Detection of Performance Deficits in Patients Receiving Breast-Cancer Related Treatment

Literature Review

According to the American Cancer Society (2018), an estimated 268,670 individuals, including both women and men, will be diagnosed with breast cancer in 2018. There are approximately 3 million women living with breast cancer currently in the United States, due to improvements in treatment and early detection (American Society of Clinical Oncology, 2017). As more women and men are battling this disease each year, there is a need to address impairments and symptoms related to receiving breast cancer-related treatment. This can be accomplished through utilization of the Health Promotion Applied Theory with a special focus on tertiary prevention. The Health Promotion Applied Theory focuses on enabling clients to increase control and to improve their health though a client-centered approach. Tertiary prevention relates to patients that are already in a state of ill health, and occupational therapy (OT) interventions are utilized to restore, remediate, maintain, and modify activities (Cole & Tufano, 2008). Occupational therapists can play an essential role in addressing occupational performance deficits created by the side-effects of cancer treatment.

Research shows that treatment for breast cancer, including surgery and radiation therapy, can lead to a decrease in range of motion (ROM) and strength, increase in pain, and risk for developing lymphedema on the involved side which can all impact functional use of the upper extremity (Lattanzi et al., 2010; Lee, Kilbreath, Refshauge, Herbert, & Beith, 2008). Range of motion at the shoulder joint is necessary for activities of daily living (ADLs) such as combing hair, reaching overhead for objects, bathing, and feeding tasks (Rundquist, Obrecht, & Woodruff, 2009). These side effects post-operatively may also impair an individuals' ability to receive radiation treatment due to inability to place the shoulder in the appropriate position. A common

position is 90 degrees flexion and abduction, as well as maximal external rotation for up to approximately 30 minutes (Campbell, El-Sayed, Graham, Noble, Riley, & Slattery, 2017). Limited ROM has been found to negatively influence functional capacity and quality of life in breast cancer patients, which can also lead to a decline in mental and emotional well-being (Cho, Do, Jung, Kwon, & Jeon, 2016).

Current evidence suggests that assessment of shoulder impairments and referrals for occupational therapy treatment, even when limitations may seem subtle, are vital components of care for patients with breast cancer (Lattanzi et al., 2010; Levangie & Drouin, 2009; O'Toole et al., 2015). O'Toole et al. (2015) and Stout et al. (2012) identified a need for prospective screening regarding lymphedema, pain, ROM, strength, performance, and quality of life to enable early detection and intervention. Lattanzi and investigators (2010) conducted a research study to explore the experience of clients undergoing occupational therapy treatment for breast cancer-related impairments, as well as to identify recommendations for practice. A few themes that emerged included challenges with obtaining referrals, challenges regarding patient education, and improvements in functional impairments after participating in occupational therapy (Lattanzi et al., 2010). Many clients noted that they had to wait until they had swelling in their arm or loss of total ROM before obtaining a referral to therapy (Lattanzi et al., 2019). Other clients reported that they did not receive instructions regarding healing and functional use after surgery, and avoided shoulder movement to minimize pain without knowing the detrimental effects (Lattanzi et al., 2010). Lastly, participants stated that their limitations significantly affected their ability to perform ADLs, however, participation in therapy helped combat performance deficits. In conclusion, researchers recommend advocating for referrals for occupational therapy consultation (Lattanzi et al., 2010).

There is a lack of standardized screening for early detection of breast cancer-related lymphedema (BCRL) according to Sun et al. (2016). Assessing signs and symptoms of lymphedema is vital in patients receiving breast cancer-related treatment, as it is estimated that early-stage BCRL is one-fifth of the cost of late-stage BCRL (Sun et al., 2016). Though, there is lack of standardization in BCRL quantification, lymphedema is defined as a 2 centimeter or more increase of any circumference on the arm of the affected side compared to the arm on the non-affected side (Nesvold, Fossa, Holm, Naume, & Dahl, 2009). Sato, Ishida, and Ohuchi (2014) suggest measuring arm circumference at two points. Forearm circumference can be measured 10 centimeters distal to the lateral epicondyle and upper arm circumference can be measured 15 centimeters proximal to the lateral epicondyle (Sato, Ishida, & Ohuchi, 2014).

