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ACCEPTANCE OF MOBILE TELEDERMOSCOPY OF PRIMARY CARE NURSE PRACTITIONERS IN THE STATE OF ARIZONA

By
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A Thesis Submitted to The Honors College
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Abstract

Currently, skin cancer the most common cancer in the United States. Unfortunately, the incidence of skin cancer is rising and the number of dermatologists who can diagnose and treat skin cancers is shrinking. Teledermatology uses telemedicine, such as a smartphone or the Internet, to diagnose and guide patients with suspicious skin lesions. Mobile teledermoscopy (MTD), a type of teledermatology focuses on the use of smartphones to assess pigmented skin lesions with a dermoscope attachment, and to transmit a lesion image and other data. Dermoscopy is a noninvasive method to diagnose pigmented skin lesions. Prior research has shown that primary care providers are able to use dermoscopy; however, little research has been published on use of dermoscopy by nurse practitioners (NPs) and no research has been conducted on whether or not they would be accepting of MTD. This honors project assessed the acceptance of MTD by primary care NPs in Arizona. The results showed that NPs were accepting of MTD. NPs had a high mean score for the perceived usefulness, perceived ease of use and attitude towards MTD. Facilitators played an important role in determining the intent of an NP to use MTD.
Chapter 1: Introduction to the Clinical Problem

Introduction

Over the past 40 years, there has been a substantial increase in the incidence of skin cancer worldwide (Olivera et al., 2001). Skin cancer is the most common cancer in the United States, with an estimated incidence rate of 3.5 billion cases of nonmelanoma skin cancer (NMSC: basal cell carcinoma [BCC] and squamous cell carcinoma [SCC]) and 76,690 cases of cutaneous melanoma (American Cancer Society, 2013). The prevalence of NMSC is 18-20 times higher than cutaneous melanoma. BCC is the most common cancer worldwide but the mortality rate is exceptionally low (Lomas, Leonardi-Bee and Bath-Hextall, 2012). While melanoma constitutes just 4% of all skin cancers, it causes over 60% of skin cancer deaths (Roebuck, 2006).

Skin Cancer Causes. Increased sun exposure or exposure to ultraviolet radiation (UVR) is a prominent cause of skin cancer. Recent evolutionary changes, such as diminished body hair, have decreased humans’ natural protection from intense year round sun exposure (MacKie, 2005). American society's current culture is another factor that encourages this dangerous trend. Pale-skinned Caucasians find some degree of tan skin to be desirable and therefore increase their sun exposure. Artificial tanning, coupled with natural ultraviolet radiation (UVR) exposure, has become widespread the past 15 years, and has contributed to much higher cumulative levels of UVR exposure than even the current generation's grandparents (2005). Although skin cancer is most commonly diagnosed in Caucasians, it can also occur on darker skin—but with much less frequency. Other factors that contribute to skin cancer causation include, but are not limited to, increased outdoor activities, changes in clothing style, ozone depletion, increased longevity, genetics, immune suppression and easy air travel (Leiter and Garbe, 2008). Skin cancer primary prevention strategies are minimizing sun exposure and sun protection (Oliveria, 2001). Secondary prevention efforts include early detection and excision (2001).
**Skin Cancer Types.** Skin cancer is a broad term that encompasses two main types: Melanoma and NMSC. Main types of NMSC are SCC and BCC. The subtypes of BCC are superficial, nodular, multifocal, morphoeic (the most invasive), ulcerated, pigmented (often confused with cutaneous melanoma) and cystic (Bath-Hextall, 2007). Melanoma can be divided into four major types: superficial spreading melanoma (SSM), nodular melanoma (NM), lentigo maligna melanoma (LMM), and acral lentiginous melanoma (ALM) (Roebuck, 2006). SSM comprises 70% of diagnosed cutaneous melanoma. SSM grows slowly and is a superficial skin cancer, conferring a good prognosis (increased survival) (2006). NM comprises only 15% of diagnosed melanoma and grows rapidly via a vertical growth pattern, conferring a poorer prognosis (2006). LMM comprises 10% of diagnosed melanoma and has a good prognosis because it is slow growing and normally remains in the epidermis. ALM comprises 5% of diagnosed melanoma and has a poor prognosis because of its rarity, late presentation, and typical occurrence in darker skinned individuals and on non-sun-exposed areas (e.g., soles of feet, palms of hands, nail beds) (2006).

**Skin Cancer Clinical Characteristics.** Understanding the clinical characteristics of skin cancers is important in order to distinguish a malignant lesion from a benign lesion. Predisposing factors of SCC include chronic sun-induced damage (otherwise known as photoaging) and traumatic damage resulting in scars. Photoaging can evolve into actinic keratoses (AKs), which are potential precursors of SCC; however, not all SCC arises from AKs (MacKie, 2005). The
progression rate from an AK to SCC is approximately 0.025% to 20% (Bath-Hextall, 2007). SCC has a red, patchy, scaly appearance (Berman, 2011). SCC is commonly found on the back of the hands and forearms as well as the head and neck (two areas that receive maximum sun exposure) (Firnhaber, 2012). Figure 1 is an example of a low risk SCC.

Approximately 80% of BCC diagnosed in Americans occurs on the head and neck (Kim and Armstrong, 2012). The remaining percentage of BCC can be found on the nose and in other areas that receive little or no UVR exposure (Firnhaber, 2012). There is no precursor lesion for BCCs (MacKie, 2005). The appearance of BCC varies; it most commonly appears as a convex lesion with a pearly white or pink color (Firnhaber, 2012). BCC is also known for having small, dilated blood vessels near the surface of the lesion (also known as telangiectasia) that develop as the lesion grows (2012). Some BCC having a black, brown or blue color mimic melanoma (2012). Figure 2 is an example of a low risk BCC.

Immunosuppressed individuals are more likely to get BCC and SCC, 10 and 100 times more likely respectively (Mudigonda, 2013). The pharmacological suppression of the immune system increases the risk of skin cancer, one particular at-risk population is patients receiving organ transplantation (Greenberg 2011). The overall skin cancer risk is dependent on the dosage, duration and the type of immunosuppressive therapy; for example, heart transplant recipients have the greatest risk of skin cancer because of the greater intensity of the immunosuppression (2011). SCCs are more aggressive in these immunosuppressed individuals.
Approximately 30% of all cutaneous melanoma evolves from a pre-existing nevus, although a majority of melanocytic nevi do not develop into melanoma (MacKie, 2005). Melanomas that do not evolve from an existing nevus are considered de novo. Melanoma exhibits variation in color and texture. For example, melanoma can be flat or pedunculated. It can be black, purple, pink, red, tan, brown or colorless (Roebuck, 2006). When diagnosing and screening for cutaneous melanoma, it is important for healthcare providers to be knowledgeable of the ABCDE mnemonic (A=asymmetrical shape, B=irregular border, C=mottled color, D=large diameter, and E=elevation/enlargement/evolving (Roebuck, 2006)). It is also essential for health providers to remember that while most melanoma reflects the mnemonic, the appearance of cutaneous melanoma is variable and can take on many different shapes, sizes and colors. Figure 3 is an example of cutaneous melanoma.

**Prognosis.** For SCC, the 5-year recurrence rate is affected by the anatomical site, depth of tumor and degree of differentiation of the lesion (Bath-Hextall, 2007). For example, a SCC with a diameter greater than 2 cm has a recurrence rate twice that is twice that of a SCC less than 2 cm (2007). The potential for SCC to metastasize can be anywhere from 0.5% to 40% (2007). A SCC found on the ear or the lips has 2 to 3 times the 5-year reoccurrence rate than other anatomical sites (2007).

As a slow growing skin cancer, BCC rarely metastasizes, averaging from a 0.0028% probability to 0.55%. The possibility of this occurrence is strongly correlated to tumor size (Kim and Armstrong, 2012). The larger the tumor, the more likely is its potential to metastasize. For
instance, tumors that are 5 cm in diameter have a 25% chance of metastasizing while tumors that are 10 cm have a 50% chance (2012). BCC has a 20% possibility of reoccurring after 1 year and the average reoccurrence rate after 5 years is 8.7% (2012).

