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The usage of E-Textiles in the medical Sector: The effects of patient's behavior on the decision to use E-Textiles in Lebanon health care sector

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Abstract
The purpose of this research is to determine the patients' intention to accept the use of electronic textiles in the field of health care in Lebanon and to determine the relation between the patient's behavior and the usage of the e-textiles in the medical sector. The main problem is the scarcity of these electronic textiles in the Lebanese medical market and the lack of patient knowledge of this technology. Therefore, the quantitative approach was adopted and a questionnaire was developed to collect data on the degree of acceptance and willingness of patients to use electronic textiles in the field of health care.

Keywords: E-textiles, ease of use, trust, self-monitoring, patient behavior, Lebanon, medical care, medical technology

1. Introduction

For many years, technology has become a major part of the world of medicine and health care. The continuous development of technology in medicine has improved many ways to provide patient health care and save millions of lives, and work on the advancement of technology continues (Proclinical, 2019) [57]. Technology has dramatically changed the pattern of health care, allowing the creation of diverse inventions that are useful in treatment and care, and it is important to take into accounts what people are today in terms of healthcare technology (Guest and Fournier, 2018) [31]. Over the years, technology has helped health care providers and patients by facilitating diagnosis and treatment in hospitals and clinics through the development of machines and medical devices, in addition to many benefits such as saving time, reducing waiting hours for the patient and other benefits (Gescienceprize, 2013) [30].

However, the idea of integrating electronics into our textile and clothing products is no longer a science fiction (Bhattasharjee, 2013) [9]; in 1990, the students of Massachusetts Institute of Technology (MIT) began to search for the importance of smart clothing in military use where it was non-wearable and could not be easily brushed off. By 1998 the combination of fashion and technology began and in 2001 was the most important development where electronic textiles were combined with medical uses (Srinivas, 2017). Over time, diseases and sudden death are increasing, signaling the need for more sophisticated health care management systems to make patients more aware of their health conditions and help them change the wrong lifestyle. This shows the importance of the use of electronic textiles for health care. It is able to collect the physiological data of the patient and give alerts about his health through sensors and techniques integrated with the tissue, which helps to control health and attention to any symptoms of a serious life-threatening human (Paradiso *et al*., 2005) [52, 54].

Electronic textiles are designed to support the idea of wearable computing. Smart sensors and applications can be combined with textiles and made easy to use by changing color and lighting, for example, or by monitoring the body temperature of athletes through sportswear combined with techniques and sensors. It is considered one of the most promising medical devices in the field of health care for its potential, such as monitoring the blood levels of the drug and providing the appropriate dose. As the sensors are integrated it is designed from the same fabric material as no one can see (Rouse, 2018) [60]. Ed Thorpe and Claude Shannon were the first to invent a computer with a cigarette-sized volume. This was in 1961, when it was designed to predict roulette wheels. Hubert Upton invented a computer for people with hearing impairment and his design was installed on a prescription to help them read the lips, and this was in 1967. The topics of helping the disabled and predicting the roulette wheel were the most common themes in the first days of wearable computing (Barcodesinc, 2018) [8].

Electronic textiles are intelligent textiles that contain electronic components such as sensors and screens. They are used in several fields, the most important of which are the health care field, which helps to monitor, examine and treat the patient. These smart textiles made it much easier for the patient to monitor his or her health (Maschenguru, 2009) [43]. Provides patient health alerts and data that enable the medical staff to understand the patient's situation more accurately and quickly and allow them to monitor patients remotely and continuously (Ahmed, 2013) [1].

In the same context, wearable computing is a device that runs through a computer and also is equipment that a user can wear. This technology includes not only clothing but also watches, glasses, shoes and so on (Fiorello, 2018) [29]. Wearable technology offers many opportunities that raise the thoughts and imagination of people from all walks of life. In our time, technology is an essential part of human life and the reliance on computers has become ubiquitous, and this has stimulated the development of wearable technology. These devices have helped professionals and specialists in many personal activities and have facilitated daily life and made them more integrated with the world of technology (Ghajharia, Verma and Pal, 2014).

Moreover, electronic textiles or wearable clothing contain

enormous amounts of relevant data and help health care to detect and manage medical cases more effectively. RFID and barcode-based wear solutions can support other medical procedures that require patient identity verification, such as bedside delivery and transfusion, and integration into health care solutions to enable patient-based access to patient data (Turan, Kaya and Aydin, 2017) [71].