There are also self-assessments that have been developed to address both lymphedema and upper extremity deficits, such as the Kwan's Arm Problem Scale (KAPS; Nesvold, Fossa, Naume, & Dahl, 2009). The KAPS is a 13 item self-rating form with two subscales that was developed specifically for breast cancer patients (Nesvold, Fossa, Naume, & Dahl, 2009). The KAPS activities of daily living subscale includes questions regarding ability to brush hair, pull on a sweater, fasten a bra, complete a back zipper, and reach overhead. The KAPS problem subscale includes questions about pain, stiffness, swelling, numbness, and movement (Nesvold, Fossa, Naume, & Dahl, 2009). The total KAPS and both subscales have been tested to show high internal consistency. The KAPS has also been confirmed for concurrent validity when compared to the BR23, which is also an assessment specifically designed for this population (Nesvold, Fossa, Naume, & Dahl, 2009). In another study, the Kwan's Arm Problem Scale also showed good psychometric properties with both convergent and discriminant validity, as well as high reliability in the sample of breast cancer survivors that participated (Nesvold, Fossa, Holm,

Naume, & Dahl, 2009). The Patient Specific Functional Scale (PSFS) is also a self-assessment that allows participants to select meaningful occupations and rate their performance in order to detect change regarding the effect of a treatment or intervention. The PSFS allows patients to identify up to three ADLs that they are having difficulty performing, as well as rate their level of difficulty on a scale of 0-10 (Campbell et al., 2012). Research suggests that the PSFS is valid and sensitive regarding measurement of change in breast cancer survivors post-operation, thus should be included in the model for prospective surveillance (Campbell et al., 2012).

Campbell et al. suggests use of the KAPS or PSFS, as well as shoulder ROM and hand grip strength when using a prospective surveillance model. Goniometer-based measurements are commonly utilized to assess shoulder ROM (Levangie & Droulin, 2009; Nesvold, Fossa, Holm, Naume, & Dahl, 2009; Sato et al., 2014; Shamley et al., 2007). Levangie and Droulin (2009) completed a systematic review to explore the effects of breast cancer treatments on shoulder function where several studies indicated that a 20 degree difference from the contralateral arm or from full ROM were considered to be associated with decreased ability to participate in daily activities. Lee et al. (2008) also recommends use of standardized tools, such as dynamometers to measure strength, in order to assess impairments and measure outcomes as accurately as possible. Use of standardized assessments is important not only for detecting performance deficits, but also for the justification of occupational therapy services for third party payers (Harrington, Michener, Kendig, Miale, & George, 2014).

In conclusion, implementation of a screening protocol for patients receiving breast cancer-related treatment allows for a proactive approach regarding lymphedema and early detection of upper extremity impairments that may hinder participation in desired occupations. Evidence concludes screenings should assess shoulder range of motion, strength, arm

circumference, and occupational performance (Campbell et al., 2012; O'Toole et al., 2015; Stout et al., 2012). Detection of physical impairments allows for early treatment via rehabilitation care, including occupational therapy services. Rehabilitation care can reduce short and long-term arm morbidity (Stout et al., 2012), allowing survivors to participate in meaningful occupations and activities in order to achieve the highest quality of life possible.

Screening and Evaluation

Individuals with breast cancer at this site are not screened for upper extremity deficits that may impair occupational performance throughout the course of treatment. Only patients who undergo general anesthesia for their procedure, which most often includes mastectomies, receive post-operation education as they are required to stay overnight in the hospital. These women and men receive an OT consult on the day of their discharge regarding education on exercises that will aid in restoring range of motion for participation in necessary daily activities, as well as education on the signs and symptoms of lymphedema. However, the portion of the breast cancer population that undergo breast-conserving surgery, including lumpectomy or partial mastectomy, leave the same day and do not receive any type of OT treatment in order to combat occupational performance deficits. Regardless of whether patients receive a mastectomy or breast-conserving surgery; baseline measurements regarding ROM, strength, or lymphedema are not obtained. Patients are not screened post-operatively at any point in their treatment to detect impairments in motor skills required for participation in activities of daily living. Through multiple assessments, a need for a screening protocol for early detection of impairments as well as lymphedema was identified.

Current evidence suggests that implementation of a prospective surveillance model for patients with breast cancer regarding physical rehabilitation should be utilized as a more holistic

approach to survivorship health care (O'Toole et al., 2015; Stout et al., 2012). Stout et al. proposed a model where patients are assessed pre-operatively, early post-operatively, and at follow-up appointments for ongoing surveillance. Research concluded that common impairments after breast cancer-related surgery and treatment include pain, lymphedema, and reduced ROM and strength necessary for participation in meaningful occupations (Lattanzi et al., 2010; Lee, Kilbreath, Refshauge, Herbert, & Beith, 2008). Thus, a screening protocol should assess ROM, strength, arm circumference, pain, and occupational performance (Campbell et al., 2012; O'Toole et al., 2015; Stout et al., 2012). Campbell et al. also suggests use of standardized outcome measures such as the KAPS or PSFS. Both of these tools allow the patient to assess their performance skills to complete daily activities such as dressing, grooming, meal preparation, home management, etc. Service delivery would include a one-on-one model. Screenings would be performed on an individual basis within the breast cancer population specifically, and any indication of impairment would justify the need for a referral to occupational therapy services for a comprehensive evaluation.