Approximately 90% of melanoma is diagnosed as a primary tumor with no evidence of metastasis (Mervic, 2012). The most important staging and prognosis factors of cutaneous melanoma, as determined by the American Joint Committee on Cancer, is the Breslow tumor thickness, mitotic rate and presence or absence of ulceration (2012). Breslow tumor thickness is defined and measured from the upper part of the granular layer to the melanoma cell that is located the deepest (2012). Considered the strongest prognostic factor, the Breslow tumor thickness demonstrates a trend where the thinnest tumors are low risk and the largest tumors are high risk (2012). For example, tumors thinner than 0.76 mm are considered low risk while tumors above 4.0 mm are considered high risk (2012). The 10-year survival rate for individuals with thin, non-ulcerated melanoma with less than 1 mitosis/mm² is 93% but decreases to 39% for individuals with deep and ulcerated primary tumors (2012). Essentially, there is a strong correlation between the depth of the tumor and the survival rate of cutaneous melanoma.

Fortunately, if melanoma is diagnosed early and if the malignant cells are only found in the epidermis, most deaths from cutaneous melanoma can be prevented by surgically removing the malignant cells (Brown, 2000).

Healthcare Providers and Skin Cancer

Early diagnosis of skin cancer is critical for a good prognosis. Early diagnosis is the responsibility of not only dermatologists, but other health care providers including NPs (Loescher, Harris, Curiel-Lewandrowski, 2011).
**Dermatologists.** Dermatologists have the best skin cancer diagnostic accuracy when compared to non-dermatologists (Corbo 2012). For example, one image-based (25 images of benign or malignant skin lesions) survey of dermatologists and nondermatologists showed that dermatologists’ average sensitivities, specificities, and diagnostic accuracies were 0.79, 0.77, and 0.71, whereas the non-dermatologists’ were 0.61, 0.62 and 0.53 (2012). Corbo et al. also noted that non-dermatologists were less likely to biopsy the suspected malignant lesion and instead refer the patient to a specialist (2012).

While the trend of advanced practice providers has been steadily increasing, there are still only 3.6 dermatologists per 100,000 people (Slade, 2012). In fact, the approximate wait time for a patient to be seen in a dermatology office is 36 days (Uhlenhake, 2009). The current dermatological specialists cannot support the influx of referrals from other providers because even patients who report changes in pigmented lesions have to wait for an average of 38.9 days (Slade, 2012). Practices that employed NPs or physician assistants, on the other hand, reduced the wait time for changed pigmented lesions to an average of 33.9 days (2012). This demonstrates that having NPs on a dermatology team decrease the waiting time for patients and can directly improve health outcomes (2012).

**Nurse practitioners.** NPs have the potential to be ideal dermatology healthcare providers when they receive the appropriate education. Compared to general physicians (PCPs) during wellness exams, general NPs perform more patient screening and provide more counseling services (Furfaro, 2008). NPs deliver the same quality of care and receive a higher level of satisfaction from both the patient and the family (Schuttelaar, 2010). One observation from Schuttelaar regarding the difference concerning the patients’ satisfaction among the different providers is that an NP is more likely to treat the family as well as the patient (2010). NPs also had time for longer consultations and more chances for education (2010). Unfortunately, there
are very few opportunities for NPs to receive formalized specialty training for skin cancer screening (Slade, 2012). Skin cancer training options currently consist of a specialty examination offered by the Dermatology Nurses’ Association (including 3,000 hours of practice in a dermatology setting along with an examination), one NP dermatology fellowship and a one-year dermatology residency program for DNP students (2012).

**Dermoscopy & Teledermoscopy**

In an effort to handle the demand for dermatology services, healthcare providers, including both dermatologists and NPs, have been using a variety of creative resources to meet their patient’s needs. These resources include dermoscopy and teledermoscopy.

When diagnosing BCC, SCC, and cutaneous melanoma, the only truly accurate method is histological examination. Benign, pigmented skin lesions can easily be confused with a malignant lesion. Unfortunately, taking a biopsy of every pigmented skin lesion is often unneeded, expensive and impractical (Brown, 2000). Dermoscopy, otherwise known as epiluminescence microscopy (ELM), is a noninvasive, advanced examination tool that gives the provider a better image of the skin and help with the diagnosis of the lesion without taking a biopsy (Brown, 2000). Dermoscopy makes this possible by examining the subsurface of the skin with handheld microscope (dermoscope) that functions to reduce the amount of light reflected, refracted and diffracted on the skin (Benvenuto-Andrade, 2007). Reflection occurs when the light hits the skin and is reflected off of the skin at the same exact angle. Refraction occurs when the light reaches the medium, or the skin, and has a change of direction. A medium is the “intervening substance” that redirects the light. Diffraction is when the light passes through the medium, or around the medium, and has an altered path. There are three forms of dermoscopy, polarized, non-polarized and cross-polarized dermoscopy. In order to understand these different types of dermoscopy, it is important to note that polarization is a type of orientation of the
regular fluctuations in a wave (Behavior of Waves, 2013). Non-polarized light, or regular light, does not have the regularity and consistency that polarized light has and varies in its intensity (2013). Cross-polarized light, on the other hand, is a combination of two types of polarized light: horizontal and vertical (Glossary: Cross Polarized Light, 2013). This particular light stops light from reflecting off of the superficial layer of the skin and allows inner pigments and capillary blood vessels to be seen (Wang, 2011). Non-polarized dermoscopy involves an oil immersion along with the use of the dermoscope, which allows the stratum corneum, or the outermost layer of the epidermis, to become transparent to light (Brown, 2000). Polarized dermoscopy uses a dermoscope with polarized light in order to visualize deep skin structures (Benvenuto-Andrade, 2007). Another benefit of dermoscopy is the ability to enhance and magnify the image for a closer and clearer image of the lesion, which makes identification of critical features easier (Brown, 2000). Instead of excising every questionable lesion, dermoscopy offers an alternative-screening tool that permits dermatologists to have a better understanding as to whether or not the lesion is cancerous.

SIAscopy, or spectrophotometric intracutaneous analysis, is the use of visible and infra-red light to determine the skin’s composition, concentration, and position of multiple chromophores (Govindan et al., 2007). More specifically, an SIAscope allows the viewer to see the quality of collagen of the skin, the vasculature of the skin as well as the distribution and quality of melanin (2007).
Teledermoscopy is known as the transfer of clinical and dermoscopic images of pigmented skin lesions through telecommunication networks such as email and the Internet (Massone, 2008). Teledermatology is a subcategory of telemedicine. The first success story for telemedicine occurred in 1906 when Wilhelm Einthoven created the telecardiogram by successfully sending an electrocardiogram through a telephone network (Kanthraj, 2011). Telemedicine has a history that spans across the past five decades, and naturally has developed over the years as new technological advances reach the world. According to Whitten and Sypher, these advances can be categorized in three generations. These generations are labeled the following: synchronous versus asynchronous modalities, data transfer and storage, and automating decision-making and using robotics (Whitten and Sypher, 2006).

The synchronous versus asynchronous modalities generation included the 1960s, 1970s and the 1980s. Asynchronous telemedicine included "store and forward," which was the first form of teledermatology (Kanthraj, 2011). Synchronous models of telemedicine became a more primary focus later on during this generation and included videoconferencing (2006). An example would be the Nebraska Project where, in 1959, a videoconference was held for psychiatry patients between two hospitals (2011).

The second generation, or data transfer and storage, consists of the 1990s and was one of the fastest growing periods for telemedicine (2006). This generation is known for expanding from a data only modality, where the data from a medical device being used in a hospital is stored at that particular hospital, to manipulating and managing data by transferring it to other hospitals and offices (2006). One example from teledermatology for this generation would be mobile teledermoscopy.

The final, and current generation of telemedicine is automatic decision-making and using robotics (2006). One example of automatic decision-making would be using computer
intelligence and a knowledge base to create a program that would help avoid prescribing medications to patients that would create adverse reactions (2006). An example of using robotics would be telesurgery and the use of a robotic arm to aid surgeons during surgery (2006).