On the other hand, the popularity of wearable computing technologies is becoming more popular over time, and in the near future it is expected to become an essential part of daily life and a milestone for individuals so that it will affect business for the better. It is also expected that future applications with wearable technologies will be easier, faster, safer and healthier (Çiçek, 2018) [18]. In the US market, this sector has been growing rapidly. In the past five years, electronic textiles have appeared in the market clearly and demand increased. According to studies, the compound annual growth rate of the US market for electronic textiles is 37%. The markets in Europe was more than 300 million euros in 2010 and is expected to grow by 20% every year (fibre2fashion, 2019) [27].

Research Problem

Despite the technological development in the medical field, the medical market in Lebanon lacks the availability of electronic textiles, also known as smart clothes. The problem is that many patients have not hear of this technology before. Even those who have heard about it have not tried it and are not aware of its many benefits. This research will measure the acceptance of patients to use these electronic textiles in the field of health care and the importance of this research is to deliver information about the benefits of electronic textiles in the medical field for medical centers and patients and how they affect patient's behavior and make it more popular.

Literature Review

Electronic textiles are known as different names such as smart clothes or smart fabrics or wearable technology. Electronic textiles are a technique used for improved digital fabrics, and are based on battery technology, light and sensors (Apparelsearch, 2019) [3]. There is a central controller that sends signals through which smart fabrics work. In the smart fabric an electrical processor is fixed to analyses and evaluate the signals. Smart textiles contain many applications that provide the wearer with several functions, helping them connect with other devices, provide energy, and protect against environmental hazards. (Hempel, 2018) [34].

Moreover, Techopedia (2018) [68] has defined electronic textile as a kind of cloth that contains electronic elements, it supports the idea of computing that can be worn and electronic devices that design clothes, and have other applications based on the integration of electronic components in fabrics and fiber as interior design technique. Consequently, electronic textiles can be worn on a daily basis, they are dynamically designed for current user needs and have flexibility in adapting to changes in requirements and sensing of application (Kholya and Jahan, 2011) [38]. Also, the electronic textiles consist of continuous wires that are resistant to deformities that can occur through washing or folding. These wires prevent any malfunction, which makes these clothes serve as long as possible and do not affect their external appearance (Xu, Eike and Eliette, 2018). This technology has enormous benefits and has sparked debate among researchers over the past 10 years (Bonoto, 2003 cited by Turan, Kaya and Aydin, 2017) [71].

According to Anwar (2018) [2], smart textiles are classified into two main categories: the first type is the electronic textiles with traditional electronic devices such as connectors, integrated circuits, lamps and traditional batteries embedded in clothing, while the second type is electronic textiles that integrate directly into fabric substrates, and can include either active components such as diodes, transistors, solar cells, or negative electronics such as resistors and conductors. So, Electronic textiles are characterized by their durability and ability to work for a long period of time (Sealy, 2018) [62].

The usage of the e-textiles allows to facilitate the daily lives of individuals by introducing them in many areas such as health control and maintaining a healthy lifestyle, sports, industrial applications, cars, entertainment and military safety (Patwary *et al*., 2015) [55]. Moreover, electronic textiles are used in many sectors, such as medicine, architecture, fashion, entertainment, defense, military, and transport, and have gained popularity, especially in health sector and sports and fitness. (Hempel, 2018) [34]. According to Textile technologies report in 2017, Adidas in cooperation with Exos had created a smart winter shirt for Germany team at the 2014 FIFA World Cup, this shirt allowed coaches and team members to track the athlete's performance in terms of distance, speed and heart rate, and helped improve the level of players and plan future exercises.

According to Fieldtex report in 2018, These textiles can allow health care providers to be alerted about the complications that the patient gets and enable them to access his or her information in real time. The market segment of smart fabrics in the health sector is extremely huge and is expected to reach $ 1000 million by the end of 2024, according to a study conducted in the United States of America, electronic textiles have contributed to the service of health centers such as hospitals, nursing homes and other medical institutions through the use of medical gowns, smart children's clothing and other medical clothing that have had a positive effect on reducing work pressure On the staff of the medical centers and provide greater comfort to the patients by facilitating the methods of examination and consultations. (Hempel, 2018) [34].

In recent decades there has been an increase in the sudden death of people in addition to the increase in the proportion of patients, especially the elderly, and they have been unable to follow up their health well, so smart textiles provide the solution through their ability to predict early symptoms and help people in the organization of their medicines and follow-up Their health status is safe.(Ozyazgan and Abdulova, 2015) [51]. Consequently, Smart clothing is a specialized solution for the issue of distinguishing damage inclined circumstances and anticipating cataclysmic circumstances before they happen. The goal of smart clothing in medical centers like hospitals is to empower enormous information examination that can be utilized to foresee perilous circumstance in the medical clinic and for the attendant continuously. It very well may be utilized to construct a checking and suggestion framework that can caution the emergency clinic to take on undertakings to all the more likely train work force and assess the advantages of another offices, such us bed and cranes. (Menander and

Honkala, 2004) [46].