Though this site previously lacked a screening protocol for upper extremity impairments and lymphedema, there is a screening program utilized to assess cancer-related fatigue in the emerging area of practice of oncology. While receiving cancer-related treatment at the cancer center, patients are asked by a nurse to rate their fatigue on a scale of 0 to 10, with 0 indicating no fatigue and 10 indicating worst possible fatigue. Individuals that rate their fatigue at a 4 or above are contacted via the outpatient therapy center to offer a free screening in order to determine whether they are appropriate for the cancer-related fatigue program. The screening lasts approximately 30 minutes and consists of a variety of special tests including a 6 Minute Walk Test, 2 Minute Step Test, 30 Second Sit to Stand Test, and Gait Speed Test. The Patient

Specific Functional Scale is a self-assessment that is used as an outcome measure tool within the program. Impairments in one or more of the special tests validate the need for a referral to the program within the outpatient therapy clinic.

The upper extremity screening program would contain similar characteristics to the fatigue screening, as the purpose of the screen would be to detect early signs of lymphedema and impairments in regards to patients' abilities to perform daily activities in order to obtain a referral to outpatient therapy. The upper extremity screening program would also utilize standardized assessments in order to identify impairments and measure outcomes in individuals with breast cancer, such as PSFS or KAPS. This screening protocol would differ from the fatigue screening, as it would be conducted in two phases, including pre-operatively and post-operatively. Though, the upper extremity screening program would be geared towards only breast cancer patients versus the entire oncology population. An upper extremity screening program would greatly benefit this site in terms of increasing referrals to outpatient therapy, as well as helping patients served to achieve the highest quality of life possible through maximal occupational performance.

Implementation

Program Planning

The implementation of the upper extremity screening program has included many phases of planning, organizing, and developing. The pre-planning portion of this upper extremity screening program included gathering evidence-based research regarding the need for occupational therapy within the realm of oncology, and specifically with breast cancer patients. Multiple needs assessments were performed by interviewing different members of the outpatient therapy team including a certified lymphedema therapist/occupational therapist and physical

therapist whom created a cancer-related fatigue (CRF) program at this site. The certified lymphedema therapist noted a need for referrals for breast cancer patients that showed any signs or symptoms of lymphedema in order to begin receiving treatment as early as possible. The physical therapist identified a need for screenings of upper extremity performance deficits for breast cancer patients, as many individuals who were referred to the CRF program were unable to participate due to a frozen shoulder on the affected side. Perspectives from a breast health navigator, social workers, radiation therapist, and palliative care nurse practitioner were also obtained. This was done in order to gain insights from multiple disciplines regarding needs and an appropriate timeline for a screening protocol for breast cancer patients. In conclusion, these health care professionals deemed a screening program appropriate pre- and post-operatively, as well as potentially further into treatment for breast cancer patients in order to increase occupational performance and quality of life throughout all stages of treatment and survivorship.

Literature was gathered regarding detection of upper extremity impairments and lymphedema after receiving breast cancer related treatment including surgery and radiation therapy, where a large need for a screening program was identified (Lattanzi et al., 2010; Levangie & Drouin, 2009; O'Toole et al., 2015; Stout et al., 2012). Evidence was also collected regarding deficits that individuals who receive breast cancer-related treatment often exhibit, as well as appropriate outcome measures to assess performance deficits for inclusion within the screening program. Common deficits found in the literature included decreased range of motion and strength, lymphedema, and pain in the upper extremity on the affected side (Campbell et al., 2012; O'Toole et al., 2015; Stout et al., 2012). In conclusion, it was decided that range of motion, grip strength, and arm circumference measurements would be incorporated within the screening process.

The organizing phase consisted of obtaining the assessment tools for use within the screening program. The Kwan's Arm Problem Scale and Patient Specific Functional Scale were identified as potential outcome measures, as they have all been considered reliable and valid tools when utilized with breast cancer patients (Campbell et al., 2012; Nesvold, Fossa, Naume, & Dahl, 2009; Stratford, Binkley, & Stratford, 2001). The PSFS was readily available online and was chosen for use within the screening program, as it allows participants to select meaningful occupations and is most time efficient. The KAPS was not available via the internet; however, the author's email was obtained via a research article. The author, Winkle Kwan, granted permission for use of the assessment tool within the screening program and provided an attachment with the tool itself. The KAPS will be utilized as a secondary outcome measure when screening patients post-operatively.

