

**Exploring Adaptive Clothing Needs for Hemodialysis Patients**

by

Kristie J. Smith

A thesis submitted to the Graduate Faculty of  
Auburn University  
in partial fulfillment of the  
requirements for the Degree of  
Master of Science

Auburn, Alabama  
May 4, 2013

Keywords: adaptive clothing, vascular access, hemodialysis, functional clothing

Approved by

Veena Chattaraman, Co-Chair, Associate Professor of Consumer and Design Sciences  
Pamela Ulrich, Co-Chair, Professor of Consumer and Design Sciences  
Karla Simmons, Assistant Professor of Consumer and Design Sciences

## **Abstract**

Approximately 370,000 people in the United States are being treated with hemodialysis (U.S. Renal Data System [USRDS], 2011). While adaptive clothing is available for hemodialysis patients, no scholarly literature was found on the subject. The purpose of this study was to explore adaptive clothing needs for hemodialysis patients following Lamb and Kallal's FEA (Functional, Expressive, Aesthetic) Model (1992). It was hypothesized that the following variables would have a positive influence on the purchase intention of adaptive clothing for hemodialysis: perceived functional attributes of vascular access (Hypothesis 1), perceived expressive attributes of increased privacy (Hypothesis 2a), perceived expressive attributes of integration with social norms (Hypothesis 2b), and accommodation of aesthetic needs of symmetry (Hypothesis 3). A questionnaire was completed by 83 hemodialysis patients. Results indicated that perceived vascular access and perceived integration with social norms had a significant influence on purchase intention; however, perceived privacy did not influence purchase intention for this group. Symmetry was not a significant factor in influencing purchase intention as most hemodialysis patients preferred the asymmetric garment. Additional findings revealed that a majority of participants indicated intent to purchase adaptive clothing, however only one participant was aware that it existed. Cost and low income levels may limit manufacturing and sales of adaptive clothing for hemodialysis patients. Guidelines for product development, marketing, and future research are included with the study.

## Table of Contents

|  |     |
|--|-----|
| Abstract.....                                  | ii  |
| List of Tables.....                            | vi  |
| List of Figures.....                           | vii |
| Chapter 1: Introduction.....                   | 1   |
| Objectives and Significance Statement.....     | 4   |
| Definitions.....                               | 5   |
| Chapter 2: Literature Review.....              | 7   |
| Background.....                                | 7   |
| Special Needs Populations.....                 | 7   |
| Hemodialysis Patients.....                     | 8   |
| Demographics of Hemodialysis Patients.....     | 8   |
| Vascular Access.....                           | 9   |
| Weight Fluctuations during Hemodialysis.....   | 10  |
| Conceptual Framework.....                      | 11  |
| Hypothesis Development.....                    | 13  |
| Functional Aspects of Adaptive Clothing.....   | 13  |
| Functional Needs of Hemodialysis Patients..... | 15  |
| Expressive Aspects of Adaptive Clothing.....   | 16  |
| Aesthetic Aspects of Adaptive Clothing.....    | 17  |
| Chapter 3: Methodology.....                    | 19  |

|  |    |
|--|----|
| Sample and Setting.....  | 19 |
| Data Collection Procedure.....   | 19 |
| Measures.....  | 21 |
| Data Analysis.....   | 23 |
| Chapter 4: Results.....  | 24 |
| Demographics of the Sample.....  | 25 |
| Reliability.....   | 24 |
| Hypothesis Testing.....  | 27 |
| Hypotheses 1 and 2.....  | 27 |
| Hypothesis 3.....  | 28 |
| Additional Analysis.....   | 29 |
| Chapter 5: Discussion, Implications, Limitations, and Recommendations.....       | 33 |
| Functional Aspects of Adaptive Clothing.....                                     | 33 |
| Expressive Aspects of Adaptive Clothing.....                                     | 35 |
| Aesthetic Aspects of Adaptive Clothing.....                                      | 36 |
| Implications of this Study.....  | 37 |
| Guidelines for Design and Development of Adaptive Clothing for Hemodialysis..... | 39 |
| Limitations of this Study.....   | 41 |
| Recommendations for Future Research.....   | 43 |
| References.....  | 45 |
| Appendix A: Examples of Current Adaptive Clothing for Hemodialysis Patients..... | 49 |

|   |    |
|---|----|
| Appendix B: Permission Forms to Conduct Research in DCI Dialysis Clinics..... | 51 |
| Appendix C: Consent Forms Approved by IRB.....                                | 54 |
| Appendix D: Measures and Constructs.....                                      | 58 |
| Appendix E: Survey Questionnaire.....   | 60 |

## **List of Tables**

|  |    |
|--|----|
| Table 1. Characateristics of the Study Sample.....                       | 25 |
| Table 2. Results of Scale Reliabilities.....                             | 27 |
| Table 3. Privacy Scale Reliabilities.....                                | 27 |
| Table 4. Cross-tabulation between Age and Employment Status.....         | 31 |
| Table 5. Cross-tabulation between Embarrassment and Access Location..... | 32 |

## **List of Figures**

|   |    |
|---|----|
| Figure 1. Diagram of Vascular Access.....                         | 10 |
| Figure 2. Lamb and Kallal's FEA Model.....                        | 12 |
| Figure 3. Bar Chart of Income Level vs. Price Willing to Pay..... | 30 |

## **Chapter I: Introduction**

According to the National Institute of Health (NIH), 10% of the population has kidney disease (2010) and approximately 550,000 U.S. residents have End Stage Renal Disease (2008), which is treated with dialysis, a mechanical process used by individuals with no or little kidney function to remove waste, fluid, and excess electrolytes from the blood (Rushing, 2010).

Hemodialysis is the most commonly used type of dialysis (Davita, 2012). During a hemodialysis treatment, patients are connected to a machine, which circulates blood out of the body through a filter, and then returns the blood to the body.

Hemodialysis treatment is referred to with the verb “dialyze” or “dialyzing.” Hemodialysis patients typically dialyze three days per week for 3-5 hours per treatment (Jacobs & Opolinsky, 2010). Treatment is conducted in a large room with numerous patients lining the clinic.

Typically, 15-30 patients are dialyzing at one time, depending on the licensing of individual clinics. The clinic staff rotates around the room assisting patients with treatment. Patients frequently get chilled in the clinic from the air-conditioned room, temperature of blood circulating outside the body, skin exposure at the vascular access site, and high incidence of anemia among patients (Davita, 2012). According to the U.S. Renal Data System (USRDS) (2011), approximately 370,000 patients were treated with hemodialysis in the U.S. in 2009.

Hemodialysis patients must have vascular access to allow blood to be circulated out and into the body for dialyzing. The access is usually located in one of three places: upper leg (femoral catheter), upper chest/neck (subclavian/jugular catheter), or forearm (arteriovenous fistula/graft) (Jacobs & Opolinsky, 2010). In-clinic hemodialysis is performed in an open clinic with multiple patients in the same area. Patients have to remove clothing from the access area when the catheters (central venous catheter) are used. A t-shirt can be worn and sleeves moved to



accommodate fistulas or grafts in the arm, but catheters in the leg or chest require more body revealing maneuvers to accommodate use. In addition to the inconvenience of removing clothing from vascular access areas, over-exposure of the body in front of numerous patients and staff may be viewed by patients as a loss of privacy or dignity issue.

At least two companies, Hemowear and Libre, have created clothing that seeks to adapt to dialysis patients' needs. Hemowear promotes that their products are functional and practical, providing t-shirts, sweatpants, and sweatshirts with zippers for vascular access (Hemowear, 2012). Libre produces fleece pullovers and sweatshirts, along with cotton-polyester pants that have at least 19" invisible zippers for vascular access (Libre, 2012). Prices range from a cost of \$15 for a t-shirt to upwards of \$60 for other products, plus shipping and handling, which can be from \$7-\$20 per order (Hemowear, 2012; Libre, 2012). Both companies cross-market to the chemotherapy population. (See Appendix A for photographs of existing products.)

Hemowear's and Libre's products are an example of adaptive clothing, which is defined as clothing produced to adjust to a consumer's special needs such as a disability or medical issue (Sau-Fun, Chi-Leung, & Lai-Fan, 2011). U.S. legislation on the rights of disabled citizens was first passed in the 1970's, with the 1973 Rehabilitation Act and the 1975 Education for the All Handicapped Children Act. Research on adaptive clothing became a topic of interest during the 1970's and 1980's (Quinn & Chase, 1990) and continued with the signing of the Americans with Disabilities Act in 1990. Watkins (1988) developed a framework to guide designers when working with adaptive clothing. Likewise, Lamb and Kallal (1992) developed a conceptual model, entitled the FEA (Functional Expressive Aesthetic) model, geared toward problem solving when designing adaptive clothing. Both Watkin's (1988) and Lamb and Kallal's (1992)

focus was on exploring consumers' needs when designing clothing for a special needs population.

Consumers typically make clothing decisions based on perceived benefits, both functional and social (Abraham-Murali, Kane, & Staples, 2001); clothing meets personal needs, psychologically, physically, and socially (Kernaleguen, 1978). Adaptive clothing has often been viewed by consumers as lacking style and being too expensive and difficult to purchase (Sau-Fun et al., 2011). Many consumers, however, may not be aware of available adaptive products (Banks, 2001). Regardless of special needs, consumers desire to be accepted into a given culture. Therefore, adaptive clothing should be functional as well as be socially acceptable (Lamb & Kallal, 1992) to enhance personal quality of life (Sau-Fun et al., 2011). Several studies have found that consumers with special needs value clothing that is convenient, fashionable, and fits well (Abraham-Murali, Kane, & Staples, 2001; Eggleston et al., 1994). Watkins (1988) noted that numerous lines of adaptive clothing for special needs were developed without exploring the needs of the consumer and therefore had little understanding of the consumer's emotional, mental, or environmental needs (Watkins, 1988).

As the U.S. population ages and life expectancy increases, there is a need to develop adaptive clothing to assist with medical needs (Kernaleguen, 1978). Clothing should be designed with consumer needs in mind to increase both the effectiveness and usability of the garments (Sau-Fun et al., 2011). Although End Stage Renal Disease spans all age groups, the largest group of dialysis patients is between the ages of 45-64, with 65 years and older comprising the second largest group (USRDS, 2011). Approximately 18.9% of all dialysis patients aged 18-54 were employed for pay in 2009 (USRDS, 2011). From personal observation and interaction with

dialysis patients as a clinic staff member, I have observed that most dialysis patients continue to be active in society and their families.

Based on fifteen years of observations and working with hemodialysis patients, I have found that few patients utilize adaptive clothing products for dialysis. In talking with a sample of current dialysis patients, none were aware that adaptive clothing existed for dialysis patients. Additionally, no published research on adaptive clothing for dialysis patients was found during an extensive literature review. Thus, the goals of this study were to fill the void by: 1) examining clothing needs related to hemodialysis patients, and 2) providing marketing information to target hemodialysis patients. Therefore, the overall purpose of this study was to examine the clothing needs of hemodialysis patients from treatment to carrying out routine daily tasks on dialysis treatment days.

### **Objectives and Significance Statement**

Objectives for this research included:

1. To assess the clothing needs and wants of hemodialysis patients, focusing on aesthetic, expressive, and functional needs.
2. To assess hemodialysis patients' views of images that are similar to current adaptive clothing products that are targeted to hemodialysis patients.
3. To assess hemodialysis patients' interest in purchasing adaptive clothing.

By exploring adaptive clothing for dialysis patients, this study furthers research by examining the needs of hemodialysis patients; exploring solutions to the clothing issues of hemodialysis patients for garments that can be worn before, during, and after dialysis; and providing consumer information to assist with the development of adaptive clothing for hemodialysis patients. I expected to find that hemodialysis patients would desire: 1) clothing that is perceived to increase vascular access ease of use during treatment; 2) clothing that provides

privacy during treatment; 3) clothing that conforms to social norms and easily transitions from dialysis treatment to daily life activities on treatment day; and 4) clothing that reflects symmetrical elements of design. Interest in and purchase intention for the clothing attributes above were measured with a survey questionnaire.

As no published research was located on adaptive clothing for dialysis patients, this study contributes insights on the clothing needs of hemodialysis patients to product developers, as well as contributes to existing scholarship on adaptive clothing. Additionally, knowledge gained from examining hemodialysis clothing needs should be applicable to other groups of patients undergoing infusion treatments, such as chemotherapy. As most of the literature on adaptive clothing is qualitative, this research is significant for being a study applying quantitative methods.