Mobile teledermoscopy (MTD) uses cellular devices to capture images of pigmented skin lesions and send them to a dermatologist for teleconsultation (Massone, 2008). MTD allows for the possibility of managing patients with emergent skin diseases without scheduling an appointment for the patient to come into the office (Massone, 2008). It serves as a filtering or triage system for the dermatology office to not only help ease the burden of new patients but to also decrease the financial burden of having to pay for a visit to a skin cancer clinic when it is unnecessary (Moreno-Rameriz, 2009). Patients who had a teledermatology consultation were also more likely to have an earlier diagnosis by biopsy and definitive treatment (Hsiao, 2008). The diagnostic accuracy of the teledermatologist is comparable to the dermatologist or the dermatology NP who provides a conventional consultation (Hsiao, 2008). In one study, 160 adult dermatology patients agreed to undergo a conventional consultation. They captured their dermatologic symptoms on a digital camera to be diagnosed by an off-site dermatologist. When compared, approximately 80% of the diagnoses between the on-site dermatologist and the off-site dermatologist were similar (Kvedar, 1997). Another study compared the accuracy of mobile teledermoscopy between two teledermatologists as well as a face to face consultation (Ebner, 2008). The results revealed that three out of four cases telediagnosis were in an agreement with a face to face consultation (2008). The diagnosis agreement between the two teledermatologists was approximately 74% (2008).

There is a lack of literature regarding the teledermoscopy acceptance of NPs as well as their response to MTD. Some insight may be gained regarding NPs’ potential acceptance by looking at the literature of nurses and their acceptance of other technology. One study that
measured the nurses’ acceptance of mobile electronic medical record systems (MEMR), found that the nurses are more optimistic about new technology only if it has an easily perceived use (Kuo 2013). The authors also noted that nurses had a higher discomfort with new technology in general and were more likely to have less computer literacy, leading to more computer anxiety (2013). The authors concluded that nurses would benefit from being exposed to more compatible and simple technologies, in order to gain confidence, as well as educational classes that teach the use of the new technology (2013). Another study of nurses’ acceptance of a bar code medication administration system noted that nurses were more adaptive to the new technology when it was proven to increase patient safety (Morriss 2009). Conversely, new technology can take more time for a nurse to use and therefore can distract from other tasks (2009).

**Purpose Statement**

The purpose of this research was to assess the acceptance of MTD by primary care NPs in the state of Arizona. Specifically, the project will determine the technological context factors, individual context factors and organizational context factors that influence NPs’ intention to use MTD.
Chapter 2: Review of Literature and Evidence and Conceptual Model

It is the responsibility of the healthcare community and the government to ensure an equal and sufficient distribution of resources. It is impossible for the current dermatologic community to support the growing population of persons with skin cancer. Therefore, it is important that the current system expands to other practitioners and considers other options of skin lesion assessment, such as MTD. It is also important to determine the acceptance of technology, and in particular, teledermoscopy, by the primary care providers. This thesis focuses NPs’ acceptance of MTD. This chapter consists of a literature review of how nurses perceive technology, barriers to skin examinations, nurse practitioners and dermoscopy as well as a synthesis of the literature review.

Literature Review

The objective of this literature review is to provide rationale for a study of acceptance of MTD by primary care NPs in the state of Arizona. It is also important to assess for barriers for screening because this can be considered a parallel action to using MTD as well as other factors. This literature review is necessary because it will provide background evidence and information. The literature search strategy focused on the following subjects: nurses and technology, barriers and NPs and dermoscopy. For nurses and technology, the following key words were used: “nurse,” “technology,” “screening,” and “dermoscopy.” For barriers, the key words were: “skin cancer screening” and “barriers.” For NPs and dermoscopy, the key words were: “nurse practitioner,” “teledermoscopy,” “dermoscopy,” “microscopy” and “technology.” There were no limitations on the year because there was scarce information about the acceptance for technology and NPs. Other PCPs were included in the search as well to provide a parallel comparison for how NPs would interact with technology. This literature review starts out with a broad topic,
nurses and technology, and becomes more specific, with NPs and dermoscopy. The search limits included English language and humans.

Findings of the literature review search were further assessed by objectives and purpose, the sample population, sample size, sample demographics, modality, factors measured, results, and implications (Appendix A). The table located in Appendix A compares the various articles reviewed. A synthesis of the table provides the identification of the strengths and weaknesses of the articles as well as possible improvements that should be addressed.

**Synthesis of literature review**

There is no information about MTD acceptance by NPs. The goal of this literature review was gain some insight to this question by looking at research done with nurses and technology, barriers to skin examinations and nurse practitioners and dermoscopy.

**Nurses and technology.** From the literature review articles collected, the authors Govindan et al. (2006) and Phelan & Heneghan (2008) either directly or indirectly focused on nurses’ technology use and acceptance. Both articles focused on different aspects of technology. Govindan et al. (2006) focused on advanced nurse specialists’ use of the SIAscope and triaging patients. Phelan & Heneghan (2008) focused on determining the level of participation that dermatology nurses have in screening and skin cancer detection, but also on assessing the nurses’ confidence and use of technology in the dermatology setting. The primary objective of Govindan et al. (2006) was to assess the effectiveness of the SIAscope; it was also an indirect perspective on how the advanced nurse specialists used the technology and were able to notice that 3 suspicious lesions were melanoma and identified otherwise. The sample population in the Govindan et al. (2006) study drew from advanced nurse specialists. Phelan and Heneghan (2008), on the other hand, had a more diverse sample population that consisted of nurses, NPs
and LPNs. Other strengths of Phelan and Heneghan’s research were large sample size (approximately 135 nurses) and the broad range of data received from the surveys. Due to the fact that Govindan et al. (2006) did not formally address the fact that advanced nurse specialists used the SIAscope, there is no nurse-specific data or sample to comment on. Instead, one can infer that the advanced nurse specialists using the technology were comfortable and effective enough with the technology to be able to use the SIAscope without affecting the quality of data. Both articles demonstrate that nurses are familiar with technology and have been using technology in the health care setting.

**Barriers to skin examinations.** Studies by Oliveria et al (2011) and Furfaro et al (2008) focused on determining the barriers that NPs and other healthcare providers experience while providing skin examinations and skin cancer screenings. Both studies used surveys to determine the barriers. Oliveria et al (2011) used a 4-point scale, with a score of 1= “not a factor and a score of 4= “major factor” to score listed barriers to skin examination. Alternatively, Furfaro et al (2008) asked participants to rank barriers from 1, the most significant barrier, to 5, the least significant barrier. The sample for Oliveria consisted of family practitioners, internists and dermatologists (n=2,999). The sample for Furfaro et al (2008) only included NPs from the states of Illinois and California (n=200). Both Oliveria et al (2011) and Furfaro et al (2008) had similar results: the two most significant barriers to skin examinations were the provider’s time limitations and embarrassment (due to the location of the lesion) for both the patient and the provider. The least significant barrier, according to Furfaro et al (2008), was the belief that a skin assessment was not in the practitioner’s scope of practice. A strength of both studies was that they queried respondents to add additional barriers. This ensured that all of the potential barriers were recorded and analyzed. Oliveria et al (2011) identified barriers and facilitators to providers conducting skin cancer screenings. A weakness of the study by Furfaro et al. (2008) was that the
sample, although comprised of NPs, could include a more diverse range of NPs from different states. A weakness of the Oliveria et al, (2011) study was that it does not assess specifically for NPs, which would benefit this proposed project.