Next, the development of this trial upper extremity screening program was completed through the use of Microsoft Excel and Microsoft Word in order to create the screening sheet. Pre-operative and post-operative range of motion, grip strength, arm circumference, and PSFS templates were created in Excel and merged within Word in order to easily record measurements throughout the screening process (See Appendix A). A participation waiver was also developed and approved through the legal department within the hospital to be utilized for the program (See Appendix B). Lastly, a proposal was developed in order to market the trial screening program and to gain permission from one of the breast surgeons within the hospital for implementation (See Appendix C).

Implementation of the Upper Extremity Screening Program

The pre-operation screenings took place within one of the breast surgeon's offices, where patients with breast cancer attended their pre-operative appointments for surgical planning. A

nurse practitioner greeted the patient in the examination room and offered the free screening after vitals were obtained. If the patient was interested in being screened, the doctoral student and occupational therapist were then allowed to enter the room to begin the assessment. First, the patient was asked to read and sign a participation waiver for the legal department of the hospital. Next, the patient was seated on the exam table and asked to remove any long-sleeve garments to ensure accuracy of measurements. Range of motion measurements were obtained via a goniometer for shoulder flexion, abduction, external rotation, and internal rotation on both arms. Grip strength was then assessed using a dynamometer three times each hand in order to acquire an average for each arm. A tape measure was used to obtain circumference measurements on both arms at three different points each for a total of six measurements. Wrist girth, forearm girth (6 centimeters distal from the lateral epicondyle), and upper arm girth (9 centimeters proximal from the lateral epicondyle) were measured in centimeters. Lastly, the PSFS was utilized and patients were asked if they were having difficulty performing any necessary or desired activities due to their breast cancer at the time.

The post-operation screening consisted of the same process as the pre-operation screening; however patients did not need to fill out another participation waiver. Range of motion, grip strength, and arm circumference were all re-measured for both arms. The PSFS was also completed once again regarding any activities of daily living patients were having difficulty participating in after their surgery. The Kwan's Arm Problem Scale was also completed at this time. Pre-operation measurements, post-operation measurements, and pre- and post-operation PSFS scores were compared in order to identify any deficits or signs of lymphedema present. Noted impairments were communicated to the patients and an outpatient therapy clinic brochure was provided if deemed necessary. This was done in order to acquire an occupational therapy

referral to the outpatient therapy department at this site to reduce occupational performance deficits within these patients.

Leadership Skills and Staff Development

A variety of leadership skills were required for the planning and implementation of the upper extremity screening program. Communication skills were crucial for the planning phases in order to interview hospital personnel and collaborate with supervising occupational therapists within the inpatient therapy department. Much communication occurred via email in order to state the purpose of an interview as well as to set up meeting times, thus it was imperative that communication was clear and professional. Leadership skills were also important in order to advocate for the unique profession of occupational therapy, and how upper extremity impairments and lymphedema can affect occupational performance. Flexibility was another essential skill, as many individuals were only able to meet for brief periods of time throughout the day or on certain days of the week. Meeting times would change frequently at the last minute due to scheduling conflicts. Motivation and persistence were also demonstrated throughout this process, as it was difficult to make initial contact with the breast surgeons in order to gain permission for implementation. These doctors are very busy serving patients, thus multiple emails and follow up phone calls were required in order to set-up a meeting.

Initially, staffing for implementation of the program included only the doctoral student and two supervising inpatient occupational therapists. However, the nurses at the breast surgeon's office were educated on the purpose of the screening program, as they are the individuals initially offering the screening to patients. The upper extremity screening program was considered as a trial program at this facility. A proposal for continuation of the program was

formulated for this site upon completion and presented to the therapy department manager for future service provision.

Outcomes and Discontinuation

Program Results and Considerations

The trial screening program allowed for assessment of three female participants pre- and post-operatively. The type of procedure, lymph nodes removed, body mass index (BMI), age, and hand dominance were all recorded for comparative data (See Appendix D). Results showed that one out of the three (approximately 33%) participants demonstrated upper extremity deficits which hindered ability to perform necessary daily tasks. This participant (participant 2) in particular exhibited a considerable loss in range of motion (60 degree decrease in flexion, 60 degree decrease in abduction), decreased grip strength (10 pounds), and decreased ability to perform daily tasks (6 point change in PSFS total score) with the affected upper extremity. Activities that participant 2 noted difficulties performing via the PSFS included completing laundry, unloading the dishwasher, and carrying out cooking tasks. Through utilization of the KAPS, this participant noted that her pain in the affected arm was a 4 when rated on a scale from 1 (no pain) to 5 (my arm is very painful). She indicated that brushing her hair and pulling a sweater overhead with the affected arm were a “moderate problem”. She also rated her ability to reach overhead as “unable to perform”. The other two participants (participants 1 and 3) showed minimal loss in range of motion and reported that they had no difficulty participating in desired roles and occupations when completing the PSFS. Both participants rated their ability to pull a sweater overhead as a “slight problem” when completing the ADL subscale of the KAPS. Participant 3 also rated numbness in her arm as a 2 on of a scale of 1 (no numbness) to 5 (my

arm is completely numb). None of the participants exhibited any signs or symptoms of lymphedema post-operatively when examining arm circumference (See Appendix E).