Patient Behavior

The main goal of electronic textiles in hospitals is to provide a huge amount of data to medical care specialists, especially the nurse. These data help him to analyze faster and avoid the occurrence of many medical errors as giving a specific medicine to the patient (Hanuska *et al*., 2016) [32]. These clothes give warnings to treat the patient's condition safely, which reduces the pressure on the work of the nurse and make it rotate on patients one by one to ensure the safety of the patient (Joong Chung, 2017) [35]. To understand the role of the e-textiles' role in the medical sector it is imperative to study the behavior of the patient, according to Davids (1989), the success of any technology is totally depending on the acceptance of the technology user.

Wearable devices often affect the patient's behavior positively. They are often associated with a smartphone or website to track and store data (Eaton, 2016) [25]. Anyone in the hospital knows that he will be under surveillance for a long time and this will be stressful for him, because he has to be tangled with many wires and electrodes and this will not give him a feeling of comfort (Macdolands *et al*., 2014).

The Health wear Smart Wear system helped 24 people with pulmonary embolism leave the hospital after an average of just 3.6 compared with 6.8 who did not use it. these clothes strengthen the relationship between the patient and the doctor, communication between them always gives the patient a sense of security According to a study conducted by the Soteria Hospital team, patients feel comfortable not only because they use technology but because the system improves their health, quality of care and constant contact with the doctor (Paradiso and Starner, 2005) [52, 54]. According to the same research, out of every five Americans, one has a wearable technology that can improve their lives for the better, facilitate treatment, give more accurate medical data, and provide them with good health care as well as contact with their doctor.

Davis (1989) mentioned in his explanation of TAM that the grasp of technology innovation is totally relying on the attitude of the user behavior, for Davis the main principle for any new technology or product success is signed to the level of behavioral acceptance of the user, as the end user of new technology feels and believes in the added value of the new technology as the acceptance and usage will increase. In the context, original TAM clarifies and predicts frameworks utilize dependent on six key-builds or attributes of development, notably perceived usefulness (PU), perceived ease of use (PEU), external variables, attitude towards using the system (A), behavioral intention to use (BIU), and actual system uses (ASU) (Davis, 1989).

Based on the TAM theory of Davis (1989), patient Behavior is depending on the ease of use of the technology. Consequently, the usage of the medical technology is not relying on the ease of the use of the technology only and also the level of confidentiality that the patient can trust the technology. Moreover, based on the above literature smart cloths are adopted to monitor patients' performance. So, to measure the patient behavior it is essential to study the three constructs: ease of use, trust, and self-monitoring.

Ease of use

The advantages of electronic mechanical textiles are bendable and washable because they are rubbery while maintaining good electrical accessibility. (Ahmed, 2013) [1]. Electronic textiles are resistant to folding or bending, which is a permanent deformation, by developing thread elasticity when spinning and weaving **.**(Kathuria, Shinde and Goswami, 2015) [37].

An European medical team has included direct sensors in textiles, making smart, practical and comfortable clothes for the patient to move around (Paradiso and Starner, 2005) [52, 54]. The "smart nightgown" will not be as spacious as the usual hospital gown, but it will not have a little warmth, and this is not as stressful as connecting it with wires (Bipin, Sandeep and Verma, 2011.) [10]. So, through Bio signals, data collected by clothing is sent to healthcare professionals and allows the doctor to examine patients and warn them of deterioration of their health.

According to Paradiso and Starner (2005) [52, 54] The doctor can conduct effective health care and remote tests by talking to the patient a phone call directing him to perform some exercises and monitor the doctor from his place ECG and measurement of oxygen without having to meet him. Availability of time to the doctor without waiting too long for the emergence of medical examinations of the patient it gives immediate results and help him to take appropriate decisions more quickly on the treatment of the patient. Moreover, the same research conducted that the health wear combines information from sensors to a single device called PPU (providers and healthcare professionals). This technology is easy to use and transparent to all patients, and this is one of the most important features of all the patient to do the wearing of the jacket and keep the shipment of PPU attached, just as it charges his mobile phone completely.

The inclusion of sensors in intelligent clothing requires only the patient a mobile-sized device that collects and transmits information, patients can be more active and independent, especially if the patient after a certain surgery training to walk the patient wearing these clothes will facilitate the process of moving and moving without be connected to any wire or device (Zyga, 2017).All of these mobile health applications can be connected with wearable technology and can be very useful in working as sensors or monitors to improve clinical decision making (Bohigian, 2017).