**Nurse practitioners and dermoscopy.** According to Chau and Hu, the more a new technology can improve efficiency in work, the more likely healthcare providers are to use it (2011). The primary objective of studies by Westerhoff et al. (2000) and Argenziano et al. (2006) was to determine whether or not dermoscopy increases the diagnostic accuracy (or identifying the correct diagnosis for the lesion) of the healthcare providers. The goal of Argenziano et al. (2006) was to determine whether or not dermoscopy would improve the accuracy of triaging suspicious lesions. The sample consisted of PCPs in Naples, Italy and Barcelona, Spain. The sample participated in a one-day training course in skin cancer detection and dermoscopy. They were then randomly assigned to a dermoscopy group or the “naked-eye,” or control group. During a 16-month evaluation, 2,522 patients were seen with skin lesions. The PCPs scored these lesions as benign or suspicious of skin cancer. Later on, these patients were assessed at clinics for pigmented lesions in order to determine the PCPs’ accuracy. It was determined that 79.2% of the cases with lesions of suggestive skin cancer were correctly determined by the dermoscopy group—indicating that dermoscopes can be used in a clinical setting for appropriate triage. Westerhoff et al. (2000)’s study objective was to determine whether or not dermoscopy would increase the diagnostic accuracy of melanoma. The sample population consisted of 74 practicing PCPs from Sydney, Australia and was recruited over the phone. Only PCPs with no formal training with dermoscopy were selected. The PCPs were asked to take a pre-test and a post-test that contained clinical and dermoscopy images. The PCPs were tested on various pictures of lesions and diagnose them accordingly. During the test, the PCPs were asked to diagnose all of the lesions and were blinded as to whether or not they were a part
of the dermoscopy intervention or the control group. There was significant improvement of dermoscopic melanoma diagnoses (75.9%) compared to the clinical melanoma diagnoses (62.7%). This shows that dermoscopy can improve the accuracy of the diagnosis of melanoma. The strengths of both of these studies are that they include large samples and both randomly assigned PCPs to groups. Diagnostic accuracy is an important factor because health care providers are more willing to accept technology that facilitates their work (Chau and Hu, 2011). Health care providers were used in this literary review because they are a parallel population to NPs.

Due to the fact that there is limited information about NPs and dermoscopy, another way to gain some insight into this perspective is to determine the feasibility of consumer mobile teledermoscopy. A feasibility study by Janda et al. (2012) had a primary focus on consumer MTD as an adjunct to skin self-examination. Consumers are similar to inexperienced NPs beginning to use and learn about teledermoscopy. The sample population was pulled from a prior experiment, the Princess Alexandra Hospital Nevi Surveillance Study, and included 10 participants who had a personal or familial history with melanoma or multiple moles and atypical nevi. The participants were given information to take home about the asymmetry-color (AC) rule and skin self-examination (SSE) instructions. They were also given a mobile teledermoscope, which was an iPhone 3 and a dermoscopic attachment called a Handyscope. Out of the 66 photographs that were collected, 88% were of good quality and allowed for a telediagnosis from the dermoscopy expert. This research study implies that MTD is feasible and can produce a good outcome when the necessary education is provided. One weakness was the study only had 10 participants. Strengths are that the study focused specifically on MTD and included patients who had no experience using an iPhone.
Conceptual Model: Teledermatology Technology Acceptance Model

While the overall cost and effectiveness is important when attempting to introduce new technology into the healthcare setting, it is also important to determine the overall acceptance of this new technology by healthcare providers. Davis created the technology acceptance model (TAM) in 1989 (Davis, 1989) to determine why a person's unwillingness conflicts with technology that has otherwise shown promise (1989). His goal was to create a better way to determine better measures for predicting and explaining use. The TAM is based on the theory of reasoned action (TRA) (Yarbrough, 2007). The TRA states that beliefs influence attitudes, which determine intentions, and these intentions determine behavior (Fishbein & Ajzen, 1975). The primary concepts that Davis uses for the TAM are perceived usefulness and perceived ease of use (Davis, 1989). Perceived usefulness (PU) is the idea that people are less likely to use technology if it does not help them perform their job better. Perceived ease of use (PEU) is the notion that the application will allow the user to use less effort while still having optimal performance. The TAM has been shown to be non-biased towards gender, technological competency, culture and age (Yarbrough, 2007). The main conflict, using TAM though, is that the model does not take into consideration external barriers and variables (2007). Figure 5 illustrates the concepts of Davis’ TAM and their inter-relationships.

Figure 5. The original TAM. (Yarbrough & Smith, 2007).
A more recent TAM, created by Orruño, Gagnon, Asua and Abdeljelil (2011), focuses on the acceptance of teledermatology. The Teledermatology Acceptance Model (TeleTAM) was created using the various theories, such as the United Theory of Acceptance and Use of Technology (UTAUT), Chau and Hu's model of telemedicine acceptance, TAM and the concept of habit. UTAUT is a theory that is based off of the theoretical framework of behavior adoption and is composed of four parts that pertain to the intention and use of technology: performance expectancy, effort expectancy, social influence, and facilitating conditions (2011). Chau and Hu's model of telemedicine acceptance incorporates three: the individual context, the technological context and the organizational context. These can be further divided into constructs. The individual context contains the constructs of Attitude, and Compatibility (2011). The technological context is similar to the TAM and encompasses the PU and the PEU constructs but it also includes Habit (2011). Habit is defined as a behavior that has become routine (2011). The organizational includes Subjective Norm, or the extent of which individuals who are attempting this new system will receive the encouragement and support from the people who are important to them. The organizational context also includes Facilitators, or facilitating conditions, such as the system or the business, that help the individual use the system (2011). When the TeleTAM was used, it was noted by the authors that although there was a positive attitude towards the technology, this did not necessarily mean that the PCP would adopt the practice (2011). Figure 6 illustrates the relationships between the multiple theories used to create the foundation of the TeleTAM.
Summary and Goals of Honors Project

The goal of the literature review is to obtain information that can better help this honors student assess the acceptance rate of MTD by primary care NPs. Unfortunately, there were no specific studies that focused on the acceptance rate of MTD. Instead, the literature review focused on the diagnostic accuracy and the possible barriers to using MTD in order to provide background evidence and information to support the feasibility of a NP using MTD. The proposed honors project will determine the acceptance rate of MTD by primary care NPs by using the TeleTAM questionnaire that will be sent out to Arizona NPs.

Figure 6. The modified TeleTAM. (Orruno, Gagnon, Asua & Abdeljelil, 2011).
Chapter 3: Methods

This chapter describes the methods used to determine acceptance of MTD Arizona by NPs. Included is information about the survey design, sample, recruitment, survey and survey procedures, and human subjects procedures.

Design

This study utilized a cross sectional design. A cross sectional survey collects information from a population over a specific point in time (Cherry, 2014). Cross sectional studies are also considered descriptive studies, or observational studies (2014).

Sample

This study did not involve vulnerable populations. The sample was comprised of Arizona NPs who are certified in adult, family, gerontologic or adult-gerontoloical practice. These NPs will have obtained at least their Master’s degree and there will be no age restrictions. Participants were recruited through the following listservs: the Coalition of Arizona Nurses in Advanced Practice (CAZNAP) listserv and the Southeastern Arizona and Advanced Practice Nurse/Nurse Practitioner Society (SAZAPN) listserv. A listserv is a tool that distributes emails to subscribers on a mailing list. The honors student contacted via email, the Webmaster of each listserv identified to help facilitate this project. The Webmasters disseminated the recruitment email with the link to the survey through the listservs. The recruitment email is in Appendix E. The contingency plan for recruitment was if recruitment from is the listservs was not sufficient, then the honors student would contact the directors of the DNP programs at the University of Arizona College of Nursing and Arizona State University to request to place an announcement of the study on the DNP student listservs. Any NP completing the survey constituted a study
participant. If the NP failed to complete the survey in its entirety or fails to submit it on time, then the survey was ineligible for analysis.

**Setting**

This research was conducted virtually through the Internet via an electronic survey provided by Qualtrics. Using the Internet when conducting research is a cost effective way of recruiting, collecting data, and analyzing data (Williams, 2012). It also allows for individuals to access the survey that would have otherwise been unable to due to time constraints and distance (2012). Ethical concerns that pertained to using the Internet include data security and confidentiality (2012). There was also less control over the testing setting but the research focused on primary care NPs throughout Arizona who took the survey on their own computers.