Results from the trial screening program suggest that individuals who undergo a partial mastectomy or more extensive surgeries may be at a greater risk for upper extremity impairments than those who only undergo a lumpectomy. A potential factor that may be considered in the future for individuals who endure a partial mastectomy is hand dominance. The participant (participant 2) that exhibited decreased range of motion, strength, and occupational performance post-operatively noted that her surgery was performed on her non-dominant side. Thus, she was able to compensate when performing daily activities by using only her dominant arm. Another factor to consider for future implementation is BMI, as the participant with performance deficits also had a considerably higher BMI than the other participants.

Potential Program Continuation

The discontinuation phase of the program began as the post-operative screenings were completed for individuals who participated in the pre-operative screenings. As the program progressed to the outcome phase, a proposal was created for the continuation within the outpatient occupational therapy center at this site upon completion of the doctoral capstone experience (See Appendix F). Evidence-based research as to why a prospective surveillance model for patients with breast cancer is an essential component to survivorship care was included in the program proposal. The targeted population and logistics of this program were also clearly defined. The screening sheet and outcome measures utilized within the program were provided as well. Lastly, the proposal included estimated cost and forecasted revenue for the outpatient therapy clinic in order to prove the program's worth. This program proposal was presented to the therapy manager at this site in order to direct administrative changes appropriately. The therapy

manager was very receptive to this information and believed utilization of the upper extremity screening program would be a great way to maximize outcomes for patients with breast cancer, as well as to increase growth in regards to outpatient OT clientele.

One future program change that will be made includes that all pre-operative and post-operative screenings will be performed at the outpatient occupational therapy center instead of the breast surgeon's offices. This change in location is necessary in order to decrease staffing costs; however, it will be imperative for the breast surgeons to encourage their patients to schedule these screenings. It is not cost efficient for this site to hire personnel only to perform the screenings in the breast surgeon's offices, as they are only in office on specific days and not all patients treated are breast cancer patients, thus screenings are not warranted each day. The outpatient therapy center already has the personnel to perform scheduling for these individuals, as well as occupational therapists qualified to perform the screenings. Therefore, this will improve the quality of services, as the outpatient therapy center already has the tools required such as mat tables, goniometers, dynamometers, and measuring tapes to perform the screenings. Tools that were used throughout the program were borrowed from the inpatient rehab center and had to be transported to the breast surgeon's office for each screening, and then promptly returned. This location change will also assist with improving quality of services, as occupational therapists performing the screenings may also be the therapists providing treatment to patients if a referral is necessary. This will aid in establishing rapport with these potential patients, and the OT practitioners will be able to explain what a comprehensive evaluation and treatment interventions may look like depending upon the patient's needs. This program is currently being considered for future implementation within the outpatient therapy clinic.

According to the American Occupational Therapy Association (AOTA), the Vision 2025 states "occupational therapy maximizes health, well-being, and quality of life for all people, populations, and communities through effective solutions that facilitate participation in everyday living" (AOTA, 2017). As more women and men are conquering breast cancer due to improvements in treatment and detection, survivorship care is becoming a routine component in healthcare in order to maximize well-being and quality of life (Stout et al., 2012). The upper extremity screening program is responding to the oncology society's needs by addressing upper extremity occupational performance deficits that may occur due to breast cancer-related treatment, such as surgery. The continuation of the screening program will allow for early detection of these impairments in order to receive occupational therapy treatment before deficits begin to hinder occupational participation and performance. Early detection will also focus on prevention of musculoskeletal disorders that are prevalent in individuals who receive breast cancer-related surgery, such as adhesive capsulitis, which can also impact one's ability to sleep or perform simple self-care activities (Jeong, Sim, Hwang, & Kim, 2010). By implementing this screening and referral process to occupational therapy at the outpatient center, patients with breast cancer will have the opportunity to restore their ability to participate in necessary roles and occupations. This may include participation in the cancer-related fatigue program or ability to receive life extending treatments, such as radiation therapy. In conclusion, the screening program aims to result in restoring participation in meaningful occupations which can overall impact quality of life in a positive manner in alignment with AOTA's Vision 2025.