### **Definitions**

Adaptive clothing: Clothing designed and produced to accommodate special needs, such as medical purposes (Sau-Fun et al., 2011).

Arteriovenous (AV) Fistula: A vascular access created by surgically connecting an artery with a vein to allow an increased blood flow for hemodialysis (Jacobs & Opolinsky, 2010).

Arteriovenous (AV) Graft: A vascular access created by surgically connecting a vein to an artery with a synthetic graft to allow increased blood flow for hemodialysis (Jacobs & Opolinsky, 2010).

Central Venous Catheter: A tube placed into a major vein that allows blood to flow in and out of the body. For hemodialysis, catheters are usually placed in the chest/neck (subclavian/jugular) or upper leg (femoral) blood vessels (NIH, 2008).

Disabled/handicapped: Anyone with a physical or mental condition that limits the ability to function in society. Terms may be interchangeable depending on the era being described. The term “Handicapped” was often used in the 1970’s and early 1980’s; disabled is most often presently used (US Census Bureau, 2012).

End Stage Renal Disease (ESRD): The stage of kidney disease when the kidneys are no longer functioning effectively, requiring dialysis or kidney transplantation (Davita, 2012).

FEA Consumer Needs Model: A design model/framework that focuses on functional, expressive, and aesthetic aspects of consumer needs (Lamb & Kallal, 1992).

Functional clothing: Clothing designed with a functional purpose (Lamb & Kallal, 1992).

Hemodialysis: Mechanically filtering the blood through a dialyzer to balance fluid and electrolytes, while removing wastes from the body (Jacobs & Opolinsky, 2010).

Interdialytic weight gain (IDWG): The amount of weight gained between dialysis treatments, typically a reflection of fluid and sodium intake (Davita, 2007).

## **Chapter II: Literature Review**

Adaptive clothing should be developed with consumers' functional, expressive, and aesthetic needs in mind. The literature review for this research will be divided into the following sections: background, to include specific needs of hemodialysis patients, conceptual framework, and hypothesis development. The hypothesis development section is guided by Lamb and Kallal's (1992) FEA model and divided into functional, expressive, and aesthetic aspects of adaptive clothing.

### **Background Literature**

**Special Needs Populations.** The term "handicapped" was widely used in the 1970's to describe anyone with physical or mental conditions (US Census Bureau, 2012); terms such as "disabled" or "special needs" are more frequently used today to describe persons with mental or physical issues. The 1973 Rehabilitation Act provided rights to handicapped/disabled persons, allowing them to work and study among the non-disabled (Voorhees & Thompson, 1981). In 1975, the Education for All Handicapped Children Act was adopted by the U.S. Congress; this law provided free public education for "handicapped" children (U.S. Department of Education [USED], 2007). In 1990, the Americans with Disabilities Act was signed into law; it prohibits employers from discriminating against qualified disabled persons and requires employers to make reasonable accommodations for the disabled individual (U.S. Equal Employment Opportunity Commission [EEOC], 2008). Previously, children and adults with disabilities or handicaps were segregated from society and possibly sent to institutions. In the last 35 years, laws regarding the rights of disabled individuals have been amended to provide additional educational support to the disabled (USED, 2007).

With education came employment opportunities and disabled citizens were integrated into society (USED, 2007). As a result of disabled individuals becoming more visible in society, clothing to accommodate the needs of the disabled was heavily studied in the 1970's and early 1980's (Quinn & Chase, 1990). Some of the major topics addressed were the wheelchair-bound, physical impacts of scoliosis, and limitations derived from stroke and burns. However, more recently, adaptive clothing studies have explored issues faced by non-disabled groups who need clothing designed for special purposes, such as sailing-wear for women and body armor for the military (Bye & Hakala, 2005; Park, Nolli, Branson, Peksoz, Petrova, & Goad, 2011). These wide-ranging topics suggest that adaptive clothing can be designed and produced for a multitude of special needs.

Adaptive clothing offers benefits to the wearer that include independence, conformity to culture, concealment of the disability, comfort, psychological contentment, safety, and durability (Kernaleguen, 1978). Adaptive clothing should promote harmony between functionality and aesthetics. Good aesthetics in the design of adaptive clothing can accentuate positive attributes of the body while distracting from negative attributes, such as the disability (Quinn & Chase, 1990). Interviews with consumers in wheelchairs suggested that adaptive clothing fills a niche that off-the-rack clothing cannot; however, complaints about adaptive clothing were the expense, poor aesthetics, and accessibility (Ortiz, 1992).

### **Hemodialysis Patients.**

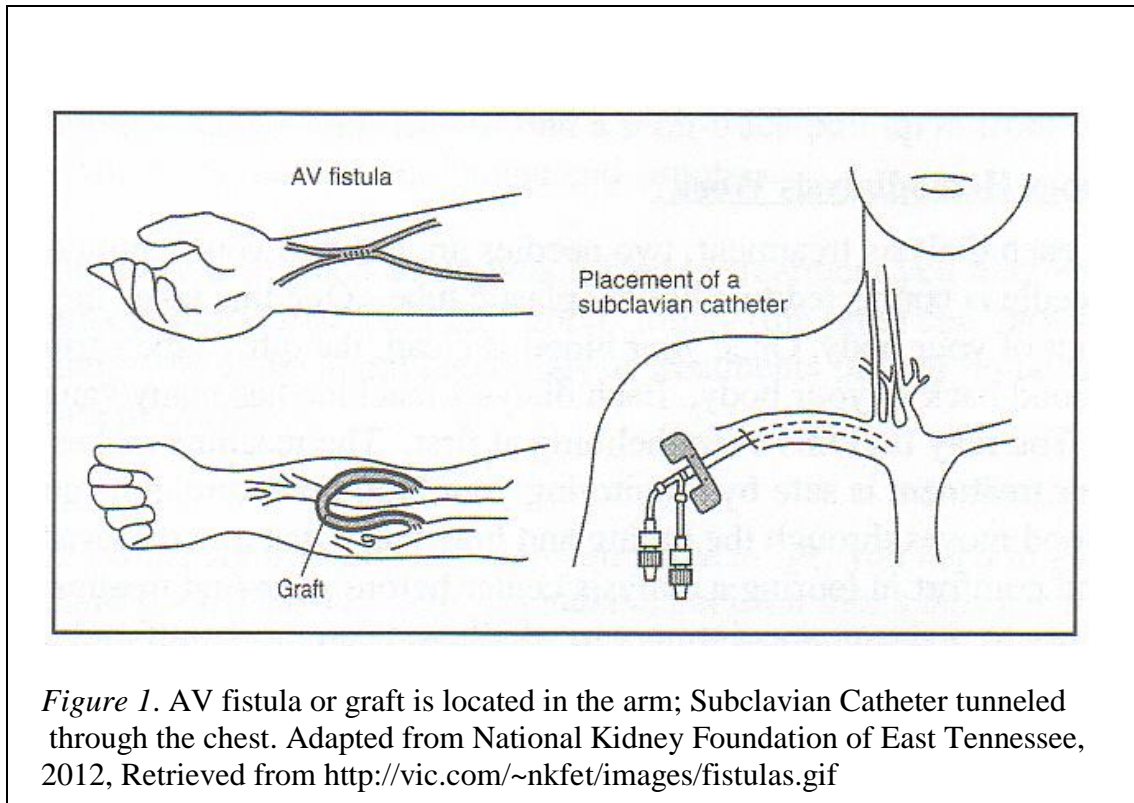
*Demographics of dialysis.* Although there is no limit to life expectancy on hemodialysis, annual mortality rate is approximately 20%, with most deaths occurring from secondary diseases and age (Merck Manual Online, 2007). African Americans are 3.5 times more likely, and Native Americans are 1.9% more likely, to develop kidney disease than Caucasians; however,

Caucasians still make up ~45% of dialysis patients (USRDS, 2011). African Americans have a higher survival rate than other races (Merck Manual Online, 2007). The largest age group of dialysis patients are those aged 45-64; almost twice as many patients are in this category compared to other categories. Those 65 and older are the second most prominent age group for dialysis. Males comprised 56% of End Stage Renal Disease (ESRD) patients in 2009, while females made up 44% of the group (USRDS, 2011).

***Vascular access for hemodialysis.*** A key element to understanding a design problem is learning the practical terminology associated with the special design need (Watkins, 1988). For dialysis treatments to be performed, one of three types of vascular access is necessary to allow blood to flow in and out of the body: AV fistula, AV graft, or central venous catheter (NIH, 2008). Physicians create AV Fistulas by surgically connecting a vein to an artery, usually in the forearm or upper arm; likewise, an AV graft is created by using an artificial prosthetic to connect the vein to the artery (Jacobs & Opolinsky, 2010; Lee et al., 2011) [see examples of vascular access in Figure 1]. A central venous catheter is a tube placed into a blood vessel to allow blood to be circulated in and out of the body. Catheters are usually placed in the subclavian (chest), jugular (neck), or femoral (upper leg) vein (Jacobs & Opolinsky, 2010; NIH, 2008). Subclavian and jugular central venous catheters are generally tunneled under the skin to exit the chest (Jacobs & Opolinsky, 2010). Catheters are most commonly used on initial treatment of dialysis or until the fistula or graft matures (Lee et al., 2011). Approximately 38% of new hemodialysis patients begin with a central venous catheter (USRDS, 2011). AV Fistulas are the most effective access for hemodialysis; however, less effective grafts or catheters are used if fistulas are not an option for the patient's individual needs or the patient refuses the procedure (Merck Manual



Online, 2007; NIH, 2008). Clothing must be accommodating (loose or removed) to allow access for dialysis and use of the extremities for blood pressure readings (NIH, 2008; Rushing, 2010).



*Figure 1.* AV fistula or graft is located in the arm; Subclavian Catheter tunneled through the chest. Adapted from National Kidney Foundation of East Tennessee, 2012, Retrieved from <http://vic.com/~nkfet/images/fistulas.gif>

***Weight Fluctuations during Hemodialysis.*** Hemodialysis patients commonly face weight shift issues. Weight encompasses fat, muscle, energy stores, and fluid (NIH, 2008). With decreased activity, loss of muscle mass and abnormally increased weight is common; however, weight tends to decrease with advanced age, menopause, and prolonged (over five years) dialysis treatment (Chumled, 2004). Weight also fluctuates with fluid intake between treatments; this is commonly referred to as interdialytic weight gain (IDWG). Hemodialysis patients should gain no more than 3 kg of fluid between treatments (Davita, 2007); however, it is common knowledge among medical professionals that a non-compliant patient's weight can shift dramatically between treatments. Additionally, body proportions may change as patients age (Sau-Fun et al.,

2011). Hence, fit and stretchability of fabrics to accommodate changes in interdialytic weight gain may be a consideration in clothing design for hemodialysis patients.

Individuals with special needs have opportunities to be productive in society, both economically and socially (Kernalguen, 1978). Most hemodialysis patients are ambulatory and independent, including driving. Some hemodialysis patients work (Davita, 2012); according to the U.S. Renal Data System (2011), 18.9% of all dialysis patients aged 18-54 were employed for pay in 2009. Physical activity and continuation of daily routine is encouraged (Davita, 2012). Hence, clothing that transitions from treatment to daily activities may be beneficial to the design of adaptive clothing for hemodialysis patients.

### **Conceptual Framework**

Lamb and Kallal (1992) developed a conceptual model for designing apparel for special needs. The FEA Model categorizes consumer needs into three sectors: functional, expressive, and aesthetic (See Figure 2). The FEA Model provides a balanced framework for practical clothing development. The courses of action suggested by the model are as follows: define the target consumer; examine the culture; and assess consumer needs (Lamb & Kallal, 1992).