**Survey**

The assessment of NPs’ acceptance of MTD was accomplished using an online survey that was adapted from an existing questionnaire provided by Orruño, Gagnon, Asua and Abdeljelil and is called the “Questionnaire for the Evaluation of Health Professionals’ Acceptance of Teledermatology” (2011). The survey (see Appendix B) is based on the Teledermatology Acceptance Model. The model indicates that certain personal, technology and healthcare provider practice-related factors (constructs) (perceived usefulness, perceived ease of use, compatibility, facilitators, subjective norm, habit, attitude and the intention to use) are associated with acceptance of skin assessment technology. The 33 items on the survey measured these factors. These items are scored on a 7-point Likert-type scale with response options ranging from strongly disagree (define low anchor) to totally agree (define high anchor). The survey also contained demographic information (i.e., age, NP gender, certification, professional experience and education). The survey took about 10 minutes to complete. This honors student obtained permission to adapt the teledermatology acceptance survey (Appendix C).
The free version of Qualtrics, a commercial survey software program, was used to create surveys and create a link to the survey that was emailed on the listservs. Qualtrics enabled surveys to be set up in existing templates, created a link to access the survey, and allowed data from the survey to be exported directly into Excel format. A disclaimer was at the beginning of the survey and consent was obtained with the completion and submission of the survey.

This honors student adapted the survey in the following ways: (1) added the description of MTD, a photograph of the mobile teledermoscopy device, and clinical case that provides an exemplar of MTD use; (2) change the term “teledermatology” in the items to “mobile teledermoscopy”; (3) created the survey online using Qualtrics supplied by the University of Arizona. The survey was constructed so that participants have to enter a response to each to progress through the survey. We believed that this approach does not compromise the respondents’ anonymity because we did not ask them about geographic location of practice or name of practice.

Procedures

The investigators asked the Coalition of Arizona Nurses in Advanced Practice (CAZNAP) contact person and the Southeastern Arizona and Advance Practice Nurse/Nurse Practitioner (SAZAPN) contact persons to place an email out to the listservs with the information about the study and the link to the survey. Any NP that read the disclaimer and proceeds to complete the survey constitutes a study participant. The disclaimer provided a summary of the study as well as reassured potential participants that they do not have to participate in the research if they are uncomfortable and may drop out at any point. If the NP failed to submit the survey, then the survey was ineligible for analysis. There was no potential for coercion or undue influence because the participants were anonymous and were not receiving any form of payment.
for participating. The study participant did not lose access to either listserv if they did not participate in the study.

This survey required IRB approval because if the honors student chooses to, she could identify participants through their IP addresses. In addition, this honors student has a desire to publish the results.

**Data Analysis Procedures**

Data exported into Excel was exported into SPSS for data analysis. SPSS is a program that features data management, data documentation as well as statistical analysis. Data were analyzed by the honors student. The data analysis consisted of descriptive statistics, such as: frequencies, measures of central tendency, standard deviation. The total mean score for each subscale, or construct, were calculated as well.

**Human Subjects Procedures**

The honors student and her advisor (Dr. Loescher) received approval for this project from the University of Arizona Institutional Review Board (IRB). The consent form contained a statement that participation is voluntary and any participant that refuses to enter or complete the survey will not receive any penalty or loss of benefits from the professional organizations that are home to the listservs. It also stated that the participant can discontinue the study at any time. (Appendix D).
Chapter 4: Results

This chapter addresses the results of the MTD acceptance survey. These results consist of the mean scores of the demographics, the survey items and the TeleTam constructs.

Sample

Table 1 shows the demographic characteristics of the participants. The final sample size consisted of 51 NPs. Of the 57 NPs who opened the survey, five were dropped from analysis due to incompletion of the survey and one was removed because she was a student.

Table 1.

Demographic Characteristics of the Sample

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>48</td>
<td>94.1</td>
</tr>
<tr>
<td>Men</td>
<td>3</td>
<td>5.9</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;30 y</td>
<td>2</td>
<td>3.9</td>
</tr>
<tr>
<td>30-39 y</td>
<td>9</td>
<td>17.7</td>
</tr>
<tr>
<td>40-49 y</td>
<td>12</td>
<td>23.5</td>
</tr>
<tr>
<td>50-59 y</td>
<td>24</td>
<td>47.1</td>
</tr>
<tr>
<td>&gt;60 y</td>
<td>4</td>
<td>7.8</td>
</tr>
<tr>
<td>NP Certification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FNP</td>
<td>39</td>
<td>76.5</td>
</tr>
<tr>
<td>ANP</td>
<td>5</td>
<td>9.8</td>
</tr>
<tr>
<td>GNP</td>
<td>2</td>
<td>3.9</td>
</tr>
<tr>
<td>FNP + GNP</td>
<td>1</td>
<td>2.0</td>
</tr>
<tr>
<td>FNP + ANP</td>
<td>3</td>
<td>5.9</td>
</tr>
<tr>
<td>ANP + GNP</td>
<td>1</td>
<td>2.0</td>
</tr>
<tr>
<td>Type of NP Practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>38</td>
<td>74.5</td>
</tr>
<tr>
<td>Individual</td>
<td>13</td>
<td>25.5</td>
</tr>
<tr>
<td>Highest Degree Obtained</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Masters</td>
<td>38</td>
<td>74.5</td>
</tr>
<tr>
<td>DNP</td>
<td>10</td>
<td>19.6</td>
</tr>
<tr>
<td>PhD</td>
<td>2</td>
<td>3.9</td>
</tr>
</tbody>
</table>

Survey

The cross-sectional online survey was activated on March 31st 2014. Fifteen responses were obtained within a span of 3 days. Eleven responses were recorded all on April 2nd 2014, 3
responses were recorded on April 3\textsuperscript{rd} and then 1 response was recorded on April 5\textsuperscript{th}. After the first few days of the survey being active, all of the traffic on the survey ceased. The honors student re-emailed the Webmasters on April 19\textsuperscript{th} 2014 to request that the Webmasters resend the survey link to the Listservs again. After this, on April 22\textsuperscript{nd} 2014, 39 responses were received and the honors student exported the data to SPSS.