Overall Learning

Verbal, written, and nonverbal interactions took place with multiple different individuals, including colleagues, fellow healthcare providers, patients, and patients' families

throughout this doctoral capstone experience. Verbal communication was used primarily when interacting with colleagues, as they were readily available at all times while on site and were able to give immediate feedback. Weekly face-to-face meetings took place with the supervising occupational therapists in order to communicate items that had been completed, tasks that still needed to be accomplished, and a plan for the upcoming week. Both written and verbal communication was utilized when contacting other healthcare providers including the breast health navigator, palliative care nurse practitioner, radiation therapist, outpatient therapists, therapy managers, cancer center staff, social workers, breast surgeons and their nursing staff, and other disciplines. This was done through email, phone calls, and face-to-face meetings. Professional and concise communication was required in order to obtain and convey pertinent information, as many stakeholders had limited available time.

Patients and their significant others/families were communicated with via nonverbal and verbal interactions. It was important to be aware of the patient's and family's demeanor when walking into a room, as this was a difficult time learning of a new breast cancer diagnosis and discussing surgical treatment options. Nonverbal communication skills were used to provide emotional support, such as establishing good eye contact and offering a smile or rub on the back when appropriate. Nonverbal communication skills were also used via demonstration for proper positioning of the upper extremities throughout the screening process.

These verbal, written, and nonverbal communication skills will continue to be utilized in future practice when working with clinicians, healthcare practitioners, patients, and management personnel. Other skills learned that will be useful in future practice regardless of setting includes research, clinical practice, and abilities regarding program development and implementation. Program development is a timely process and requires collaboration from many

disciplines in order to be successful. Program development and implementation also requires formation of a business plan in order to show forecasted revenue for sustainability, as well as creation of a proposal for marketing to stakeholders. Clinical practice skills that were gained through conducting these screenings will also be useful for identifying deficits and relating how they may be impacting occupational participation and performance. Lastly, occupational therapy's role within the oncology population and survivorship care will continue to be advocated for within acute, outpatient, and community settings to help these individuals achieve the maximum quality of life possible.

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Appendix A. Screening Sheet

Upper Extremity Assessment

Patient Information

Name:	
DOB:	
Pre-Op Date:	
Post-Op Date:	

Shoulder ROM

Pre-Op

Left	Degrees	Normal	Deficit (Yes if ≥20 degrees from normal range)
Flexion		180	
Abduction		180	
Internal Rotation		70	
External Rotation		90	
Right	**Degrees**	**Normal**	**Deficit (Yes if ≥20 degrees from normal range)**
Flexion		180	
Abduction		180	
Internal Rotation		70	
External Rotation		90	

Post-Op

Left	Degrees	Normal	Deficit (Yes if ≥20 degrees from normal range)
Flexion		180	
Abduction		180	
Internal Rotation		70	
External Rotation		90	
Right	**Degrees**	**Normal**	**Deficit (Yes if ≥20 degrees from normal range)**
Flexion		180	
Abduction		180	
Internal Rotation		70	
External Rotation		90	

Grip Strength

Pre-Op	kg	Deficit (Yes if below normal range)
Left		
Right		
Post-Op	**kg**	**Deficit (Yes if below normal range)**
Left		
Right		

Grip Strength Ratings (in kg)		
Age	Female Normal Range	Male Normal Range
18-19	19.2-31.0	35.7-55.5
20-24	21.5-35.3	36.8-56.6
25-29	25.6-41.4	37.7-57.5
30-34	21.5-35.3	36.0-55.8
35-39	20.3-34.1	35.8-55.6
40-44	18.9-32.7	35.5-55.3
45-49	18.6-32.4	34.7-54.4
50-54	18.1-31.9	32.9-50.7
55-59	17.7-31.5	30.7-48.5
60-64	17.2-31.0	30.2-48.0
65-69	15.4-27.2	28.2-44.0
70-99	14.7-24.5	21.3-35.1

Arm Circumference (in cm)			
Pre-Op			
	Wrist	Forearm (6 cm distal from elbow crease)	Upper Arm (9 cm proximal from elbow crease)
Left			
Right			
Difference			
Indication of Lymphedema (Yes if ≥ 2 cm difference)			
Post-Op			
	Wrist	Forearm (6 cm distal from elbow crease)	Upper Arm (9 cm proximal from elbow crease)
Left			
Right			
Difference			
Indication of Lymphedema (Yes if ≥ 2 cm difference)			

Patient Specific Functional Scale (PSFS)			
	Pre-Op (Rate 1-10)	Post-Op (Rate 1-10)	Change
Activity 1:			
Activity 2:			
Activity 3:			
Total Score			
*higher score = higher function			
*MDC (90% CI) 2 points average score			
*MDC (90% CI) 3 points for single activity			