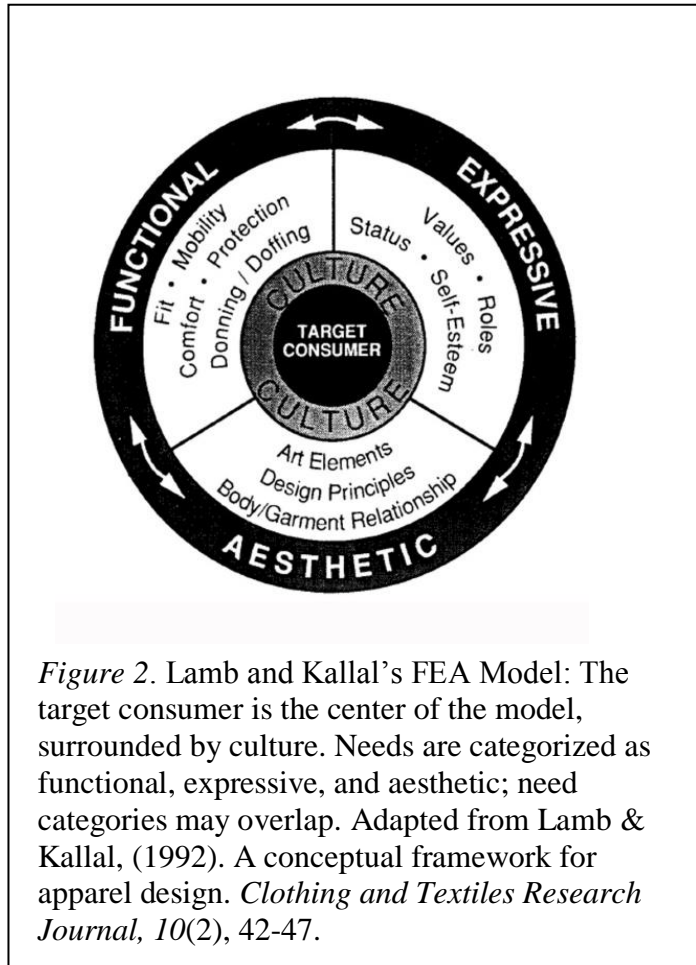


Figure 2. Lamb and Kallal's FEA Model: The target consumer is the center of the model, surrounded by culture. Needs are categorized as functional, expressive, and aesthetic; need categories may overlap. Adapted from Lamb & Kallal, (1992). A conceptual framework for apparel design. *Clothing and Textiles Research Journal*, 10(2), 42-47.

The overall purpose of the FEA model is to gauge the needs of the consumer. The functional category relates to the garment's practical aspects, such as protection, comfort, or fit. The expressive category relates to what the garment conveys about the wearer, either symbolically or through more direct communication. The aesthetic category addresses the appearance components of the garment, including the color, design lines, texture, fabric, and pattern. In a study by Bye and Hakala (2005), functional was defined as fit, mobility, safety, and quality; emotions and self-esteem factors related to clothing were categorized as expressive needs; the image that a consumer desired to display was categorized as aesthetic needs. Typically, consumers have needs concerning all three categories, and attributes of clothing can often fall into more than one category and thus, categories may overlap (Lamb & Kallal, 1992). For this research, functional aspects of adaptive clothing was addressed by examining

accommodation of vascular access; expressive aspects of adaptive clothing was addressed by examining privacy and integration with social norms; and aesthetic aspects of adaptive clothing was addressed by examining symmetrical vs. asymmetrical design elements.

As a precursor to Lamb and Kallal's (1992) design model, Watkins (1988) developed a framework from the perspective of teaching functional design to students with a focus on creatively solving design problems. A seven step process was proposed: accept the problem, analyze the problem, define the needs, ideate solutions, select a solution, implement a solution, and evaluate the solution. Watkins stressed the importance of learning about the problem by getting to know the needs of the user and the context/area where the garment will be used; clearly understanding the problem and needs of the user increases the success of the solution (Watkins, 1988). Both the Lamb and Kallal's FEA model and the Watkins design framework advocate surveying patients regarding their needs. Exploring the consumer's needs, as well as environmental needs, can be valuable in defining the design elements that should be addressed (Watkins, 1988). In exploring the needs of dialysis patients, environmental needs could include clothing needs for the dialysis clinic to accommodate the treatment area, such as temperature and safety, as well as for other places the patient might go during the dialysis day.

## **Hypotheses Development**

**Functional aspects of adaptive clothing.** Functional clothing is defined as apparel designed with a purpose (Lamb & Kallal, 1992); for example, medical garments are produced to accommodate needs or functions based on medical purposes (Sau-Fun et al., 2011). Functional aspects found to influence successful adaptive clothing are protection, ergonomics, and comfort (Powers, 1998; Sau-Fun et al., 2011). Adaptive clothing that creates functional independence for

the wearer is beneficial in building self-confidence (Ortiz, 1992), increases self-esteem, and preserves dignity (Banks, 2001).

Bye and Hakala (2005) studied adaptive clothing for a nondisabled group, female sailors. Lamb and Kallal's FEA model (1992) and Watkins' seven-step design process (1988) were used as design criteria based on consumer needs. Through qualitative interviews, the important functional aspects of sailing were defined to be safety, comfort, mobility, fit, and quality. Quality was addressed because adaptive clothing is often expensive and wearers frequently desire durability to withstand multiple uses and washing. Fit and mobility were important for safety, as well as comfort, which also included attention to body temperature.

Convenience of maneuvering clothing on and off is an important aspect when considering clothing for wheelchair users, as using the restroom can be a task as difficult as changing clothes (Ortiz, 1992). Easily managed openings save time and decrease frustration for the user (Eggleston et al., 1994), while garments with front openings foster independence (Abraham-Murali et al., 2001). Zippers and hook and loop tape were the most commonly used closures on adaptive clothing for ease of use (Eggleston et al., 1994). However, some consumers have stressed concerns about hook and loop tape openings allowing exposure (Abraham-Murali et al., 2001). When buttons must be used, they can be sewn with elastic thread to aid with fine motor skill issues (Eggleston et al., 1994). Independence can bolster self-esteem and feelings of security (Kernaleguen, 1978), an expressive need.

Functional features of wheelchair adaptive clothing includes easy closures, access to openings, functional pockets, and fitted silhouettes (Eggleston et al., 1994). Most consumers in wheelchairs preferred separates over one-piece outfits for convenience reasons (Abraham-Murali et al., 2001). Other considerations for wheelchair users are clothing fit and fabric allowance.

Jackets and shirts need to be short to not get caught in the wheels, yet loose around the arms to allow for shoulder movement (Ortiz, 1992). Pant lengths should be slightly longer as hems tend to rise in the sitting position; skirts should cover the knees, but be tapered to prevent interference with wheels and mobility (Eggleston et al., 1994). Additional fabric may be needed to accommodate braces, urine bags, or other medical devices (Eggleston et al. 1994); conversely, people that are sitting and prone to pressure sores must consider avoiding additional fabric in high friction areas, such as back pockets, to prevent skin-abrasion or wounds (Ortiz, 1992). Pockets and functional aspects, such as openings, of apparel should be placed to provide accessibly to the wearer (Eggleston et al., 1994).

**Functional needs of hemodialysis patients.** Patients frequently complain about getting chilled in the clinic and the lack of privacy as treatments are conducted with numerous patients in an open clinic. Typical reasons stated for patient complaints of a cold clinic are patient inactivity during treatment in an air-conditioned room, temperature of blood circulating outside the body, skin exposure at the vascular access site, and the high incidence of anemia (Davita, 2012). Most patients bring blankets from home; however, clothing that accommodates body temperature may be beneficial to the patients. A clear path to the vascular access makes dialysis easier for both the patient and nursing staff to perform dialysis treatment. Hence, accommodation of vascular access may be a consideration in clothing design for hemodialysis patients. Based on the above discussion, the following hypothesis was proposed:

H1: The extent that adaptive clothing is perceived to meet functional needs to accommodate vascular access for dialysis will positively influence purchase intent of the clothing product.

**Expressive aspects of adaptive clothing.** The expressive sector of the FEA model addresses how and what the clothing communicates about the wearer (Lamb & Kallal, 1992). Traditional, medical adaptive clothing is often thought of as poorly fitting and not fitting with social norms, which inhibits patients from wearing it, and can lower self-esteem, as well as self-confidence (Sau-Fun et al., 2011). Garment fit affects a consumer's expressive and aesthetic senses, thus influencing self-esteem (Bye & Hakala, 2005). Function is the main attribute of adaptive clothing; however, psychological factors, such as social acceptance and dignity, play a key role in the effectiveness of garments worn (Sau-Fun et al., 2011). Consumers with disabilities desire to blend with society and assimilate a regular life (Abraham-Murali et al., 2001). Social acceptance factors to consider are a patient's self-esteem, style/fashion, and inclusiveness in a group. For example, medical garments should be visually appealing and look similar to clothing worn by the general population, camouflaging adaptive differences (Sau-Fun et al., 2011).

Carroll, Alexander, and Spencer (2007) examined the role of exercise clothing for children in a weight management program. Knits, t-shirts and sweatshirts were worn most often as fit and flexibility were issues with standard exercise clothing. An interviewed parent expressed a desire for multi-use clothing that transitions for a child's daily activity at home, school, or play. Hence, clothing that transitioned to multiple activities could fall into the expressive sector of the FEA model (Lamb & Kallal, 1992). Results indicated that stylish, age-appropriate, and well-fitting clothing could motivate exercise in obese children (Carroll et al., 2007). Hence, socially acceptable (expressive) clothing adapted for a special population, could have a positive impact on self-esteem.

In addition to maintaining social norms, privacy can be an issue because of patients having to remove clothing to accommodate vascular access. Patients are discouraged from wearing clothing that limits vascular access and blood pressure reading (Rushing, 2011); thus, restrictive clothing must be removed, often in front of staff and other patients. It was expected that dialysis patients would desire clothing that adheres to social norms, while protecting privacy in the dialysis clinic. Hence, the following hypotheses were proposed:

H2: The extent that adaptive clothing accommodates Expressive/Social needs will positively influence the purchase intention of the clothing product.

H2a: The extent that adaptive clothing is perceived to increase privacy while in dialysis treatment will positively influence the purchase intention of the clothing product.

H2b: The extent that adaptive clothing is perceived to expressively integrate with mainstream social norms will positively influence the purchase intention of the clothing product.

**Aesthetic aspects of adaptive clothing.** The desire to wear specialized clothing has been linked to both expressive and aesthetic aspects. Researchers studying maternity support belts conducted interviews with pregnant women and found that 70% of them preferred support belts that were aesthetically pleasing and conformed to social norms, such as having the aesthetics of normal undergarments. Sixty percent of those interviewed preferred the special garment to be invisible on the outside of garments; hence, assisting the women with blending in with others (Ho et al., 2009). The sense of blending in with others is expressive, while the desire for the garment to be visually pleasing is aesthetic. Therefore, the combination of social norms and



beauty would fall into both the Expressive and Aesthetic categories in the FEA model (Lamb & Kallal, 1992).

Kidd (2006) explored formal wear design for teens with special needs. Three teens with spina bifida and one with osteogenesis imperfect, all of which wore leg braces, took part in Kidd's project. Because the teens desired to expressively blend in with other teens, longer lengths of dresses were desired to hide leg braces. Aesthetically, shiny woven fabrics were desired over knits for their more formal appearance. The designers noted asymmetry of body shape which caused issues in creating the garments. Draping the fabrics on the teens' bodies to develop asymmetrical patterns provided an aesthetically pleasing visual illusion of a symmetrical garment on each teen. It was expected that dialysis patients would desire symmetrical design elements of design as symmetrical elements may aesthetically camouflage their disability and provide the perception of balance. Hence, the following hypothesis was proposed:

H3: The extent that adaptive clothing accommodates aesthetic needs of symmetry will positively influence the purchase intention of the clothing product.

## **Chapter III: Methodology**

### **Sample and Setting**

The research plan was to seek quantifiable answers to survey questions from in-clinic hemodialysis patients who range in age, socioeconomic backgrounds, and gender. Potential subjects were chosen in the research setting, a dialysis clinic. Because nursing staff assesses each patient's mental status monthly, the researcher verbally conferred with a registered nurse in each clinic to ensure that potential participants invited to participate in the study were mentally competent to complete the questionnaire. All clinics used in the survey were Alabama clinics, and under the management of Dialysis Clinics Incorporated (DCI). The target goal for sample size was 80 subjects.

End Stage Renal Disease (ESRD) does not discriminate by age. Because nationally the largest age group of dialysis patients are between the ages 45-64 (USRDS, 2011), it was expected that the largest number of participants would be between the ages of 45-64. Likewise, ESRD does not discriminate by gender. In 2009, 56% of patients with ESRD were male and 44% were female (USRDS, 2011). Hence, both males and females were surveyed. No ethnicities were excluded from the research. African American and Native Americans have a 3.5 times greater incidence of ESRD; however, the population of Caucasians in Alabama is 66.8% (U.S. Census Bureau, 2011). Thus, it was expected that the number of participants who would agree to participate in the survey would be equally split between Caucasians and African Americans, and there would be lower numbers of Asians, Native Americans, Hispanics, and Pacific Islanders.