Trust

Public trust in these products is very important (Douglas, 2018). The advantages of smart textiles are that it helps to monitor the health of the person by giving very accurate data to detect the signs of the disease early and this enhances the confidence of people in their use (Fieldtex, 2016). Smart textiles made of strong wires are difficult to break, making them more durable and do not need to be repaired or purchased other, which strengthens consumer confidence in these products and encourages the acceptance and use (Stoppa and chiolerio, 2014).

The main goal of electronic textiles in hospitals is to provide a huge amount of accurate data to medical care specialists, especially the nurse. These data help him to analyze faster and avoid the occurrence of many medical errors as giving a specific medicine to the patient (Hanuska *et al*., 2016) [32]. These clothes give warnings to treat the patient's condition safely, which reduces the pressure on the work of the nurse and make it rotate on patients one by one to ensure the safety of the patient (Joong Chung, 2017) [35].

The Food and Drug Administration Law requires that smart textiles be subject to inspection before they are available in

the market and cannot be sold without the consent of the administration to ensure that they meet the necessary conditions that benefit the consumer and help him. This is a strong evidence to increase consumer confidence in these products (Balar *et al*., 2017).

Monitoring

Health care requires more technology-level developments to meet the patient's medical requirements, for better health control that maintains patient health (Bagehorn, 2016). Apart from conventional solutions, smart textiles help to monitor the patient permanently by sending alerts about the heart rate, for example, alerts to the doctor or health care professionals via a smart phone enables them to monitor the patient more consistently and more accurately. (Lopez, Moreno and Custodio, 2013).

The integration of sensors in smart clothes contributes to the monitoring of physiological data, including the rate of breathing and heartbeat and record the number of calories burned and alert the body to the levels of stress and you can take some steps to alleviate it (Poupyrev, 2015). These devices also help the patient by giving him warnings if he needs to sleep or drink water, and also eat food and medication at the specified times, without resorting to or consulting with doctors (Kumar, 2017).

According to Bonito 2010, one of the benefits of this technology is its long-term monitoring of individual health in different settings, such as homes and society, which further contribute to the improvement of sensors and electronic textiles that can be worn. These fabrics are designed to provide both comfort and functionality. These textiles help the intelligent sensor system monitor, connect, receive and transmit physiological signals. These textiles are used to examine cardiovascular and respiratory disorders and to study and examine the respiratory and nervous systems (Bonito, 2010). smart textiles provide the solution through their ability to predict early symptoms and help people in the organization of their medicines and follow-up Their health status is safe (Ozyazgan and Abdulova, 2015) [51].

Acceptance usage of e-textile by patients

According to a survey of 1034 patients, 210 of whom about 21% reported using smart clothes to monitor physical health and wellness. Of these, 854 were 82% of respondents who used these devices for urinary tract care. Those who want to use these clothes (14% of the 86%) also reported significant medical benefits such as improving communication and confidentiality, improving health and monitoring physical activity (Nehra *et al*., 2016). Many people who are sick hear about wearable technology but few are aware of its importance for health care. But when the patient and her role in helping him to monitor his health in a safe and continuous, excited to try it (Vontentisianos, 2017).

According to (medical press, 2018), Many women were eager to use wearable technology as they were useful during their pregnancy to monitor their health status and were ready to buy and use it. The elderly also had a great deal of acceptance of these clothes to help them pursue their health because of their age and inability to pay attention to their health accurately (Hanuska *et al*., 2016) [32].

In contrast, many people do not want to use these devices in their daily lives inside or outside the medical centers for fear of inaccuracy of data and some of them described as boring and others who are aware of the importance and interested in the acquisition will not do because of the high price and what will add from the additional costs to buy a smartphone Or subscription to the Internet (Purdue, 2018).

Previous studies

According to Arjun and Beg 2018, the steps taken daily help to provide quality of life for cancer patients. Researchers at the Southwestern Cancer Center Simmons show that wearable fitness equipment, such as “fitbits”, is a good tool for assessing cancer patients by measuring the steps taken daily to help treat them (sciencedaily, 2018). This is the first step to understand the suitability of smart textiles for cancer patients in the hope that they will be used in large clinical trials to see the real effect of various cancer benefits on patients and after assessing the functional status of the patient is an essential part of clinical interviews and influences treatment decisions (Boase, 2019).

Smart accessories can make cancer prevention as easy as checking the accuracy of diagnostic data through sophisticated technology by researchers at the New York Cancer Center, a vital optical device that converts a videotape device into a sophisticated 24-hour diagnostic monitor (Atkin *et al*., 2017). According to Florence 2017, MD and endocrinologist at the Comet Center for Microbiology in New York City, Electronic textiles are a great invention that must be developed and likened to magic because of its tremendous ability to give data to the doctor, analyze and help him to find the patient's solution in the treatment and according to the Comet Center analysis, data from wearable devices help the doctor design interventions for diabetics and chronic conditions more effectively. In contrast, a large number of doctors were not convinced of the idea of smart devices and do not trust the data and data resulting from it and consider that it cannot solve the problems of disease accurately (Downs, 2017). For nurses, they encouraged their use in medical centers because of their ease of use in reducing the pressure and ease of treatment between them and the patients, and providing psychological comfort for them due to the effort they suffer in the accuracy of care and supervision (Hanuska *et al*., 2016).