\textbf{Items}

Table 2 shows the mean scores and standard deviation of the 33 survey items that were assessed on the online survey. The item with the lowest mean score was Item 19. The item with the highest mean score was Item 3. Table 3 shows the mean scale scores for the constructs of the TeleTam.
<table>
<thead>
<tr>
<th>Item</th>
<th>Mean Score</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 I feel comfortable with information and communication technologies.</td>
<td>5.90</td>
<td>.922</td>
</tr>
<tr>
<td>2 Mobile teledermoscopy could help me to diagnose my patients more rapidly</td>
<td>5.84</td>
<td>1.03</td>
</tr>
<tr>
<td>3 I think that I could easily learn how to use mobile teledermoscopy</td>
<td>6.25</td>
<td>.688</td>
</tr>
<tr>
<td>4 I think it is a good idea to use mobile teledermoscopy for the diagnosis of my patients’ skin lesions</td>
<td>5.90</td>
<td>.900</td>
</tr>
<tr>
<td>5 I have the intention to use mobile teledermoscopy when it will be available in my center</td>
<td>4.31</td>
<td>1.61</td>
</tr>
<tr>
<td>6 The use of mobile teledermoscopy may involve major changes in my clinical practice</td>
<td>4.55</td>
<td>1.68</td>
</tr>
<tr>
<td>7 The use of mobile teledermoscopy may improve the diagnosis of my patients</td>
<td>5.82</td>
<td>1.01</td>
</tr>
<tr>
<td>8 I think it would be easy to perform the tasks necessary for the diagnosis and management of my patients using mobile teledermoscopy</td>
<td>5.76</td>
<td>1.07</td>
</tr>
<tr>
<td>9 Most of my patients will welcome that I use mobile teledermoscopy</td>
<td>5.51</td>
<td>1.08</td>
</tr>
<tr>
<td>10 I think that my center has the necessary infrastructure to support my use of mobile teledermoscopy</td>
<td>4.57</td>
<td>1.70</td>
</tr>
<tr>
<td>11 Mobile teledermoscopy could help me get the most out of my time</td>
<td>5.06</td>
<td>1.32</td>
</tr>
<tr>
<td>12 I think that the diagnosis made through mobile teledermoscopy will be clear and easily understandable</td>
<td>5.24</td>
<td>1.11</td>
</tr>
<tr>
<td>13 The use of mobile teledermoscopy is compatible with my work habits</td>
<td>5.24</td>
<td>1.37</td>
</tr>
<tr>
<td>14 Most of my colleagues will welcome the fact that I use mobile teledermoscopy</td>
<td>4.82</td>
<td>1.28</td>
</tr>
<tr>
<td>15 Mobile teledermoscopy can improve my performance in patients care</td>
<td>5.78</td>
<td>.901</td>
</tr>
<tr>
<td>16 I think that mobile teledermoscopy is a flexible technology to interact with</td>
<td>5.57</td>
<td>1.10</td>
</tr>
<tr>
<td>17 I find it interesting to use mobile teledermoscopy for the diagnosis of my patients’ skin lesions</td>
<td>6.10</td>
<td>.806</td>
</tr>
<tr>
<td>18 I have the intention to use mobile teledermoscopy when necessary to provide healthcare to my patients</td>
<td>4.55</td>
<td>1.65</td>
</tr>
<tr>
<td>19 I have already used mobile teledermoscopy for the diagnosis of my patients’ skin lesions</td>
<td>1.78</td>
<td>1.35</td>
</tr>
<tr>
<td>20 Health managers would welcome the fact that I use mobile teledermoscopy</td>
<td>4.39</td>
<td>1.37</td>
</tr>
<tr>
<td>21 Mobile teledermoscopy can help to diagnose my patients</td>
<td>3.67</td>
<td>1.05</td>
</tr>
<tr>
<td>22 The use of mobile teledermoscopy may promote good clinical practice</td>
<td>3.69</td>
<td>1.12</td>
</tr>
<tr>
<td>23 The use of mobile teledermoscopy is beneficial for the diagnosis of my patients</td>
<td>5.56</td>
<td>1.15</td>
</tr>
<tr>
<td>24 I think it easy to acquire the necessary skills to use these technologies</td>
<td>5.72</td>
<td>1.16</td>
</tr>
<tr>
<td>25 I would use mobile teledermoscopy if I receive adequate training</td>
<td>5.74</td>
<td>1.45</td>
</tr>
<tr>
<td>26 Other health professionals (physicians, other specialists etc…) would welcome the fact that I use mobile teledermoscopy</td>
<td>5.12</td>
<td>1.29</td>
</tr>
<tr>
<td>27 In general, mobile teledermoscopy may be useful to improve the diagnosis of my patients</td>
<td>5.80</td>
<td>.808</td>
</tr>
<tr>
<td>28 I have the intention to use mobile teledermoscopy routinely with my patients</td>
<td>4.14</td>
<td>1.57</td>
</tr>
<tr>
<td>29 The use of mobile teledermoscopy may interfere with the usual follow-up of my patients</td>
<td>3.30</td>
<td>1.69</td>
</tr>
<tr>
<td>30 I think that the mobile teledermoscopy is easy to use</td>
<td>4.94</td>
<td>.978</td>
</tr>
<tr>
<td>31 In my opinion, the use of mobile teledermoscopy will have a positive impact</td>
<td>5.72</td>
<td>.858</td>
</tr>
<tr>
<td>32 I would use mobile teledermoscopy if I receive technical assistance when I need it</td>
<td>5.58</td>
<td>1.33</td>
</tr>
<tr>
<td>33 I often use information and communication technologies in my work</td>
<td>5.86</td>
<td>1.28</td>
</tr>
</tbody>
</table>

*aThe mean scale scores are based on a scale from 1 (Strongly disagree) to 7 (Totally agree)*
Table 3. 

*Mean Scale Scores for the Constructs of the Teledermatology Acceptance Model.*

<table>
<thead>
<tr>
<th></th>
<th>Perceived Usefulness</th>
<th>Perceived Ease of Use</th>
<th>Compatibility</th>
<th>Subjective Norm</th>
<th>Facilitators Intention to Use</th>
<th>Attitude</th>
<th>Habit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>5.68</td>
<td>5.59</td>
<td>4.71</td>
<td>4.96</td>
<td>5.27</td>
<td>4.34</td>
<td>5.86</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>.819</td>
<td>.653</td>
<td>.827</td>
<td>.998</td>
<td>1.21</td>
<td>1.53</td>
<td>.812</td>
</tr>
</tbody>
</table>

**Comments from Participants**

A central theme from participants’ comments at the end of the survey was cost of the device. For example: “There were no questions about cost of the technology - do I have to pay for the device - how do I bill for the use and recoup my costs. Who is the Dermatologist reading or reviewing the pictures and how will he or she be reimbursed - it won't be done for free.”

Another participant commented: “The only barriers I perceive to using mobile teledermatology would be the cost, and possibly concerns about patient confidentiality/HIPPA.”

Another theme could be related to the Facilitators construct. One participant stated: “I am receptive to teledermatology, however, the gyn environment would not embrace this. Also, without further information on reimbursements, its difficult to determine if this concept would be embraced.” Another participant said: “Unfortunately this data would not be a mainstay in my practice, but I would be interested in seeing it work further.”

Finally, participants were enthused about the potential of using MTD: “This is a FASCINATING topic and cutting edge. I think providers using this should network directly with dermatologists to optimize its utility.” Another participant asked: “when can I get one? :).”
Process Evaluation

Overall, disseminating the cross-sectional survey was smooth. Throughout the process, though, there were a few minor issues that were dealt with along the way. The first dilemma was determining an appropriate online survey program. Not only did the program require flexible features and customizable options, but it also had to be safe in order to protect the NPs personal information. Initially, the choice was to use the free version of SurveyMonkey to create and maintain the cross-sectional survey; however, the free version of SurveyMonkey offers limited features and options, e.g., only allows the user to create a maximum of 10 questions and does not have a feature to export the data to another program. The ability to export data was important because the principal investigator was going to use SPSS to analyze the data.

Instead of using SurveyMonkey, the honors student contacted the University of Arizona’s Office for Learning and Healthcare Technology Innovations (LHTI) to determine an alternative survey program. LHTI introduced a program called Qualtrics. Qualtrics, through the University of Arizona, offers unlimited questions, quality safety features such as virus protection, and offers unique features. Some of the unique features of Qualtrics include hiding IP addresses, unlimited responses, monitoring the traffic of the users accession the survey and when the survey is accessed. This program also allowed for the collected data to be exported to SPSS. Once the principal investigator decided to use Qualtrics to create the survey, she set up an appointment with LHTI to learn how to use the program. The principal investigator also watched a series of “how to” videos about Qualtrics provided by the program’s company.

The second possible issue was contacting the Webmasters of CAZNAP and SAZAPN listservs. The ideal situation is that both Webmasters would be willing to work with honors student and distribute the survey link through the listserv. The Webmasters would also have to be easily accessible by email. In the event that one or both of the Webmasters were unreachable or
did not want to disseminate the survey, then the honors student would have two other listservs as a back up. These listservs would be the University of Arizona Doctor of Nursing Program and the Arizona State University Doctor of Nursing Program. Fortunately, both of the Webmasters were easy to get in touch with and were willing to help disseminate the survey.
Chapter 5: Discussion

The chapter discusses the sample, survey items, the model factors, the limitations, the practice and research implications as well as the honors student’s presentations of the findings.

Sample

The final sample size was 51 NPs. More women (n=48) than men (n=3) participated in the survey. The median age of the participants was 50 years. A majority of the participants are considered “digital immigrants” or individuals who have not grown up with the Internet or the technology that is used today (Prensky, 2001). Digital immigrants have learned to adapt to their environment—some better than others (2001). Participants were more likely to be FNPs (n=39) and they commonly worked in a group work setting (n=38). The mean number of years in practice was 9.08 (range 0-32 years). Similar to Phelan and Heneghan’s study, the predominant age range was 50-59 (n=51) (2008). While this research study primarily focused on NPs, Phelan and Heneghan had nurses, ranging from LPNs to RNs, and NPs (2008). Phelan and Heneghan had 15 NPs participate. In this study, 38 NPs stated that they belonged to a group practice. In Phelan and Heneghan’s study, approximately 38% of the participants stated that they worked in a private physician’s practice and 31% stated that they worked in an outpatient ambulatory clinic (2008).