### **Data Collection Procedure**

Permission to offer the survey to potential participants in the dialysis center was obtained from each clinic administrator and a corporate official. The study proposal was submitted to, reviewed, and approved by the Auburn University Institutional Review Board (IRB). Research

was completed under IRB protocol number 13-003EP 1301. Both Auburn University and DCI required consent forms to be completed by participants before initiating the questionnaire. (See Appendix B for permission forms to conduct research in Dialysis Clinics; see Appendix C for consent forms approved by IRB.)

As no previous research was found on adaptive clothing for dialysis, this research was exploratory, and questions were based on previous research with other populations that use adaptive clothing. The completed research is empirical and a survey questionnaire was used for data collection. The survey included questions that tested identified hypotheses. Additional, pertinent research questions were asked regarding the context of clothing needs and demographics.

There were three versions of the survey. The questions on all of versions were the same, but the clothing images varied by the participant's individual vascular access site because these sites are in different parts of the body. A pre-screening question was asked regarding the location of the participant's vascular access, and then the appropriate survey questionnaire, one that corresponded to the location of the participant's vascular access, was provided. The three survey versions reflected chest access (A), arm access (B), and leg access (C).

For convenience, participants completed the survey while on the dialysis machine; patients typically dialyze for 3-5 hours per treatment and are confined to the dialysis machine throughout the time period (Jacobs & Opolinsky, 2010). As computers are not readily available in hemodialysis clinics and some patients may not have computer access, the survey was administered in written (paper/pen) format. The researcher, trained in CITI human research, verbally explained the study to potential participants, distributed the consent agreement, and administered the questionnaire. The scripted explanation was as follows:

“I am a researcher from Auburn University examining clothing needs of dialysis patients. The study will include a short survey questionnaire to inquire about your clothing needs for dialysis. Participation in the study is completely voluntary. All information is confidential and your name will not be on the questionnaire or linked to the responses. Information will be viewed only by a researcher of this study and compiled to get survey results. Would you like to participate in this study?”

Upon verbal agreement from an individual to participate in the study, written consent to participate in the study was obtained from the survey participant before beginning the survey questionnaire. Following this, the pre-screening question regarding vascular access location was verbally asked. The survey that corresponded to the participant’s vascular access site was provided to the participant. The researcher was present in the clinic if questions arose about the survey research or questionnaire.

Participation in the survey study was voluntary and no penalties, punishment, or undue stress was inflicted on a prospective participant if he or she chose not to participate in the survey. All personal information, such as demographics, was confidential and only viewed by the researcher to compile cumulative research results. Data was analyzed anonymously.

## **Measures**

The following independent variables were measured to test influence on purchase intention of adaptive clothing for the respective hypotheses:

- Hypothesis 1: Perceived accommodation of vascular access
- Hypothesis 2a: Perceived privacy
- Hypothesis 2b: Perceived integration with social norms

Hypothesis 3 (symmetry) was manipulated by vascular access openings on garment drawings/images and is discussed in the next paragraph. (See Appendix D for a Table of Constructs and Measures.)

The questions were mutually exclusive, with multiple choice answers and Likert-type scales. To test Hypothesis 3 (participants' purchase intention based on aesthetic preference for symmetry), two sets of questions were developed. As participants may have vascular access on either the left or right sides of their body, presenting one drawing with one zipper, which might be on the wrong side for any particular patient, could be a confounding variable; therefore, participants were shown drawings and images of two asymmetrical articles of clothing (one with a zipper on the left and the other with a zipper on the right). Participants were then asked to answer purchase intention questions regarding the drawings and images using a 5-point Likert-type response scale ranging from strongly disagree to strongly agree. A symmetrical drawing and image of an article of clothing with zippers on both sides and the same set of questions regarding purchase intention was also shown.

A purchase intention scale by Baker and Churchill (1977) was used in the present study. Three scale items were used in the questionnaire and were adapted for the present study. The items were: 1) I would like to try this clothing; 2) I would buy this clothing; and 3) I would actively look for this clothing in order to buy it. The items were rated with a 5-point Likert-type scale ranging for strongly disagree to strongly agree. Reliability of the purchase intention scale has ranged with Cronbach's alphas of 0.73-0.91 in various studies (Bruner, Hensel, & James, 2000).

Variables in Hypotheses 1 and 2 were measured with a 5-point Likert-type scale. Nine scale items addressing independent variables (three items for each variable of vascular access,

privacy, and conformity) were created for this study. Participants were asked to look at the clothing sketches and images on the questionnaire and answer the extent to which they agreed or disagreed with statements regarding functional and expressive aspects of the clothing. Likert-type response tables giving the options from strongly disagree to strongly agree were used to gauge perception of clothing features. Two of the items were reverse coded in this section.

Questions regarding the context of clothing needs both while in the clinic and outside of the clinic on treatment days were asked with multiple choice answers. Demographic response parameters were similar to those used in the U. S. Renal Data System (USRDS) surveys and included gender, age, ethnicity, income level, and education level. An additional demographic question was asked regarding access to internet. (See Appendix E for the Survey Questionnaire.)

### **Data Analysis**

After a participant completed a questionnaire, it was collected for analysis. Dialysis patients dialyze in shifts, but individual dialyzing times and days vary. The goal was to spend two days in each clinic to provide participation opportunities for all patients who desired to be a part of the study. Data obtained from the survey questionnaires were coded and entered into SPSS statistical software for analysis. To test hypotheses, the following statistical analyses were performed:

- Hypotheses 1 and 2 were analyzed with multiple regression.
- Hypothesis 3 was analyzed with a t-test comparing the responses to purchase intention scales of symmetrical clothing with asymmetrical clothing.

## **Chapter IV: Results**

The objective of this study was to explore the adaptive clothing needs of hemodialysis patients. Approximately 150 potential participants were asked to participate in the survey; 83 agreed and completed the questionnaire. The response rate was approximately 55%. All questionnaires were at least 80% complete and valid for the study. All participants were 19 years or older, current hemodialysis patients, and English speaking. Four potential participants were disqualified from the study because they were Spanish speakers only, and no translator was available in the clinic. The clinics were located in two North Alabama cities, Decatur and Birmingham; both clinics had some patients that lived in areas surrounding the immediate clinic location. Data were coded and entered into an Excel spreadsheet each day after data collection. Before analysis, data were uploaded to SPSS statistical software and cleaned. Two questions from the questionnaire were reverse coded.

Reliabilities of the study scales were first analyzed. Hypotheses 1 and 2 were analyzed with multiple regression. Scales relating to Hypothesis 3 were transformed to produce the mean of each purchase intent variable (for asymmetric and symmetric adaptive clothing) and then analyzed with a paired t-test. Demographic information was analyzed to determine frequency distributions. Descriptive statistics were computed for the additional questions. Result sections are discussed in the following order: demographics, reliabilities of scales, results of hypotheses testing, and results of additional questions asked regarding clothing needs of hemodialysis patients.

### **Demographics of the Study Sample**

As shown in Table 1, sample demographic information pertaining to gender, age, ethnicity, level of education, income, and access to the Internet, was collected and analyzed. Of

the 83 study participants, 58% were male and 42% were female. The largest group of participants was between the ages of 45-64, who composed just over half of the sample.

Table 1

*Characteristics of the Study Sample*

| Demographic Characteristic | Frequency ( <i>n</i> =83) | Percentage |
|----------------------------|---------------------------|------------|
| <b>Gender</b>              |                           |            |
| Male                       | 48                        | 57.8%      |
| Female                     | 35                        | 42.2%      |
| <b>Age</b>                 |                           |            |
| 20-44                      | 8                         | 9.60%      |
| 45-64                      | 44                        | 53.00%     |
| 65-74                      | 18                        | 21.70%     |
| 75+                        | 13                        | 15.70%     |
| <b>Ethnicity</b>           |                           |            |
| African American/Black     | 42                        | 50.6%      |
| Caucasian/White            | 40                        | 48.2%      |
| Hispanic                   | 1                         | 1.2%       |
| <b>Education Level</b>     |                           |            |
| Below high school          | 12                        | 14.5%      |
| High school/GED            | 28                        | 33.7%      |
| College                    | 31                        | 37.3%      |
| Graduate or above          | 12                        | 14.5%      |
| <b>Income Level</b>        |                           |            |
| \$20,000 or less           | 35                        | 42.2%      |
| \$20,000-35,000            | 22                        | 26.5%      |
| \$35,000-50,000            | 15                        | 18.1%      |
| \$50,001 or above          | 10                        | 12%        |
| no answer                  | 1                         | 1.2%       |
| <b>Internet Access</b>     |                           |            |
| yes                        | 46                        | 55.4%      |
| no                         | 37                        | 44.6%      |

There was a near balance in numbers of African Americans (or Blacks) and Caucasians (or Whites). A language barrier prevented four Hispanics from participating in the study. Most participants (71%) had a high school or higher level of education. The largest group of



participants (37%) had at least some college education. Income level of the sample was assessed, and results indicated that almost half of the participants (42.2%) had an annual income of \$20,000 or less. The final demographic question regarded access to the Internet. The results indicated that a slight majority of participants had internet access (55 %). Low income levels and age may have had an impact on lack of internet access.

### **Reliability**

Reliability analyses were conducted on five scales. These were vascular access, privacy, social norms, purchase intention for asymmetric clothing, and purchase intention for symmetric clothing. Each scale had three questions. After assessing the Cronbach's alpha coefficient for each variable (see Table 2), composite variables were created by averaging the scale items for each variable. All scales except for privacy were deemed reliable because coefficients were at least 0.70.

Privacy scale items were analyzed for reliability in item combinations; no combination of scale items was reliable (see Table 3 for reliability of privacy scale items). Two possible reasons for the lack of reliability of the privacy scale may be that patients were accustomed to the lack of privacy while being treated in a large room full of other patients and that the privacy questions may not have been clearly understood by participants. Because neither the three item scale, nor any combination of two items had adequate reliability, it was deemed necessary to use one item to assess privacy. The following item was chosen based on face validity of the items: This clothing will cover my body well during my dialysis treatment.

Table 2

*Results of Scale Reliabilities*

| Scale<br>(n=83)                            | Cronbach's alpha | # of items |
|--|------------------|------------|
| Vascular Access                            | 0.732            | 3          |
| Privacy                                    | 0.547            | 3          |
| Social norms                               | 0.785            | 3          |
| Purchase intention for asymmetric clothing | 0.945            | 3          |
| Purchase intention for symmetric clothing  | 0.956            | 3          |

Table 3

*Privacy Scale Reliabilities*

| Scale Items   | Cronbach's alpha | # of items |
|---|------------------|------------|
| Covers body well <sup>a</sup> /Increases privacy <sup>c</sup> | 0.532            | 2          |
| Exposes body <sup>b</sup> /Increases privacy <sup>c</sup>     | 0.15             | 2          |
| Covers body well <sup>a</sup> /Exposes body <sup>b</sup>      | 0.537            | 2          |

*Note.* n=83

<sup>a</sup>Complete scale item wording: This clothing will cover my body well during my dialysis treatment.

<sup>b</sup>Complete scale item wording: The clothing will show too much of my body when used.

<sup>c</sup>Complete scale item wording: The clothing will help me be more private during my dialysis treatment.

**Hypotheses Testing**

**Hypotheses 1 and 2.** Hypothesis 1 stated that the extent to which adaptive clothing is perceived to meet functional needs to accommodate vascular access for dialysis will positively influence purchase intent of the clothing product. Hypothesis 2a states that the extent to which the adaptive clothing is perceived to increase privacy while in dialysis treatment will positively

influence the purchase intention of the clothing product. Hypothesis 2b states that the extent to which the adaptive clothing is perceived to expressively integrate with mainstream social norms will positively influence the purchase intention of the clothing product. Because these hypotheses examine the influence of three different independent variables on one dependent variable, multiple regression analysis was employed.

Results of multiple regression indicated that two of the three independent variables had a significant influence on purchase intention [ $R^2=.251$ ,  $F=10.179$ ,  $p=.000$ ]. Perceived vascular access had a significant positive influence on purchase intention [ $\beta=.252$ ,  $p=.014$ ], supporting Hypothesis 1. Perceived integration with social norms had a significant positive influence on purchase intention [ $\beta=.374$ ,  $p=.000$ ], supporting Hypothesis 2b. Comparisons of *beta* values indicate that perceived social integration had a larger influence on purchase intention than perceived vascular access, but both variables were significant in their influence. Perceived coverage of the garment, which was used to convey a sense of privacy, did not have a significant influence on purchase intention [ $\beta=.090$ ,  $p=.389$ ]. Hence, Hypothesis 2a was not supported.