Electronic textiles are characterized by their durability and ability to work for a long period of time (Sealy, 2018) [62]. The electronic textiles consist of continuous wires that are resistant to deformities that can occur through washing or folding. These wires prevent any malfunction, which makes these clothes serve as long as possible and do not affect their external appearance (Xu, Eike and Eliette, 2018). The smart textiles of the elderly provide heart rate monitoring and give a warning to the doctor or health care provider in the hospital about his or her emergency condition, which helps them to quickly control the situation (Hanuska *et al*., 2016). Smart socks provide a solution for diabetics by connecting them to sensors that alert the wearer to the position of her feet so that the patient does not have to amputate one of the limbs due to poor circulation (Bipin, Sandeep and Verma, 2011) [10].

After the elderly person is out of the hospital, he must take many medications, and most elderly patients cannot take their medications in time. Smart clothes are equipped with sensors that alert the patient that he has not taken the medication or taken medication. This helps him to take care of his health better (Hanuska *et al*., 2016) [32]. So according

to Brown 2018, smart textiles can grow aging population and make elderly more comfort. However, Care of the child is a very important and stressful situation for the parents and causes them stress especially if the child is newborn. The e-textiles provided intelligent surveillance equipment that could help parents and hospital care professionals to monitor the sound and comfort of the child (Scarano, 2018).

Doctors and participants from health care professionals collect data through laboratory, imaging and other studies to test the effectiveness of new treatment in cancer patients. ”Pros” is a measuring device in clinical trials that is a paper survey or a health tool that reports on results such as sleep quality, activity level, and mood accurately and is difficult to analyze by professional doctors (cox, lane and volchenboum, 2017) [19]. It is a clock remote control device for patients with chronic obstructive pulmonary disease. It has been developed with the help of Spry Health. The wrist strap has been designed for use in the treatment of chronic obstructive pulmonary embolism (COPD) and other chronic conditions This loop have received a permit from the Food and Drug Administration to monitor patients with chronic obstructive pulmonary disease (Draper, 2019) [24].

Monitoring is very important in diabetes mellitus, nervous system science ailment, heart illness and stroke. For instance, one of the wearable innovation items utilized in the distinguishing proof and analysis of illnesses in the cardiology facility is the holder gadget. This gadget stays on the patient for 24-48 hours, and the patient's cardiovascular cadence, heartbeat and pulse esteems can be recorded and observed by means of cathodes. Another instrument utilized in heart infections is cardiovascular pacemaker. According to Wilson, (2016) [73], Cardiovascular pacemaker gives the capacity of the heart by making an electromagnetic field to the heart and giving electrical movement to the heart cited by (Turan, Kaya and Aydin, 2017) [71].

Healthcare professional experts concur that predictable information trade between restorative innovation frameworks and programming arrangements (the wonder is otherwise called interoperability) and further information investigation is urgent to moving from long winded to ceaseless patient consideration. (Wilson, 2016) [73].

Semantic interoperability can likewise wipe out the virtual and physical hindrances to medicinal services learning sharing inside associations and help clinics recognize bottlenecks and oversee resources all the more viably Accurate identification of the patient is one of the most important things in the health centers with the corresponding records of electronic health, in the United States alone every year 200 thousand deaths due to medical errors and 58% of them result from identity errors. (Turan, Kaya and Aydin, 2017) [71].

Another example is the wearable fitness equipment through which the data is analyzed and collected. The doctor monitors the patient's health condition through heart rate and physical activity level and to give the patient the necessary daily calorie intake (Tseng and Qualcomm, 2015) [69]. The gadgets that are intended to be utilized in the control of diabetes and that give insulin as per the glucose proportion in blood by persistently estimating the glucose are generally utilized in the present diabetic patients.

The hand cleanliness checking screen created by (Turan, Kaya and Aydin, 2017) [71]. For the counteractive action of emergency clinic contaminations totally centers on medical attendants' hand washing, is utilized in the avoidance of emergency clinic diseases and appears to have victories. Hand asepsis is given by sending an update if the medical attendant did no wash her hands previously or after the medical caretaker goes into the room through the sensor that can be mounted on the divider and the attendants have. It is seen that these items, which are incorporated into the writing for checking purposes, have been unraveled by a convenient sensor for the treatment of both human services experts and patients.