Appendix B. Upper Extremity Screening Program Participation Waiver

Upper Extremity Screening Program

Participation Waiver

I understand that my involvement in the Upper Extremity Screening program at The Christ Hospital is voluntary. I understand that I may be asked questions and to participate in certain tests to screen for signs of dysfunction. I understand that participation could pose the risk of injury. I understand it is my responsibility to seek and continue to receive medical evaluations from my personal physician to determine if there are any medication conditions, medications, or injuries that could limit my participation in the screening program or future therapy treatment interventions. I also understand that this program does not in any way constitute a comprehensive occupational therapy evaluation and/or treatment prescription procedures. I understand that I am voluntarily participating in an Upper Extremity Screening program and I assume the risk of any injury, loss, and/or adverse health consequences.

I hereby release The Christ Hospital, Physical and Occupational Therapy Center locations, outpatient services and their offices, directors, employee, and their affiliated entities from any and all claims, liabilities, and demands of any kind arising from injury or adverse consequences related to my voluntary enrollment in the Upper Extremity Screening program at The Christ Hospital. Subject to these conditions, I affirm that I have read, understand, and agree to all the terms set forth above, and enroll voluntarily at my own risk.

Name: (print)_____

Signature:_____

Date:_____

Date of Birth:_____

Clinical Staff Name:_____

Appendix C. Implementation Proposal

Proposal: Prospective Surveillance for Detecting Upper Extremity Performance Deficits in Breast Cancer Patients

By: Ellen Thomas, Doctoral Student of Occupational Therapy, University of Indianapolis

Research concludes that treatment for breast cancer can lead to a decrease in active range of motion and strength, increase in pain, and risk for developing lymphedema (O'Toole et al., 2015; Stout et al., 2012). Rotator cuff tendonitis and adhesive capsulitis are also prevalent among individuals who undergo breast surgery (Mafu, September, & Shamley, 2018). Decreased range of motion and strength, pain, and lymphedema can hinder an individual's ability to perform necessary activities of daily living such as dressing, bathing, and grooming (Rundquist, Obrecht, & Woodruff, 2009). These side effects post-operatively may also impair a patient's ability to receive radiation treatment due to difficulty achieving and maintaining appropriate shoulder positioning (Campbell, El-Sayed, Graham, Noble, Riley, & Slattery, 2017; Conneely & Weber, 2007). Early detection of these impairments is a vital component to survivorship care.

Target population: Patients undergoing breast surgery as a result of breast cancer

Goal:

To detect upper extremity impairments in patients receiving breast cancer-related treatment in order to warrant the need for an OT referral to address limitations that may hinder occupational participation and ability to receive life-extending oncology treatments.

Process:

Patients will be assessed pre-operatively and approximately 2-4 weeks post-operatively in order to detect early impairments regarding range of motion, strength, occupational performance, and signs/symptoms of lymphedema.

1) Shoulder AROM via goniometer
    a. Measurements will be performed seated regarding flexion, abduction, IR, and ER of both affected and non-affected arm
    b. Impairment noted if 20 degrees difference between arms or 20 degrees from normal or baseline measurements
    c. Normal ROM includes: flexion 180 degrees, abduction 180 degrees, internal rotation 70 degrees, external rotation 90 degrees

2) Grip strength via dynamometer
    a. Average grip strength of 3 trials for each hand will be measured
    b. Impairment noted if below norm for age group

3) Arm circumference for detection of lymphedema
    a. Wrist: measure at wrist crease
    b. Forearm girth: 6 cm distal from elbow crease
    c. Upper arm girth: 9 cm proximal from elbow crease
    d. Compare both affected and non-affected, with possible signs of lymphedema if 2 or more cm difference

4) Patient Specific Functional Scale (PSFS)
    a. Clinical measure to assess change related to the effect of a treatment or intervention (i.e. surgery) for an individual
    b. Patients will identify 3 activities of daily living to rate difficulty on scale of 0-10
    c. Research supports use of PSFS as a valid and sensitive tool to detect change in breast cancer survivors after surgery

5) Kwan's Arm Problem Scale (KAPS)
    a. Self-assessment with problem subscale and ADL subscale
    b. Designed specifically for patients with breast cancer post-operatively
    c. Tested to show high internal consistency, reliability, and discriminant validity within this population

Average time of screen: 13 minutes

Contacts:
Ellen Thomas, SOT
Kristin Blackham, OTD, OTR/L, CLT
Justin Gill, OTR/L, Supervisor of Occupational Therapy Department