**Hypothesis 3.** Hypothesis 3 stated: The extent that adaptive clothing accommodates aesthetic needs of actual symmetry will positively influence the purchase intention of the clothing product. A paired *t*-test between purchase intentions for symmetrical and asymmetrical adaptive clothing indicated that there was a significant difference between the means of each group ( $M_{asymmetric} = 3.56$ ,  $M_{symmetric} = 3.23$ ,  $Mean\ difference = .32530$ ,  $t=2.805$ ,  $SE=.11598$ ,  $p=.006$ ). Contrary to the expectation in Hypothesis 3, the asymmetrical garments were preferred over the symmetrical. Hence, Hypothesis 3 was not supported. The preference for asymmetrical adaptive clothing may have occurred because respondents were focused on adaptive elements of

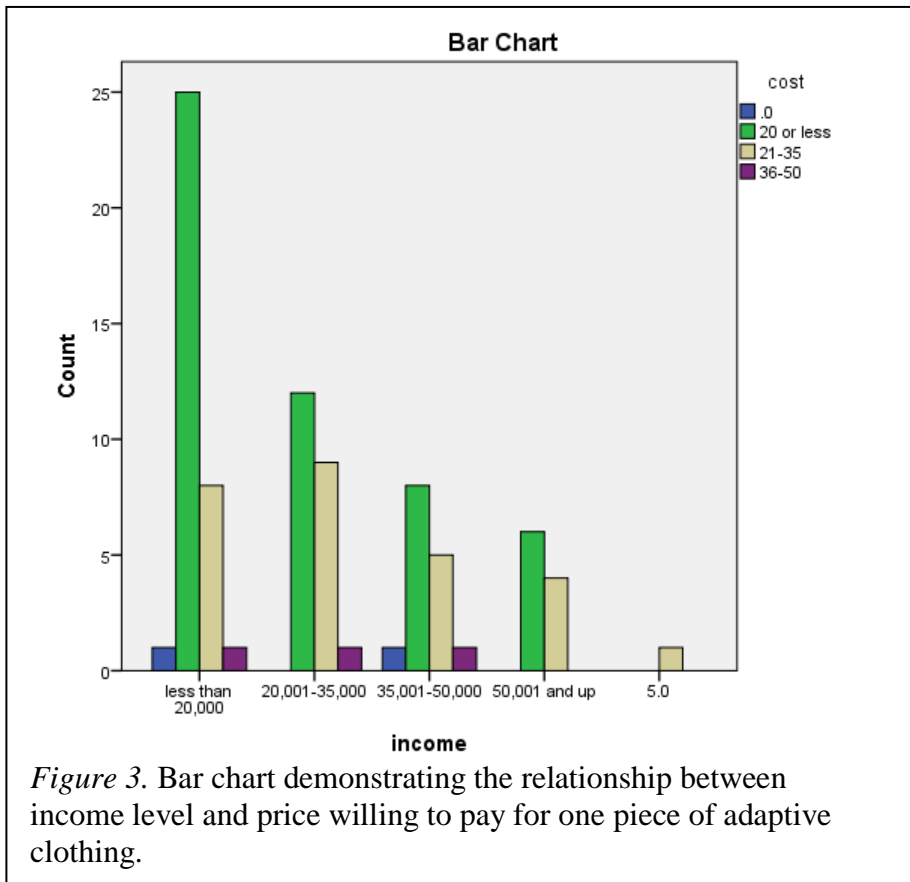
clothing instead of aesthetics. Respondents may have preferred one zipper because their access is only on one side of their body.

### **Additional Analyses**

Additional questions were asked on the questionnaire regarding access location, awareness of adaptive clothing for dialysis, daily routine on hemodialysis treatment days, employment, embarrassment during dialysis, and purchase intention regarding adaptive clothing for hemodialysis. As discussed in the literature review, awareness of adaptive clothing is a critical issue to marketers. With respect to awareness of adaptive clothing for dialysis, the results of this study indicate that 96.4% of the questionnaire respondents were unaware that adaptive clothing exists for hemodialysis patients. Although 2.4% did not complete the question, only one participant out of the 83 surveyed was aware of adaptive clothing. However, almost 75% of the participants indicated being interested in purchasing adaptive clothing for hemodialysis. These results are positive for companies designing and selling adaptive clothing, but indicate that marketers need to better promote awareness to specialized populations.

Participants were questioned about their willingness to pay and preferred purchase methods for adaptive clothing. When asked about the purchase price for one piece of adaptive clothing, the following was indicated: 61.4% preferred the price to be \$20 or less; 32.5% would pay \$21-\$35; and 3.6% were willing to pay \$36-\$50. Income may be a key factor in willingness to pay for specialized clothing; thus, a tabulation of willingness to pay for adaptive clothing and income level was examined (see Figure 3 for tabulation results). The \$20 or less price point for one article of adaptive clothing was chosen most often in all income levels except for the highest income bracket. A majority of participants (75.9%) preferred to purchase adaptive clothing in a

store rather than on the Internet, which may indicate that this sample of the population prefers to see, touch, or try-on the garment before buying.



Routine on dialysis days was addressed in the questionnaire. Approximately 76% of participants reported going places (e.g., run errands, shop, or eat) before or after dialysis treatment days. Approximately 22% reported that they did not go to other places on treatment days, possibly as a result of fatigue after treatment or transportation issues. The following scenario question was asked: “If you were invited to lunch/dinner after dialysis, would you change clothes first?” Three-quarters of participants were unlikely or very unlikely to change clothing after dialysis. Possible explanations for not changing may be that it is too much trouble to go home first and return to the restaurant or simply that chronically ill patients are focused on

relationships more than personal appearance; thus, proceeding to the social interaction takes precedence over changing clothes.

When asked about employment, only six individuals, 7.2% of the sample, worked for pay. It was suspected that sample age might have impacted employment, but cross-tabulation between age and employment revealed that the largest number of workers was aged 45-64 (see Table 4). Although disability with chronic disease may be an important factor affecting low employment in this sample of hemodialysis patients, 37% were aged 65 or older and might not have worked anyway. Of the six participants who reported working for pay, three reported working on the days of their dialysis treatments.

Table 4

*Cross-Tabulation between Age and Employment Status*

| Employment      | Age of Participants |       |       |     |
|-----------------|---------------------|-------|-------|-----|
|                 | 20-44               | 45-64 | 65-74 | 75+ |
| yes             | 1                   | 4     | 1     | 0   |
| no              | 7                   | 40    | 17    | 13  |
| Total per group | 8                   | 44    | 18    | 13  |

*Note: n=83, Employment is an indication of current employment status.*

As privacy was queried in Hypothesis 2, a question was asked about possible embarrassment while removing clothing to get to vascular access for dialysis. Approximately 82% reported never being embarrassed while removing clothing. This high proportion may be due to the large number of participants whose vascular access was in the arm instead of the chest or leg. A cross-tabulation of vascular access location and level of embarrassment revealed a slight increase in embarrassment with access location in the leg or the chest areas (see Table 5).

Table 5

*Cross-Tabulation between Access Location and Level of Embarrassment*

| Access Location | Level of Embarrassment |           |       |
|-----------------|------------------------|-----------|-------|
|                 | often                  | sometimes | never |
| arm             | 1                      | 5         | 55    |
| leg             | 2                      | 0         | 3     |
| chest           | 2                      | 5         | 10    |
| totals          | 5                      | 10        | 68    |

## **Chapter V: Discussion, Implications, Limitations, and Recommendations**

The purpose of the study was to explore the adaptive clothing needs of hemodialysis patients with the goal of creating product development insights that offered the potential to enhance the quality of life of these patients. The research was guided by the three conceptual factors, functional, expressive, and aesthetic needs, as delineated in Lamb and Kallal's FEA Model (1992). These factors guided development of the three hypotheses tested through this study. A questionnaire was created by the researcher for distribution to patients while in hemodialysis treatment. In addition to hypothesis-related questions, the questionnaire included others regarding demographics, vascular access location, embarrassment during treatment, daily routines on treatment days, purchase intent for adaptive clothing, and adaptive clothing awareness. Results from this study contribute to a holistic understanding of the target consumer (hemodialysis patients), which lies at the center of the FEA model (Lamb & Kallal, 1992). Watkins (1988) emphasized that a clear definition of the target consumer and design problems yields effective solutions. Based on the results of this study, this chapter delineates effective design and product development guidelines for adaptive clothing for hemodialysis patients. The chapter is organized according to the following sub-headings: functional aspects of adaptive clothing, expressive aspects of adaptive clothing, aesthetic aspects of adaptive clothing, implications, guidelines for design and development of adaptive clothing for hemodialysis, limitations, and recommendations for future research.

### **Functional Aspects of Adaptive Clothing for Hemodialysis Patients**

Hemodialysis treatment pivots around the ability to circulate blood out of and into the body via vascular access. Hypothesis 1 posited that the extent to which the adaptive clothing is perceived to functionally provide vascular access for dialysis will have a positive influence on



purchase intention. Thus, vascular access relates to the functional need for increasing ease of dialysis. The results supported Hypothesis 1, i.e., increase in perceived vascular access was significant in predicting an increase in purchase intention. Therefore, perceived functional value relating to vascular access was a significant factor in purchasing adaptive clothing, which reinforces previous literature. A majority of studies on adaptive clothing have centered around function (Abraham-Murali et al., 2001; Bye & Hakala, 2005; Eggleston et al., 1994; Sau-Fan et al., 2011; Watkins, 1998); adaptive clothing is sometimes referred to as functional clothing. Function and fit are key to any clothing, especially adaptive clothing (Bye & Hakala, 2005; Eggleston et al., 1994); 70% of participants in the Ho et al. (2009) study reported function as a primary priority in adaptive clothing. Abraham-Murali et al. (2001) indicated that functional style elements such as accessible closures improved quality of life for disabled individuals. Eggleston et al. (1994) indicated that functional design elements that provided convenience and sense of independence were desired and sought after by disabled individuals for effective adaptive clothing. Further, convenience and ease of use of adaptive clothing are a recurring theme in literature regarding adaptive clothing (Abraham-Murali et al., 2001; Eggleston et al., 1994; Sau-Fun et al., 2011), supporting the results of the current study with respect to the ease of vascular access.

Despite this significant result, numerous participants commented on the lack of awareness of functional clothing for dialysis after completing the survey questionnaires. Many participants thought that functional clothing for dialysis was a good idea, but they had not encountered this clothing concept before the survey. Although the functional need for vascular access was a significant predictor of purchase intention, the current study revealed that the need to integrate into social norms had a larger impact on purchase intention for adaptive clothing;

hence, expressive needs surpassed functional needs for this sample. As the need to belong is a basic need for people, chronically ill patients may be more aware of their health status and value a sense of belonging more than the function of convenience.

### **Expressive Aspects of Adaptive Clothing for Hemodialysis Patients**

Expressive aspects of adaptive clothing that were explored in the present study were privacy and conformity to social norms. A social connection offered through dignified clothing can be beneficial to the wearer's self-esteem; clothing that is expressively comfortable increases social comfort (Sau-Fan et al., 2011). Two hypotheses were proposed relating to two expressive aspects (privacy and conformity to social norms) of adaptive clothing for hemodialysis patients.

Privacy was addressed through Hypothesis 2a; it posited that a perceived increase in privacy while in hemodialysis treatment would positively influence purchase intention for an adaptive clothing product. The results of this study indicated that perceived body coverage of adaptive clothing did not significantly predict purchase intention. Hence, Hypothesis 2a was not supported; however, as the full privacy scale items were not reliable, additional research with privacy and hemodialysis would be beneficial. Also, the question of length of time on hemodialysis was not posed. Privacy may be diminished with increased time on dialysis as patients may get accustomed to the routine of exposing the vascular access site for treatment. Further, results from additional questions revealed that embarrassment might be a bigger issue when participants had vascular access in either the leg or chest areas. Because a majority of the participants had vascular access in the arm, privacy and embarrassment from exposure would have been a lesser issue for this sample.