Despite the fact that medical attendants are not legitimately capable in these treatment and care rehearses identified with debilitated people, they force obligation regarding quiet training about the utilization of the patient's wearable innovation items and the focuses that the individual should focus on. Thusly, they make it obligatory for medical caretakers to know about the utilization of the wearable items and the qualities of the item. (Turan, Kaya and Aydin, 2017) [71].

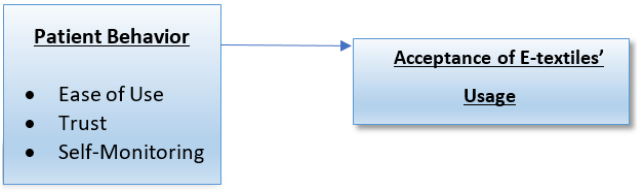
First, according to Mishke (2018), a doctor can quickly create a patient-friendly program using an application based on the patient's needs. Secondly, smart textiles allow for early diagnosis of the condition. This is the most important step for the patient to ensure his safety. Precise medical parameters in these textiles help in early detection of the condition. These systems also help doctors monitor the heart patients for example during rehabilitation periods, as well as the low time of hospitalization (Paradiso *et al*., 2005) [52, 54].

Third, one of the most important features of remote patient monitoring. The doctor can monitor the patient's condition remotely. For example, if the patient is in the hospital and the doctor is in his clinic, these clothes will give the doctor about the patient's health remotely and in real time. And fourthly, monitor the patient remotely. It is very important in hospitals to give the patient a medicine by mistake or not to give it on time. The role of smart textiles here is to inform the doctor through the warnings if the failure to adhere to the administration of drugs. (Mishke, 2018).

Theory Framework Model & Research Hypotheses

The aim of this study is to support patient’s behavior in Lebanon by introducing new technology for health care. In the theoretical framework there are two significant variables, one independent variable is patient’s behavior and the dependent variable is the Acceptance of electronic textile’s usage.

The research model is based on the technology acceptance model of usage of electronic textiles using patient's behavior to use an independent variable containing three constructs, ease of use, trust, and self-monitoring. The figure below shows the research frame model, the figure illustrates the relationship between the two variables of the study.



Theory Framework Model

***Source*:** Developed by the Author for this Research

Fig 1

To study the theory model three hypotheses are going to be examined to emphasize the relationship between the three

constructs of the independent variable patient's behavior: Ease of use, Trust and Self-monitoring and the dependent variable Acceptance of e-textiles' usage. The three hypotheses are:

H1: There is a significant positive relation between ease of use and Acceptance of e-textiles' usage.

H2: There is a significant positive relation between trust and Acceptance of e-textiles' usage.

H3: There is a significant positive relation between self-monitoring and Acceptance of e-textiles' usage.

Methodology

The purpose of this research was to determine the relationship between the two main Variables patient's behavior and acceptance of electronic textiles' usage in Lebanese medical centers. To test the proposed hypotheses and to see the relationship between the Variables, a quantitative methodology was used to measure these relationships via statistics using SPSS. The method of collecting quantitative data is based on mathematical calculations in different formats. They include questionnaires with closed-ended questions, correlation methods, intermediary, and so on. Quantitative methods can be applied in a short period of time, unlike qualitative methods that require time to collect them. Quantitative data makes it easy to compare results because of the high level of standardization.

In this research, information was collected using the survey method. It was analyzed by means of statistics using the SPSS program in addition to data collection from different sources such as books, magazines and site sources. However, the respondents of the questionnaire are patients of all ages, such as adolescents, young people, the elderly and both genders male and female, who suffer from various health problems, to determine their interest in using these textiles in medical centers, and to know which category is most interested in this subject. The adoption of diversity by ages and categories to make the results balanced and more accurate and clearer, and to identify their beliefs in electronic textiles as a user benefit for everyone and easy to use.

The term reliability refers to the extent to which the result is stable and constant (Carmines and Zeller, 1979) [17]. The reliability test is important because it indicates consistency across parts of the measurement tool (Mathonnet et.al, 2007) [44]. A measure and test that can be trusted and relied on must give the same consistent results each time the measurement is repeated (Moser, 1989) [47].

The sample size is one of the elements of research design that researchers take into account in their study plan to achieve statistical considerable results and to guarantee the efficient use of research resources efficiently (Burmeister and Aitken, 2012) [11]. The smallest sample size in multi-variable research should be 10 times greater than the number of variables (Mueller, 1997) [49]. Since the search variables are five, the sample must be equal to 5*10 = 50 respondents.