Appendix D. Participant Factors

Participant Factors					
	Procedure	Lymph nodes removed	Age	BMI	Dominant arm
Participant 1	R lumpectomy + sentinal node biopsy	2	51 y.o.	26.8 (overweight)	R
Participant 2	L partial mastectomy + sentinal node biopsy + intraoperative radiation therapy	1	55 y.o.	47.4 (obese)	R
Participant 3	L lumpectomy + sentinal node biopsy	1	68 y.o.	31.6 (obese)	R

Appendix E. Program Results

Comparing Pre- to Post- Screening Results			
	Participant 1	Participant 2	Participant 3
Range of Motion	No deficits noted	flexion 60* decrease; abduction 60* decrease	No deficits noted
Grip Strength	No deficits noted	10# decrease	No deficits noted
Arm Circumference	No deficits noted	No deficit noted	No deficits noted
PSFS total score difference	0	6	0
KAPS score	15/65	34/65	15/65
Referral to OT	No	Yes	No
*PSFS 2 pt change in total score or 3 pt change in single activity is significant			
*KAPS (higher score = decreased function)			

Appendix F. Continuation Proposal

Prospective Surveillance for Detecting Upper Extremity Limitations in Breast Cancer Patients

By: Ellen Thomas, Student of Occupational Therapy

The Need for an Upper Extremity Screening Program

Research concludes that treatment for breast cancer can lead to a decrease in active range of motion and strength, increase in pain, and risk for developing lymphedema (O'Toole et al., 2015; Stout et al., 2012). Rotator cuff tendonitis and adhesive capsulitis are also prevalent among individuals who undergo breast surgery (Mafu, September, & Shamley, 2018). Decreased range of motion and strength, pain, and lymphedema can hinder an individual's ability to perform necessary activities of daily living such as dressing, bathing, and grooming (Rundquist, Obrecht, & Woodruff, 2009). These side effects post-operatively may also impair a patient's ability to receive radiation treatment due to difficulty achieving and maintaining appropriate shoulder positioning (Campbell, El-Sayed, Graham, Noble, Riley, & Slattery, 2017; Conneely & Weber, 2007). Early detection of these impairments is a vital component to survivorship care.

Program Overview

This screening program will target patients undergoing breast surgery as a result of breast cancer. Patients will be assessed in the outpatient therapy center in order to detect early impairments regarding range of motion, strength, occupational performance, and signs of lymphedema.

Goal:

To detect upper extremity impairments in patients receiving breast cancer-related treatment in order to warrant the need for an occupational therapy referral.

Provision of Services

1) Pre-operative screening – obtain baseline measurements
2) Post-operative screening – approximately two to four weeks after surgery
3) Recommend referral to outpatient OT
4) Outpatient OT evaluation
5) Outpatient OT treatment

Screening Process:

- Shoulder AROM
- Grip strength
- Arm circumference
- Patient Specific Functional Scale (PSFS)
- Kwan's Arm Problem Scale (KAPS) – post-operatively only

Forecasted Revenue

- Average pre-op screening time: 10 minutes
- Average post-op screening time: 10 minutes
    - Total screening time: 20 minutes
- Lowest OT practitioner hourly rate: $32.38
    - $32.38/60 minutes = $0.54 per minute
    - $0.54 x 20 minutes = $10.80 per total screening
- Outpatient OT evaluation: $288.00
    - $288.00 - $10.80= **$277.20 revenue generated per referral made**
- Outpatient OT treatment
    - Recommended treatment frequency of 2-3x/week for 6-12 weeks (Cheifetz & Haley, 2010; Conneely & Weber, 2007)
        - Therapeutic activity unit: $131.00
        - Therapeutic exercise unit: $144.00
        - ADL unit: $131.00
    - $ unit(s) x 2 x 6 = $1,572 minimum treatment generated revenue

Marketing Strategies

It is vital to gain support from the breast surgeons and their staff within The Christ Hospital network for the success of this potential program, as they will need to encourage their patients to schedule a pre-operative screening at the outpatient therapy center for obtaining baseline measurements. Dr. Kelly McLean and her staff have allowed for a trial period of the program within their office for the last ~6 weeks. Occupational therapists performing the pre-operative screenings will need to advise their patients to schedule a post-operative screening time approximately two to four weeks after their surgery date, which is also when the patient will return to the breast surgeon's office for a post-operative appointment. Based on results of the post-operative screenings, a doctor's referral for a comprehensive occupational therapy evaluation may be warranted if deficits are present.

Summary of Proposal

The above information is a brief outline of the importance of prospective surveillance screening for breast cancer patients. This upper extremity screening program aligns with The Christ Hospital's vision to "be a national leader in clinical excellence, patient experience, and affordable care" by providing patients with a preventative approach for upper extremity performance deficits in order to maximize outcomes and quality of life as a survivor. I believe this program will increase clientele volume through referrals to the outpatient occupational therapy department.