Hypothesis 2b posited that the extent to which adaptive clothing was perceived to expressively integrate with mainstream social norms would positively influence purchase

intention for the adaptive clothing product, i.e., addressing the expressive need for social acceptance. Results of the present study indicated that increased perceived integration with social norms significantly predicted an increase in purchase intention for adaptive clothing, which supported Hypothesis 2b. Thus, clothing that fits with societal norms is a critical factor in adaptive clothing for hemodialysis; this expressive predictor had a larger influence on purchase intention for adaptive clothing than the functional factor of vascular access. This finding is similar to past studies (Carroll et al., 2007; Ho et al., 2009), which have found that adherence to social norms was desired by individuals who physically look different than the mainstream population. Adaptive clothing that is socially acceptable can thus motivate and instill self-confidence within the wearer. Results of additional queries of the participants further revealed that the majority reported that they would likely wear their treatment clothing when meeting a friend for lunch on dialysis days; thus, socially acceptable adaptive clothing that camouflages signs of dialysis will better serve the needs of this population.

### **Aesthetic Aspects of Adaptive Clothing for Hemodialysis Patients**

Aesthetic aspects in this study involved symmetrical appearance. Physiological and psychological changes, such as a medical condition, can influence aesthetic clothing choice (Ho et al., 2009). Hypothesis 3 addressed aesthetic needs by positing that the extent to which adaptive clothing accommodates aesthetic needs for actual symmetry would positively influence purchase intention for an adaptive clothing product. Study results revealed that there was a significant difference in preference between the symmetric and asymmetric garments. However, the expectation that the symmetrical garment design would be preferred over the asymmetrical garment design was not confirmed; rather, the preference was for the asymmetrical design. Thus, Hypothesis 3 was not supported; this finding differs from Kidd's (2006) findings that supported

the consumer's need for aesthetic balance. The researcher anticipated that symmetry would be connected to participants' internal need to feel balanced; however, this did not emerge in the results. Adaptive clothing tends to be more functional than stylish (Kidd, 2006); a single, asymmetrical opening for treatment was functional, and this seems to have been adequate for participants in this sample. It is possible that dialysis patients were more focused on functional attributes of the clothing than on the aesthetic values, and thus preferred the asymmetrical garment to meet the need of their vascular access, which was located on one side of the body. The findings of this study indicated that the sample participants valued functional, expressive, and aesthetic needs in the following higher to lower order. In their purchase decisions for adaptive clothing for hemodialysis, integration with social norms (expressive) was most important, then vascular access (functional); symmetry (aesthetic) was not a significant factor in purchase intent. Based on these findings the following recommendations and implications are provided for product developers, marketers, and future researchers.

### **Implications of this Study**

Because no previous published research was found on adaptive clothing for dialysis patients, or even others with some comparable special needs, this study can serve as a foundation for building the knowledge that could lead to enhancing or newly developing adaptive clothing for hemodialysis. Other populations of patients undergoing medical infusion treatments that require vascular access, such as chemotherapy, could also benefit from the knowledge gained from this study. As the bulk of the literature on adaptive clothing is from the 1970s and early 1990s, this study contributes to literature today by addressing contemporary facets of purchasing adaptive clothing such as utilizing the internet and bringing enhanced understanding of the desires of special needs populations.

Of interest is the indication that most patients would consider purchasing adaptive clothing if they were aware of its availability and where to purchase products. Cost of the clothing could be an issue, however, as the pricing preferred by most participants in the study was in the \$20 or less price range; this could limit product development and marketing options. Participants with higher incomes were more willing to pay higher prices for adaptive clothing; thus, patients in more affluent areas might pay more for adaptive clothing. Strategic marketing with large dialysis clinics and surgeons who insert vascular accesses would be beneficial to increase awareness of adaptive clothing availability. Target marketing with awareness of the income ranges of various clinics could be beneficial to boosting sales of adaptive clothing at different price points.

Very little research designed to incorporate quantitative analyses has been done on adaptive clothing; this study is valuable for its contribution in this area. Quantitative studies are useful in gaining feedback from large numbers of potential or current consumers and in eliciting what factors are in fact significant. This can be beneficial to marketers, product developers, and future researchers in gaining a better understanding of special population needs. The present study presents a potential model for types of questions to be used in a survey format; other studies could build questionnaires from this foundation regarding adaptive clothing. As our population is aging and becoming more obese, a quantitative format similar to this study could be used to explore factors relating to clothing needs for both the elderly and obese populations as body composition and physique changes. Researchers could use a similar quantitative format to explore clothing needs for populations undergoing the transitions of dramatic weight change or the elderly who may be losing some mobility or have balance issues. Variables and scales should be adjusted to test hypotheses that are study specific.

Functionality with regards to vascular access and integration with social norms were important factors in purchase intention for adaptive clothing; thus, product developers should note that clothing that fits in well with society and provides ease of use may be more likely to be purchased by hemodialysis patients. As society ages and grows more obese, there is a higher risk for kidney and other diseases (NIH, 2010); this may increase the need for adaptive clothing. Asymmetrical clothing was preferred over the symmetrical clothing for dialysis patients, possibly suggesting that functional attributes could be sufficient and might outweigh aesthetic criteria for hemodialysis patients. Assessing a combination of functional, expressive, and aesthetic needs are important aspects of developing products for target consumers (Lamb & Kallal, 1992). Special attention to social norms of the general population could assist product developers to better equip patients and sell desirable adaptive clothing.

### **Guidelines for Design and Development of Adaptive Clothing for Hemodialysis**

Recommendations for adaptive clothing development and design for hemodialysis patients are as follows:

1. Functional adaptation of clothing for vascular access was significant to these participants.

Vascular access openings should allow be wide and long enough to accommodate treatment and provide easy access for medical staff (e.g. if zippers are used, they should be long to provide a wide opening or spreading of clothing to allow medical manipulation of vascular access). A wide opening will also help prevent clothing from being blood stained during treatment.

2. Expressive integration of adaptive clothing into society norms was significant to participants.

Adaptive clothing for hemodialysis patients should look like clothing worn by the mainstream market, such as cargo pants or shirts with pockets that unzip to reveal an opening

for vascular access. Invisible zippers or flaps to hide zippered openings would help conceal adaptive features for vascular access. Participants desired clothing that resembles what is sold in stores and what their friends are wearing.

3. Most participants reported going other places on dialysis treatment day; therefore, clothing that transitions well from treatment to a normal daily routine is desired. Adaptive clothing that conceals medical differences from the normal population is beneficial as expressive integration with society was a significant influence on purchase intent and would allow for patients to blend in with the general population before or after treatment. Design details such as ruffles that cover the access opening, draped fabrics that flap outward to reveal a zippered opening for treatment, or zippers that are hidden in the seams of a color-blocked or pieced fabric would camouflage the vascular access when in public and may satisfy the need for social integration.
4. As most of the participants had low incomes and reported that they would probably spend a limited amount on clothing, adaptive clothing should be cost efficient. Unfortunately, this may preclude elaborate designs and manufacturing details, leading, for example, to fewer trims. A sense of value, as in durable clothing, may entice patients with limited income to purchase specialized clothing. The focus should be on durability as patients may wear and wash the garment numerous times throughout the week. Stain resistant fabrics, neutral or common colors, and traditional styling may help streamline the manufacturing process to decrease costs and appeal to a wider range of patients. Marketing adaptive clothing to family members or friends of ill patients may spark increased sales as family or friends often feel a need to comfort their loved ones and provide useful gifts.

5. Aesthetically, asymmetric design elements were desired over symmetric design elements in this study. Asymmetric design elements could be used to draw attention away from the adaptive elements of the clothing or to camouflage the vascular access site; ideas include strategically placed screen-printed graphics, asymmetric collars, buttons, color-blocking, decorative or double stitching, gathers, tucks or asymmetrically pieced garments. Design details on the opposite side of the vascular access may provide a useful distraction; however, asymmetrically designed adaptive clothing, such as an Asian style shirt with buttons that open down one side of the chest, could also work.
6. As the asymmetric vascular access opening was desired most often, at least six basic garments would need to be produced: three garments to accommodate vascular access on the right side and three garments to accommodate vascular access on the left side. The garments should accommodate vascular access in the chest, arm, and upper thigh area. To decrease the cost of elaborate styles, basic garments can be produced and embellished easily with additional design elements to differentiate clothing and provide various styles. Examples of embellishments could include screen-printed graphics, embroidery, ruffles, patch pockets, collars, cuffs, and zippers. Additionally, styles for men and women can be taken into consideration. Women may prefer a more fitted style than men; men may prefer minimal decorative design details.

### **Limitations of this Study**

The first limitation of the study is sample size, which affects the generalizability of the results of this study. Eighty-three dialysis patients participated in the study; there are over 350,000 hemodialysis patients in the United States (USRDS, 2011). The second limitation is the sample region, which again limits the generalizability of the current results. All eighty-three



participants were in a small region of the southeastern U.S. Clinics in relatively large cities were used for the study. There was not a broad range of income levels; they were low for nearly half of the participants, which may have impacted on ability to think about purchasing special clothing. Likewise, the largest age group was between the ages of 45-64; it would be advantageous to survey more participants in the 44 and under age group as they may be more attuned to fashion trends and the technology associated with shopping online. Hence, the findings of the present study may not translate to the entire hemodialysis population. It would be advantageous to explore a broader sample of dialysis patients, from different regions of the US, various socioeconomic levels, and different age groups.

Simple line-drawn images of basic adaptive clothing were used in the study. Because approximately three-quarters of participants indicated that they would be more likely to purchase adaptive clothing in stores rather than on the internet, actual clothing to view, feel, or even wear might have been more effective in providing a clearer window into purchase intention. It is of value to note that actual purchase (as opposed to purchase intent) can be influenced positively or negatively by design factors, such as styling, color, fabric, texture, fit, and price. Sample garments for patients to examine could provide better input on design details that the garments should entail. Additionally, it would have been interesting to explore which garment (symmetrical or asymmetrical) participants would choose if the garment images were side by side on the questionnaire instead of on isolated pages. A comparison of specific design details, such as zippers, pockets, collars, cuffs, or graphics could provide additional information on purchase intent, effective clothing design, marketing, and sales.

The present study was quantitative; the addition of more qualitative information consisting of personal comments regarding clothing needs for hemodialysis would be helpful to

expand on the findings of the present study. Qualitative questions could include open-ended feedback on garment designs, discussion of the thought process behind preferences for varied aspects of garments, and additional input on routines during treatment and on dialysis treatment days. Qualitative information could provide a more complete picture of patient challenges and opportunities and thereby enhance product development. Focus groups to gain information on styles, design, and products would be beneficial as well..

The privacy scales developed for the study were not reliable, making findings on privacy less conclusive. Personal knowledge of dialysis clinics shows that infusion patients are often treated with other patients without regard to privacy; lack of it could be an issue. Research into privacy issues with infusion patients should be explored more deeply to get a better test significance. Aside from the lack of reliability of the privacy scale, a few factors may have influenced the lack of significance in predicting purchase intention. A majority of the participants had arm vascular access; the level of embarrassment appeared moderately higher for participants with leg or chest access, so the predominance of arm access could have impacted the lack of interest in privacy. It is also possible that patients may not see privacy as an issue because they are accustomed to treatment routines. Lack of privacy concerns may be better explored through qualitative interviews, focus groups, or additional questions to address personal feelings or other core issues regarding privacy.

### **Recommendations for Future Research**

Future research could test more attributes of adaptive clothing. Additional functional aspects could be explored with hemodialysis patients, including temperature control, perception of comfort, fit needs, ease of donning and doffing garments, and variations in types of closures. Other expressive aspects that could be explored with hemodialysis patients include the nature of

patterns or graphics on garments, conformity with fashion trends, fabric types, feminine versus masculine appearances, and effects of design variations on self-esteem. Aesthetic aspects that could be explored with hemodialysis patients include color, design details, and fabric feel or hand. It would be beneficial to have actual garments for participants to wear before providing feedback.

Future research could also include trial adaptive clothing designs, either in images or actual garments, for hemodialysis patients to critique and offer feedback. Comparison of garments may be beneficial to better assess products, especially aesthetic features. Emotions evoked by wearing a garment would fit into the expressive sector of research and are worth exploring.

As hemodialysis patients sit for hours for each treatment, design details such as strategic pocket placement to prevent pressure ulcers and to provide access to convenient storage would be interesting to explore. Additionally, faux pockets that camouflage vascular access and zip off or open for treatment would be a logical feature to investigate, especially for femoral (upper leg or thigh area) access. Ruffles and cowl necks that overlay a shirt and unsnap for treatment could be aesthetically pleasing for patients with upper body vascular access. Research into products, design details, and target marketing strategies should be pursued with this category of patients because their numbers are sizeable and may grow.