Survey Items

Overall, the NPs had an optimistic view of MTD, as demonstrated by the mean scores of approximately 5 on a scale of 1 to 7. NPs believed that MTD will have a positive impact on their practice (M=5.72) and MTD would be useful to improve the diagnosis of their patients (M=5.80). NPs are also familiar with technology and use it in their work (M=5.86), which potentially could be a factor for their high level of interest in using MTD to diagnose their patients’ skin lesions (M=6.10). Item 19 that had the lowest score (M=1.78) asked whether or not
NPs have used MTD before in order to diagnose a patient’s skin lesions. This low score was likely due to the limited amount of exposure that NPs have with dermoscopy in general (Phelan and Heneghan, 2008) and that MTD has not been actively marketed to NPs in the United States. Item 3 (I think that I could easily learn how to use mobile teledermoscopy) had the highest mean score (M=6.25) indicating that NPs may be open to learning more about this technology. The item scores in the evaluation of the TeleTam survey (Orruno et al., 2011) were not reported by the authors, so it is difficult to compare the scores from the NP participants in this study to the group of Spanish PCPs in the only other study of teledermatology using the TeleTam as a framework. However, this honors student was able to compare the mean scores for the constructs of the TeleTam.

TeleTam Factors

Within the model factors, the highest mean score was the NPs’ attitude (M=5.86) and the lowest mean score was intention to use (M=4.34). The NPs’ attitude was positive about MTD because nurses are open to technology. This positive attitude is also demonstrated in the nurses’ use of a new technology (SIAscope) in Govindan et al.’s study (2006). Compared to the findings of Orruno et al. (2011), there were may similarities between the Spanish PCPs and the Arizona NP participants in this study. Both had the same mean score for Facilitators (M=5.27). Orruno et al. defined facilitators as “the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system” (2011). Examples of institutional support for promoting MTD for NPs can include providing classes on how to use MTD and covering the cost of both training and the equipment. Orruno et al. also noted that the perceptions of facilitators were the most important variable when determining the intention for PCPs’ to use technology (2011). The lowest model factor in this study of NPs was the intention to use (M=4.34), while the PCPs in Orruno et al.’s study had a higher mean score of M=5.28. This
could be related to cost of the dermoscope attachment, which can also be related to Facilitators. MTD is expensive. FotoFinder, a German company that sells MTD equipment, sells its least expensive dermoscopy attachment for an iPhone for 495,80 euros, or $680 USD (FotoFinder Systems, 2010). This cost does not include the necessary app, which costs $10 USD (FotoFinder Systems, 2010).

Limitations

This study was limited by different types of bias. Self-selection bias occurs when all participants select or deselected themselves to participate in a survey (Olsen, 2008). This can lead to bias because the participants who have selected themselves to take the study do not represent the entire population, which includes the participants who refused to take the study (2008). A small sample size creates a bias because there is not an equal distribution of the population represented (Verial, 2008). The statistical power, or the ability that a statistical test to show traits that truly exist in a population, is also negatively affected by a small sample size (2008). Social desirability bias is the tendency of a participant to respond to questions in a way that is socially acceptable, or what the investigators want to hear (Spector, 2004). This could be caused by an individual’s need for approval (2004). Other survey limitations could include only receiving input from NPs with internet access or a personal electronics that can access the survey.

Practice Implications

NPs participating in this study learned about MTD from the survey (e.g., case exemplar and photograph). One of the practice implications of the study findings is that this limited knowledge of MTD may encourage NPs to consider using MTD in their practice. The research findings also may encourage participating NPs to consider their current early diagnosis and management practices for suspicious skin lesions. Ultimately, if NPs use MTD it could decrease
wait time for a patient to be seen by a dermatologist, as well as decrease the hassle of referring patients to a dermatology office. However, until the price of the dermoscope attachment decreases in price, it is unlikely that MTD will become a common tool in NP practice. To increase the likelihood of NPs potentially using MTD, this honors student will post the results of the study on the listservs of SAZAPN and CAZNAP.

Research Implications

The primary objective of this honors thesis is to provide insight into the acceptance of MTD by NPs. This research also encourages the further study of the TeleTam model, to evaluate whether the factors in the model predict intention to use MTD. In the future, other research studies can conduct a larger study of NPs’ use of MTD.

Win Conference. The honors student was selected via peer review to present this honors thesis at the 2014 Western Institute of Nursing (WIN) Annual Conference in Seattle, Washington. The goal of WIN is to promote evidence-based practice and the exchange of scholarship and research within the nursing community. The honors student presented the honors thesis as a professional poster and had four hours to present the thesis to passing WIN members. These members included various graduate students, nurses, nurse practitioners and nurse instructors. The most commonly asked question about the honors thesis was: “What is mobile teledermoscopy?” The WIN members were also interested in sharing their stories about skin cancer. The honors thesis poster at the WIN Conference made an impact by educating WIN members about skin cancer and MTD.

University of Arizona Medical Center’s Nursing Conference. The honors student also had the opportunity to present at the 2014 University of Arizona Medical Center’s (UAMC) 1st Annual Nursing Conference in Tucson, Arizona. The goal of this conference was to promote nursing research in the units and to disseminate this research to the other units in the hospital.
The UAMC nurses were interested in MTD and what it was. There were also some individuals who worked in the telemedicine department that were excited about MTD. The honors thesis poster continued to make an impact at the UAMC conference by educating nurses about skin cancer and MTD.
### Appendix A Overview of Literature Review Articles

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| Govindan, Smith, Knowles, Harvy, Townsend, Kenealy (2006) | • To determine the effectiveness of the SIAscope in triaging patients referred by general practitioner with a suspicion of melanoma | • Pigmented lesions clinic patients in a hospital clinic  
  • 886 patients were recruited  
  • Between the period of March and November 2003  
  • Children under the age of 16, patients were not able to consent and patients with lesions in inaccessible areas | • A nursing consultant examined the patients blinded to the SIAscope assessment  
  • Suspicious pigmented excised  
  • Patients with a lesion that appeared benign but had a suspicious history were followed up | • Accuracy of SIAscope | • 60% of patients were diagnosed as melanin-negative and 39% were diagnosed as melanin-positive.  
  • Nurse diagnosed benign lesions in 71% (627) of patients and clinically suspicious lesions in 29%.  
  • Of the suspicious lesions, 19% (171) were excised and the other 10% (79) that were followed up ended up not needing an excision.  
  • 54 of X excised lesions were melanoma, 6 were melanocytic lesions of unknown. The remaining were BCC and SCCs.  
  • The nurse specialist thought that the 3 melanin-negative melanomas were clinically suspicious) | • The SIAscope can be used as an accurate triage tool  
  • Clinical nurse specialists were open to and able to use new technology |