Finding & Results

After collecting data related to the research literature, data were collected to analyze patients' acceptance of the use of electronic textiles in health care. A survey questionnaire was adopted to collecting data. The survey questionnaire was distributed to 200 patients of different ages and different levels of education using 32 questions the respondents were 110 that was greater than 50 case (the minimum number of the sample size). The questions were posted in Google Forms, through which we were able to see the patients' views on electronic textiles and their acceptance of the use of this technology for health care.

Demographics

Respondents to the questionnaire were of different age groups. The majority of those aged 18 to 24 years were 59.6%, followed by 17.4% for those between the ages of 25 and 35, 8.3% for ages 36 to 44, and 6.4% for those 55 and older, and the lowest proportion was for patients under the age of 18 year 5.5%. However, the survey included both genders males and females. The percentage of females was 63.6% equal to 70 patients and the percentage of males was 35% equal to 40 patients.

The level of education of the respondents was different and the higher some of participants are still students, and their percentage is percentage is for the university students was 78.6%, followed by 8.7% for the higher degree, and following by 11.7% for the secondary degree. While occupation's percentages show the highest 43.1%, followed by the percentage of employees 22.9%. The percentage of non-employees was 12%, followed by the proportion of housewives 10.1% and the lowest percentage was 6.4% for retired. Most of the participants were from the south with 79.8% from the study and 6.5% from Beirut city.

Reliability

Results shows that all constructs mean greater than 3.5 and the decision to use e-textiles mean was 4.2, and these findings confirm that patients are willing to accept smart textile technology and use it in healthcare. The Cronbach's alpha for the three constructs ease of use was 0.85, for trust is 0.86, self- monitoring 0.87, and the dependent variable the acceptance of usage was 0.95, all Cronbach's alpha was greater than 0.7 which is mean that the items of the questionnaire are reliable.

Table 1: constructs descriptive statistics

Construct	Mean	Std. Deviation	Cronbach's alpha
Ease of use	3.76	0.67	0.85
Trust	3.55	0.76	0.86
Self-monitoring	3.83	0.68	0.87
Acceptance of usage	4.03	0.69	0.95

Developed by the author for this research

Hypotheses Testing

H1: There is a significant positive relation between ease of use and Acceptance of e-textiles' usage.

The correlation test between the ease of use and Acceptance of e-textiles' usage has shown a strong relation between the two variables according to the table below. The person correlation is 0.766 and the significant value is 0.001 < 0.05 that indicates a strong positive relation between the two variables, immediately H1 hypothesis is supported. The ease of use shows that patients find the use of electronic textiles is easy according to a very acceptable percentage shown by the questionnaire in the questions, especially the third question about the speed of the use of smart textiles, which got 68.6%.

Table 2

Correlations			
		Ease of use	**Acceptance of e-textiles' usage**
Ease of use	Pearson Correlation	1	.766**
	Sig. (2-tailed)		.000
	N	110	110

**. Correlation is significant at the 0.01 level (2-tailed).

SPSS correlation result of ease of use and Decision to use E-textile.

H2: There is a significant positive relation between trust and Acceptance of e-textiles' usage.

The correlation test between trust and Acceptance of e-textiles' usage has shown a strong relation between the two variables according to the table below. The person correlation is 0.747 and the significant value is 0.001 < 0.05 that indicates a strong positive relation between the two variables, immediately H2 hypothesis is supported.

Table 3

Correlations			
		Trust	**Acceptance of e-textiles' usage**
trust	Pearson Correlation	1	.747**
	Sig. (2-tailed)		.000
	N	110	110

**. Correlation is significant at the 0.01 level (2-tailed).

SPSS correlation results for trust and acceptance

H3: There is a significant positive relation between self-monitoring and Acceptance of e-textiles' usage.

The correlation test between Self-monitoring and Acceptance of e-textiles' usage has shown a strong relation between the two variables according to the table below. The person correlation is 0.829 and the significant value is 0.001 < 0.05 that indicates a strong positive relation between the two variables, immediately H3 hypothesis is supported.

Table 3

Correlations			
		Self-monitoring	**Acceptance of e-textiles' usage**
Self-monitoring	Pearson Correlation	1	.829**
	Sig. (2-tailed)		.000
	N	110	110

**. Correlation is significant at the 0.01 level (2-tailed).

SPSS correlation results for self-monitoring and acceptance.

Conclusions

The main objective of this research is to indicate the acceptance of patients for new medical technology, namely electronic textiles and the extent of acceptance of their use to care for their personal health and see their impact on their behavior. The first part of the study was conducted to demonstrate the importance of using this technology in the medical field and to see the intention of the patients if they are ready to accept the use of electronic textiles.

Based on the findings, it makes sure that technology today is a major part of the medical world, and that patients are willing to accept any new technology that will provide them with a healthier life, especially if they facilitate their daily lives and increase their chances of survival. The opinion of the patients in this research on electronic textiles about their readiness to use was positive and supports this technology significantly. The three research hypotheses were supported by patients due to the high proportion that support the use of electronic textiles in the field of health care.