As Bye and Hakala (2005) suggested, partnering with a manufacturer that already produces adaptive clothing would assist the manufacturer, researcher, and consumers. Studies in more regions and varied socioeconomic areas around the US would be beneficial to provide a better overview of the needs of the hemodialysis population. The current study revealed that a large group of participants had a low income and only a few were employed. Income levels of hemodialysis patients across the country may impact sales and limit resources to develop

advanced adaptive clothing; thus, additional research on income and ability to purchase adaptive clothing should be explored.

## REFERENCES

- Abraham-Murali, L., Kane, W., & Staples, C. (2001). Perceptual criteria and attributes used for evaluation of clothing by women using wheelchairs. *Perceptual and Motor Skills*, 93, 727-733.
- Baker, M. J., & Churchill, G. A. (1977). The Impact of Physically Attractive Models on Advertising Evaluations. *Journal of Marketing Research*, 14(Nov), 538-555.
- Banks, K. (2001). Adaptive clothing-Preserves independence and assists the caregiver. *Lippincott's Case Management*, 6(6), 243-245.
- Bruner, G.C., Hensel, P. J., & James, K. E. (2000). *Marketing scales handbook : a compilation of multi-item measures for consumer behavior and advertising research*. Chicago, IL: American Marketing Association
- Bye, E., & Hakala, L. (2005). Sailing apparel for women: A design development case study. *Clothing and Textiles Research Journal*, 23(1), 45-55.
- Carroll, K., Alexander, M., & Spencer, V. (1999). Exercise clothing in children in a weight-management program. *Journal of Family and Consumer Science*, 99(1), 68-72.
- Center for Dialysis Care. (2011). *What is dialysis?* Retrieved from <http://www.cdcare.org/what-is-dialysis/>
- Chumled, W. C. (2004). Anthropometric and body composition assessment in dialysis patients. *Seminars in Dialysis*, 17(6), 446-470.
- Davita. (2007). *Kidney diet tips*. Retrieved from [www.davita.com/kidney-diet-tips](http://www.davita.com/kidney-diet-tips).
- Davita. (2012). *Treatment options*. Retrieved from [www.davita.com/treatment-options](http://www.davita.com/treatment-options), <http://www.davita.com/services/in-center-dialysis/living-well-on-in-center-dialysis>

- Eggleston, J. M., Bentrem, D. J., Bromberg, W. J., London, S. D., Biesecker, J. E., & Edlich, R. F. (1994). Adaptive clothing for persons with mobility disorders after burn injuries. *Journal of Burn Care and Rehabilitation, May/June*, 269-274.
- Hemowear. (2012). *Product information*. Retrieved from <http://www.hemowear.org/>
- Ho, S. S., Yu, W. W., Lao, T. T., Chow, D. H., Chung, J. W., & Li, Y. (2009). Garment needs of pregnant women based on content analysis of in-depth interviews. *Journal of Clinical Nursing, 18*, 2426-2435.
- Jacobs, C. N. & Opolinsky, D. (2010). *The little handbook of dialysis*. Sudbury, MA: Jones & Bartlett.
- Kernaleguen, A. (1978). *Clothing designs for the handicapped*. Edmonton, Canada: The University of Alberta Press.
- Kidd, L. K. (2006). A case study: Creating special occasion garments for young women with special needs. *Clothing and Textiles Research Journal, 24*(2), 161-172.
- Lamb, J. M. & Kallal, M. J. (1992). A conceptual framework for apparel design. *Clothing and Textiles Research Journal, 10*(2), 42-47.
- Lee, T., Mokrzycki, M., Moist, L., Maya, I., Vazquez, M., & Lok, C. E., (2011). Standardized definitions for hemodialysis vascular access. *Seminars in Dialysis, 24*(5), 515-524.
- Libre. (2012). *Product information*. Retrieved from <http://www.libreclimbing.com/clothing.html>
- Merck Manual Online. (2007). *Renal replacement therapy*. Retrieved from [http://www.merckmanuals.com/professional/genitourinary\\_disorders/renal\\_replacement\\_therapy/hemodialysis](http://www.merckmanuals.com/professional/genitourinary_disorders/renal_replacement_therapy/hemodialysis).
- National Institute of Health (NIH). (2010). *Kidney disease statistics for the US*. Retrieved from <http://kidney.niddk.nih.gov/kudiseases/pubs/kustats/>

- National Institute of Health (NIH), (2008). *Vascular access of hemodialysis*, Pub # 08-4554,  
Retrieved from <http://www.kidney.niddk.nih.gov>
- National Kidney Foundation of East Tennessee. (2012). Retrieved from  
<http://vic.com/~nkfet/images/fistulas.gif>
- Nelson E. E., Hong C. D., Pesce A. L., Peterson D. W., Singh S., Pollak V. E. (1990).  
Anthropometric norms for the dialysis population. *American Journal of Kidney Disease*,  
*16*, 32–37.
- Ortiz, S. (1992, February). Dressing for success isn't always easy. *Mainstream*, 22-26.
- Park, H., Nolli, G., Branson, D., Peksoz, S., Petrova, A., & Goad, C. (2011). Impact of wearing  
armor on lower body mobility. *Clothing and Textiles Research Journal*, *29*(3), 232-247.
- Powers, M. (1998). Apparel for special needs. *Human Ecology*, *26*(4), 18-20.
- Quinn, M. D. & Chase, R. W. (1990). *Design without limits: Sewing and designing for special  
needs*. Philadelphia, PA: Drexel Design Press.
- Rushing, J. (2010, Fall). Caring for a patient's vascular access for hemodialysis. *Med/Surg  
Insider*, 47.
- Sau-Fun, N., Chi-Leung, H, & Lai-Fan, W. (2011). Development of medical garments and  
apparel for the elderly. *Textile Progress*, *43*(4), 235-285.
- U.S. Census Bureau, U.S. Department of Commerce. (2011). *State and Country Quick Facts*.  
Retrieved from <http://quickfacts.census.gov/qfd/states/01000>
- U.S. Census Bureau, U.S. Department of Commerce. (2012). *Disability overview*. Retrieved  
from <http://www.census.gov/hhes/www/disability/overview.html>
- U.S. Equal Employment Opportunity Commission (EEOC). (2008). *Facts about Americans with  
Disabilities Act*. Retrieved from <http://www.eeoc.gov/facts/fs-ada>

- U.S. Department of Education (USED). (2007). *Twenty-Five Years of Progress in Educating Children with Disabilities Through IDEA*. Retrieved from <http://www2.ed.gov/policy/speced/leg/idea/history.pdf>
- U.S. Renal Data System (USRDS). (2011). *USRDS Annual Data Report: Atlas of Chronic Kidney Disease and End-Stage Renal Disease in the United States*. Retrieved from <http://www.usrds.org/adr.aspx>
- Watkins, S.M. (1988). Using the design process to teach functional apparel design. *Clothing and Textiles Research Journal*, 7(1), 10-14.
- Voorhees, S. & Thompson, A. (1981). *Accessible fashions*. Washington, D.C.: National Access Center



## **Appendix A**

### **Examples of Current Adaptive Clothing for Hemodialysis Patients**



## **Appendix B**

### **Permission Forms to Conduct Research in DCI Dialysis Clinics**

# Dialysis Clinic, Inc.

(A NON-PROFIT CORPORATION)

Azita Takeshian, M.D. Medical Director  
Robert F. Steading, Administrator

8713 Parkway East  
Birmingham, AL 35206  
(205) 838-5400  
(205) 838-5424 Fax

Date: 12/21/2012

Auburn University Institutional Review Board  
c/o Office of Human Subjects  
307 Samford Hall  
Auburn, AL 36849

Please note that Kristie Smith, AU Graduate Student, has the permission to conduct research at our facility for her study, "Exploring Adaptive Clothing Needs for Hemodialysis Patients".

Ms. Smith will *recruit* potential subjects by approaching them in the clinic and verbally explaining the study. A written information sheet will be available as well. Upon subjects' verbal agreement to participate in the study, a written consent will be provided for subject to sign. A simple questionnaire will be presented in written (paper/writing utensil) format. Ms. Smith will be present if questions or comments arise. The questionnaire will take ~10-15 minutes to complete and all information provided will be anonymous. Ms. Smith's on-site research activities will take place in Spring Semester 2013.

Ms. Smith is a Registered Dietitian and trained to work in a medical environment. Universal precautions will be observed, as well as, any safety protocols set by the facility. Ms. Smith has also agreed to provide to our facility a copy of the Auburn University IRB-approved, stamped consent document and survey questionnaire before she recruits participants.

If there are any questions, please contact my office.

Signed,

R.F. Steading  
Signature

Robert F. Steading  
Printed Name

12/21/2012  
Date

Birmingham / Pell City  
Clinic/facility Location

# Dialysis Clinic, Inc.

(A NON-PROFIT CORPORATION)

Date: December 26, 2012

Auburn University Institutional Review Board  
c/o Office of Human Subjects  
307 Samford Hall  
Auburn, AL 36849

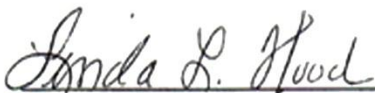
Please note that Kristie Smith, AU Graduate Student, has the permission to conduct research at our facility for her study, "Exploring Adaptive Clothing Needs for Hemodialysis Patients".

Ms. Smith will *recruit* potential subjects by approaching them in the clinic and verbally explaining the study. A written information sheet will be available as well. Upon subjects' verbal agreement to participate in the study, a written consent will be provided for subject to sign. A simple questionnaire will be presented in written (paper/writing utensil) format. Ms. Smith will be present if questions or comments arise. The questionnaire will take ~10-15 minutes to complete and all information provided will be anonymous. Ms. Smith's on-site research activities will take place in Spring Semester 2013.

Ms. Smith is a Registered Dietitian and trained to work in a medical environment. Universal precautions will be observed, as well as, any safety protocols set by the facility. Ms. Smith has also agreed to provide to our facility a copy of the Auburn University IRB-approved, stamped consent document and survey questionnaire before she recruits participants.

If there are any questions, please contact my office.

Signed,

  
Signature

Linda Hood, Administrator  
Printed Name

12/26/12  
Date

DCI- Decatur, Cullman, Moulton  
Clinic/facility Location

**Appendix C**  
**Consent Forms Approved by IRB**



COLLEGE OF HUMAN SCIENCES  
DEPARTMENT OF CONSUMER AFFAIRS

(NOTE: DO NOT SIGN THIS DOCUMENT UNLESS AN IRB APPROVAL STAMP WITH CURRENT DATES HAS BEEN APPLIED TO THIS DOCUMENT.)

**INFORMED CONSENT**  
for a Research Study entitled  
"Clothing Needs for Hemodialysis Patients"

You are invited to participate in a research study to assess hemodialysis patients' clothing needs and interest in purchasing adaptive clothing. The study is being conducted by Kristie J Smith under the direction of Dr. Veena Chattaraman and Dr. Pamela Ulrich in the Auburn University Department of Consumer and Design Sciences. You were selected as a possible participant because you are a hemodialysis patient and are age 19 or older.

**What's involved?** If you decide to participate in this research study, you will be asked to complete a survey questionnaire. Your total time commitment will be approximately 10-15 minutes.

**Risks?** There are no foreseen risks with completing the survey as it is non-invasive.

**Benefits?** If you participate in this study, you can expect to be instrumental in providing knowledge of clothing needs for the hemodialysis population. The desire is that this information will bring attention to the needs of hemodialysis patients and further development of products to meet your needs. I cannot promise you that you will receive any or all of the benefits described.

**Costs and Incentives?** If you decide to participate, you will fill out a quick survey questionnaire. There is no cost involved in taking the survey. There will be no material incentives to participating in the survey.

**If you change your mind about participating,** you can withdraw at any time during the study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the Department of Consumer Affairs or Kristie J Smith.

**Your privacy will be protected.** Any information obtained in connection with this study will remain anonymous. No names will be associated with your information. Information will be gathered for statistical purposes only. Information obtained through your participation may be used to fulfill an educational requirement, published in a professional journal, presented at a professional meeting.



JOHN NORTON, Ph.D.  
Associate, AL 36849-5604

Telephone:  
334-844-4004

Fax:  
334-844-1340

www.auburn.edu

*Owing much to the past, Auburn's greater debt is ever to the future.*



## COLLEGE OF HUMAN SCIENCES

DEPARTMENT OF CONSUMER AFFAIRS

If you have questions about this study, please ask them now or contact Kristie J Smith at [dncareofal@hotmail.com](mailto:dncareofal@hotmail.com) or (205) 655-1997. A copy of this document will be given to you to keep.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Human Subjects Research or the Institutional Review Board by phone (334)-844-5966 or e-mail at [hsubjec@auburn.edu](mailto:hsubjec@auburn.edu) or [IRBChair@auburn.edu](mailto:IRBChair@auburn.edu).

**HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH STUDY. YOUR SIGNATURE INDICATES YOUR WILLINGNESS TO PARTICIPATE.**

Participant's signature \_\_\_\_\_ Date \_\_\_\_\_

Investigator obtaining consent \_\_\_\_\_ Date \_\_\_\_\_

Printed Name \_\_\_\_\_

Printed Name \_\_\_\_\_

The Auburn University Institutional Review Board has approved this document for use from  
1/17/13 to 1/16/14  
Protocol # 13-003EP1301

205 South Hall

Auburn, AL 36849-5691

Telephone:

(334) 844-4084



PATIENT AUTHORIZATION & RELEASE

I, \_\_\_\_\_, am a patient at the Dialysis Clinic, Inc. ("DCI") clinic located at \_\_\_\_\_ ("Clinic"). I understand that Kristie Smith, a graduate student in the Department of Consumer Affairs at Auburn University and a DCI employee, ("Ms. Smith") is conducting a voluntary survey at the Clinic as part of her graduate research which I may choose to participate in. I understand that the survey may involve questions about my identifiable health information and demographic information. The purpose of the survey has been explained to me and I hereby authorize DCI to allow Ms. Smith to include me as a research participant at the Clinic for the purpose specified above.

I understand and agree that any information obtained from the survey is the property of Ms. Smith and I relinquish any rights that I may have to my completed survey questionnaire. I understand that there shall be no financial compensation for my participating in the survey.

I understand that DCI shall not condition my right to treatment or payment on my granting this requested authorization. I understand that I have the right to refuse to sign this authorization. Except to the extent that DCI and the \_\_\_\_\_ have already relied on it, I understand that I shall have the right to revoke this authorization by doing so in writing addressed to the following:

Jennifer Wood, LCSW  
205-838-5418

A photocopy of this authorization shall have the same force and effect as the original. This authorization expires on December 1, 2013.

The information used or disclosed under this authorization may be subject to re-disclosure by the recipient and may no longer be protected by the regulations that require health care providers to protect individually identifiable health information.

I certify that I have read (or had read to me) the above authorization and that I fully understand the nature and purpose of this authorization. I have had the opportunity to ask and have answered any questions that I may have regarding the information contained in this authorization form. I also certify that I am the patient or the patient's duly authorized agent or representative and that I am authorized to execute this authorization.

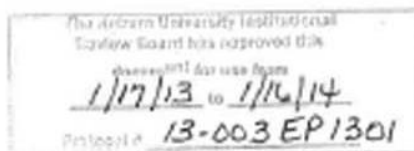
Signed: \_\_\_\_\_

Date: \_\_\_\_\_

Witness: \_\_\_\_\_

Date: \_\_\_\_\_

12/12 rdk



13

**Appendix D**  
**Measures and Constructs**

| <b>CONSTRUCTS</b>  | <b>SCALE ITEMS</b>  | notes:       |
|--|---|--------------|
| <b>Independent variables</b>   | <b>to test independent variables</b>  |              |
| <b>FUNCTIONAL</b>  |   |              |
| Vascular access  | The zippered opening on the clothing will make dialysis easier.                                 |              |
|  | The zippered opening on the clothing will help the nurses connect me to the dialysis machine.   |              |
|  | The zippered opening on the clothing will make dialysis more difficult.                         | reverse code |
| <b>EXPRESSIVE/SOCIAL</b>   |   |              |
| Privacy  | This clothing will cover my body well during my dialysis treatment.                             |              |
|  | The clothing will show too much of my body when used.   | reverse code |
|  | The clothing will help me be more private during my dialysis treatment.                         |              |
| Conformity to mainstream   | This clothing looks similar to what my friends wear.  |              |
|  | This clothing looks like what I normally wear.  |              |
|  | This clothing looks like regular clothing found in a store.                                     |              |
| <b>AESTHETIC</b>   |   |              |
| Symmetric vs. Asymmetric   | Drawings/images with symmetrically different design elements will be shown and images compared. |              |
| <b>Dependent Variable: Purchase Intention</b>                              |   |              |
| <b>From Baker and Churchill (1977) Original Scale Items</b>                | <b>Items Adapted for the study</b>  |              |
| Would you like to try this ___?  | I would like to try this clothing.  |              |
| Would you like to buy this if you happened upon it in a store?             | I would buy this clothing.  |              |
| Would you actively seek out this ___ (in a store in order to purchase it)? | I would actively look for this clothing in order to buy it.                                     |              |

**Appendix E**  
**Survey Questionnaire**

### Survey Questionnaire

Please read the below definition and answer the following questions by checking the box beside your answer.

**Adaptive clothing is defined as clothing that has been adapted for a special purpose, such as openings for dialysis vascular access.**

1.) Where is your vascular access located? (Which area of your body is connected to the machine during your dialysis treatment?)

- Arm
- Leg
- Chest
- Other, Please explain \_\_\_\_\_

2.) What side of your body is your vascular access located?

- Right side
- Left side
- Other, (please explain) \_\_\_\_\_

Examples of adaptive clothing for dialysis are sketched below. Please answer the questions following the drawings. (Three separate questionnaires will be available. Examples shown to participants will be based on vascular site.)

3.)

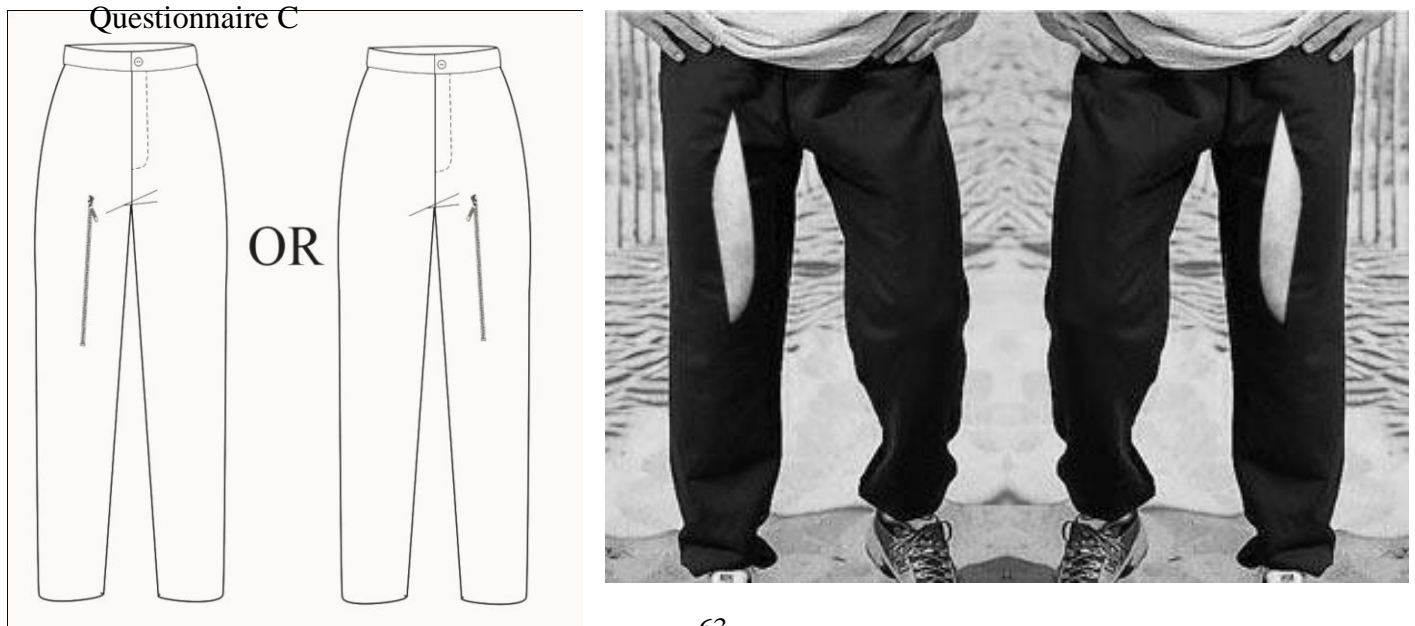
Questionnaire A



Questionnaire B



Questionnaire C



After looking at the pictures above, please check the box that best represents how much you agree or disagree with these statements:

|   | strongly disagree | disagree | neither agree or disagree | agree | strongly agree |
|---|-------------------|----------|---------------------------|-------|----------------|
| I would like to try this clothing.                          |                   |          |                           |       |                |
| I would buy this clothing.                                  |                   |          |                           |       |                |
| I would actively look for this clothing in order to buy it. |                   |          |                           |       |                |
|   |                   |          |                           |       |                |

4.) (Images shown will vary by vascular access site)



After looking at the pictures above, please check the box that best represents how much you agree or disagree with these statements:

|   | strongly disagree | disagree | neither agree or disagree | agree | strongly agree |
|---|-------------------|----------|---------------------------|-------|----------------|
| I would like to try this clothing.                          |                   |          |                           |       |                |
| I would buy this clothing.                                  |                   |          |                           |       |                |
| I would actively look for this clothing in order to buy it. |                   |          |                           |       |                |

5.) Look at the clothing presented in questions 3 and 4. Please answer the following questions by checking the box that best represents how agreeable you are with the statements below.

|   | strongly disagree | disagree | neither agree or disagree | agree | strongly agree |
|---|-------------------|----------|---------------------------|-------|----------------|
| The zippered opening on the clothing will make dialysis easier.                               |                   |          |                           |       |                |
| The zippered opening on the clothing will help the nurses connect me to the dialysis machine. |                   |          |                           |       |                |
| The zippered opening on the clothing will make dialysis more difficult.                       |                   |          |                           |       |                |
| This clothing will cover my body well during my dialysis treatment.                           |                   |          |                           |       |                |
| The clothing will show too much of my body when used during my dialysis treatment.            |                   |          |                           |       |                |
| The clothing will help increase my privacy during my dialysis treatment.                      |                   |          |                           |       |                |
| This clothing looks similar to what my friends wear.  |                   |          |                           |       |                |
| This clothing looks like what I normally wear.  |                   |          |                           |       |                |
| This clothing looks like regular clothing found in a store.                                   |                   |          |                           |       |                |



6.) Are you aware of special clothing for dialysis patients?

- Yes
- No

7.) Do you go places (run errands, shop, eat, etc...) before or after dialysis?

- Yes
- No

8.) If you were invited to lunch/dinner after dialysis treatment, how likely are you to change your clothing before the meal?

- Very unlikely
- Unlikely
- Likely
- Very likely

9.) Do you work or are you employed for pay?

- Yes
- No

10.) Do you work on dialysis days?

- Yes
- No
- Sometimes
- I do not work

11.) How often do you feel embarrassed removing clothing from your access area for treatment?

- Often
- Sometimes
- Never

12.) Would you purchase clothing that was made for dialysis?

- Yes
- No

13.) How much would you pay for one piece of adaptive clothing made for dialysis?

- \$20.00 or less
- \$21.00-35.00
- \$36.00-50.00
- Over \$50.00

- 14.) Would you be more likely to order adaptive clothing from the internet or in a store?
- internet
  - store

### Demographics

The below information will be used for research purposes only. All answers are confidential and personal information will not be used to identify your survey answers.

Directions: Please check the box that best describes you.

1.) Gender:

- Male
- Female

2.) Ethnicity:

- African American/ Black
- Caucasian/White
- Asian/ Island Pacific
- Hispanic
- American Indian
- Multiracial
- Other \_\_\_\_\_

3.) Age:

- 0-19
- 20-44
- 45-64
- 65-74
- 75+

4.) Level of education:

- Below high school
- High school/GED
- College
- Graduate or above

5.) Annual Income level:

- Less than \$20,000
- \$20,001-\$35,000
- \$35,001-\$50,000
- \$50,001 or above

6.) Do you have internet access?  Yes or  No