The first hypothesis H1 was to measure the relationship between the ease of use of this technology and the acceptance of its use. Ease of use was one of the three constructs of this research and was included in the questionnaire to give us the opinion of patients if their ease of use influenced their decision to accept the use of smart textiles.

The results of patients' responses to the questionnaire showed that there is a strong relationship between easy-to-use technology and patient acceptance. Whatever technology is easy to use, it will increase the acceptance of its use by patients. On the contrary, whatever technology is difficult to use will be ignored by patients. As a result, the first hypothesis H1, which showed the strong and strong relationship between impacts of the ease of use of electronic textiles, was supported to accept their use in health care.

The second hypothesis H2 in this study was to learn the relationship between confidence in this technology and its impact on the acceptance of electronic use of textiles and confidence are the second structures in the questionnaire. The results also showed a strong positive relationship between patient confidence in data from electronic textiles and their impact on the acceptance of smart textiles. The more accuracy and reliable the data, the greater the patient's trust in the technology and the greater acceptance. Confidence is a key factor. If electronic textile technology is lacking in data accuracy and mistakes are made in the transmission of patient information, it will make the patient completely away from their use and consider it a danger to his health. Based on the results of the questionnaire and because of the confidence of the large patients in the accuracy of these textiles, the second hypothesis H2 was supported by the strong relationship between the two variables

To move on to the third hypothesis H3 of research, which is to measure the relationship between self-monitoring and its effect on the decision of patients to accept the use of electronic textiles. After examining the questionnaire and its analysis on the third construct, self-monitoring, the results showed positive answers that confirm the self-monitoring of the use of electronic textiles. The patient's monitoring of himself continuously and easily and his constant contact with the doctor, in addition to the alerts received in case of danger increase his desire of the acceptance of the use of electronic textiles for the care of his personal health. Here, the third hypothesis H3 was supported because of the strong positive relationship between the two variables of control and acceptance of the use of electronic textiles.

The results of this study are positive, which confirms that a large proportion of patients are willing to accept the use of electronic textiles in the field of health care, and that it must be available in the Lebanese medical market because of its importance and impact on the lives of patients.

The main objective of this research is to see if the dependent variable is true and supported. The confirmation of the validity of the acceptance of the use of electronic textiles for health care is by confirming the patients as useful and easy to use and their confidence in the data from the chest and help them in self-monitoring and support for this technology confirms the validity of the variable of the research and indicate their acceptance of the use of electronic textiles.

After these results, electronic textiles have a great impact on the lives of patients in the medical field, and it will be a very successful technology and exist in all medical centers if they are available in the Lebanese medical market, especially that it is easy to use and suitable for all ages and categories, So its presence is very necessary and supports the field of medicine and develops towards the best.

Recommendation

After examining the importance of using electronic textiles in healthcare, it is important to consider the importance of this technology in the Lebanese medical market. Healthcare professionals in all Lebanese medical centers should provide electronic textiles to care for patients' health and make them more common to support their use and support the medical field and make it more advanced.

It is necessary to use these electronic textiles in medical centers because of their benefits and to provide time for patients and health care professionals through rapid access to data and reduce patient pressure on the hospital, allowing all to receive timely treatment in particular, Lebanese hospitals, where sometimes there is no empty bed To the patient, and moving to another hospital leads to serious complications that could endanger his life.

It is very important to conduct a more detailed research to see the impact of electronic textiles on doctors and the discovery of their opinion in this technology, because the doctors' support for this technology greatly affects the patient and motivate the use of electronic textiles and increase confidence in them.

The limitations of the study

Some limitations are encountered for this research as in each research in Lebanon, and some suggestions for future studies may provide a useful perspective in generating new research.

The limitations of this study are

- This research depends on the only quantitative method that can enrich the results. The reliance on quantitative and qualitative data collection makes search results more accurate.
- The study may not include all diseases experienced by patients
- This research may not include all medical centers in Lebanon.
- Limited time available to the researcher.
- Conducting a group search will give greater results and allow deeper investigation.

Smart textiles are not water-resistant and here the individual will have difficulty during rain times, thus limiting mobility (Bhattasharjee, 2103) [9]. The cost of these textiles is not covered by insurance in the event of any defect that disrupts them, especially since these clothes are expensive and the consumer has to buy with them, for example, a smart phone, which constitutes excessive expenses (Kashyap, Tuli and Sharma, 2016). And under the Food and Drug Administration Act (FDA), medical devices must be subject to calibration to pass government requirements so its take time to be in the market (Srinivas, 2017).

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