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| Phelan, Heneghan (2008) | ● To survey the level of participation that dermatology nurses have in screening and skin cancer detection | ● Dermatology Nurses Association national convention.  
● Of the survey participants, 24% were registered nurses, 15% were licensed practical nurses, 11% were advanced practice nurses, and 11% were NPs and dermatology nurse practitioners  
● Number (38%) were between the ages of 50 to 59 years  
● Number (32%) practiced in an outpatient ambulatory dermatology clinic, number (38%) practiced in a private physician's dermatology practice and 13% practiced in other | ● The nurses were asked to complete a cross-sectional survey.  
● The nurses were approached during an 8-hour period as they entered the lobby for registration | ● Demographic information  
● Clinical setting information  
● Practice information | ● 84% stated that photography was being used in their practice  
● 66% stated that digital photography was used  
● 30% said Polaroid cameras were used  
● Photography: n (45%) took photos of skin lesions; n (45%) of NPs, n(43%) of RNs, and 34% of LPNs stated that were very confident taking the photographs with a digital camera  
● Dermoscopy: 78% of the nurses answered that they had a dermatoscope in their practice, but only 34% use it | ● Majority of nurses are using digital photography |
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| Furfaro, Bernaix, Schmidt, Clement (2008) | To determine NPs' knowledge base and clinical practices | • Setting?  
• Purposive, randomized sample of 100 Illinois and 100 California NPs  
• Range of 27-68 years old  
• The participants must be an APN licensed as a certified NP in either state | Survey design  
57-item self-administered questionnaire and a 15-item demographic survey  
NPs ranked the top five barriers to performing skin cancer assessments  
Score 1 was the most significant and score 5 was the least significant barrier | Knowledge of melanoma preventative measures and risk factors, barriers to performing melanoma assessments and lesion recognition | There was an inconsistent completion of this section by a majority of the participants, which can effect the validity of the research  
80% and 60% of the respondents from Illinois and California, respectively, identified time limitations as the most significant barrier  
32.6% and 21.3% of NPs from Illinois and California, respectively, stated embarrassment as a barrier (This was second most significant barrier)  
The least significant barrier was the idea that "It isn't in my scope of practice" (21.7% and 14.9%) | Ways to overcome barriers to performing skin cancer screenings should be understood and found |
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<td>Oliveria, Heneghan, Cushman, Ughetta, Halpern (2011)</td>
<td>To find the barriers and facilitating factors to skin cancer screening practices among US PCPs and dermatologists</td>
<td>Board-certified US physicians in the American Medical Association Medical Marketing Services database: family practitioners (n=999), internists (n=1000), and dermatologists (n=1000) The physicians were required to have postal mail and an electronic mail address</td>
<td>Literature-based and expert-validated survey containing 13 items on demographics, practice characteristics, skin cancer screening behaviors, and barriers and facilitators when performing the skin examination. Items scored on a 4-point scale ranging from &quot;not a factor&quot; to a &quot;major factor&quot;</td>
<td>Barriers and facilitating factors for skin examinations Other specific barriers such as lack of skill or training, uncertainty about what to look when a patient has an increased number of moles, time constraints; lack of the following: equipment, inadequate monetary compensation, importance of skin examinations standardized guidelines and patients who are not at high risk; patient embarrassment or reluctance; not routinely seeing the skin uncovered; low probability of finding cancer; and the presence of competing comorbidities</td>
<td>Top 3 barriers: time constraints, competing comorbidities, and patient embarrassment for full-body skin examinations Family practitioners (54.4%) and internists (54.5%) were more likely to report time constraints as a moderate or major barrier than dermatologists (30.6%) FP (31.3%) and internists (51.7%) reported competing comorbidities as moderate or major compared to dermatologists (16.3%) More dermatologists (44.2%) reported embarrassment (patient or provider) as a moderate or major barrier than did FPs (31.3%) and internists (32.7)</td>
<td>Family practitioners and internists are significantly less likely to perform routine skin cancer screening than dermatologists Understanding physician barriers to skin cancer screening could help improve this rate</td>
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<td>Aregenzianno, Puid, Zalaudek, Sera, Corona, Alsina, Barbato, Carrera, Ferrara, Guilabert, Massi et al (2006)</td>
<td>To determine whether or not dermoscopy along with a standard clinical examination will improve the accuracy of PCPs to triage suspicious lesions</td>
<td>PCPs in Naples (n=40) were invited to participate from different geographic areas of the city. PCPs from Barcelona (n=33) were recruited from two of the largest healthcare cooperatives. Only PCPs who attended the training session and who screened patients and referred them to the Pigmented Lesion Clinic (PLC) were considered participants of the study.</td>
<td>PCPs participated in a one day training course on skin cancer detection and dermoscopy, then were randomly assigned to dermoscopy evaluation or “naked-eye” evaluation arm. Over 16-months 73 physicians evaluated 2,522 patients with skin lesions who attended their clinic and scored the presented lesions as benign or suspicious of skin cancer. Expert dermatologists at PLCs then evaluated these patients.</td>
<td>Diagnostic accuracy with and without dermoscopy</td>
<td>Both groups did not have a large difference in specificity but the dermoscopic group had better in sensitivity (p= .002). 79.2% of the cases with lesions of suggestive skin cancer were correctly determined by the dermoscopy group; standard evaluation group only determined 54.1% of the cases. Dermoscopy group had a better outcome with negative predictive value. This means that they were less likely (1.9%) to not refer a patient with a lesion suggestive of cancer to get a second expert opinion.</td>
<td>Dermoscopy should be used in clinical settings. It is a valid, safe, simple method for trained PCPs to identify high-risk lesions.</td>
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<td>Janda, Loescher, Soyer (2012)</td>
<td>▪ To determine the feasibility of consumer mobile teledermoscopy (MTD, iPhone 3 and a Handyscope,) to potentially complete skin self-examinations (SSEs).</td>
<td>▪ 10 participants from a larger PAH (Princess Alexandra Hospital) Nevi Surveillance Study ▪ 18 years or older, consisting of 4 women and 6 men with a personal or familial history of melanoma, atypical nevi or multiple moles ▪ No experience with a smart phone was necessary ▪ Conducted from November 2011 to May 2012</td>
<td>▪ Participants completed a survey of sociodemographic characteristics, risk factors, and SSE practice ▪ The participants took home a booklet explaining asymmetry-color (AC) rule and SSE instructions and a body chart to record lesion locations, mobile teledermoscope, and additional image information and instructions on how to photograph and send the emails to the researchers ▪ The participants had one week to complete the SSE and send the photographs of their pigmented lesions using their teledermatoscope ▪ Participants submitted a body chart, a follow-up survey on satisfaction and its usefulness for SSE</td>
<td>▪ Satisfaction with SSE and AC rule education ▪ MTD outcomes (such as number of e-mailed lesions per participant, image quality, lesion diversity, and lesion location) ▪ The likelihood of malignancy and the need for further follow up (such as a biopsy or excision)</td>
<td>▪ Out of 66 photographs, 88% were of good quality, allowing telediagnosis ▪ Of these, 50% were dysplastic nevi, 27% were benign nevi, 8% were seborrheic keratosis, 2% were solar lentigo, and 2% were angiomata ▪ Advantages: convenience (traveling, time), rapid telediagnosis ▪ Disadvantages: availability of dermoscope attachments (only smartphones), cost, which can limit consumer use, access to technology and to a teledermatologist. Low health literacy, and concern about identifying the most worrisome lesions.</td>
<td>▪ Consumers need more education about benign nevi for the optimization of the technology ▪ A new consumer to the teledermoscopy market could be similar to a naïve NP who has no prior knowledge of skin cancer.</td>
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<td>Westerhoff, McCarthy, Menzies (2000)</td>
<td>• To determine whether or not dermoscopy will increase the diagnostic accuracy of melanoma</td>
<td>• 74 practicing PCPs recruited by telephone from a list of current practitioners from the Central Sydney Area Health Service Division of General Practice  • Only practitioners who had no formal training with dermoscopy and did not use a dermoscope in their clinical practice were included.  • Randomized to dermoscopic intervention or control group (the randomization was not specified)</td>
<td>• The PCPs completed a pretest of 50 photos of melanomas and 50 atypical nonmelanoma pigmented skin  • The tests presented the lesions first with a clinical photograph and then a dermoscopic image  • Participants selected from the following four diagnosis options: melanoma, benign melanocytic lesion, benign non-melanoma lesion and other  • Participants were not allowed to look at the dermoscopic image until they scored the clinical image  • The PCPs were not told which group they were in until after the pretest  • An identical post-test followed after the dermoscopy group had its 1 hour presentation on dermoscopy and read the pictorial atlas</td>
<td>• Improvement between the pretest and the post-test  • Melanoma diagnostic accuracy  • The accuracy of dermoscopy versus clinical melanoma examination</td>
<td>• There was a significant improvement between the dermoscopic melanoma diagnoses (75.9%) to the clinical melanoma diagnoses (62.7%)</td>
<td>• Healthcare providers are more accepting to technology when it works  • Dermoscopy helps improve the diagnostic accuracy of PCPs</td>
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Appendix B. Acceptance of Teledermatology Questionnaire

Disclaimer
Purpose of the Study:
The purpose of this study is to collect preliminary information on the acceptance of mobile teledermoscopy by primary care nurse practitioners (NPs) in Arizona.

What will Occur:
We will ask you to complete an online survey containing 33 items that ask your opinion about technology and mobile teledermoscopy. These items ask your opinion about individual, technological, and implementation factors that may or may not influence your intention to use MTD in your practice. The survey also contains 6 other items that will ask you to provide basic demographic information, such as age, gender, NP certification, and etc.

Benefits of this Study:
The benefits of this study to you will be primarily educational. By taking this survey, you may gain an interest in skin cancer and mobile teledermoscopy. Informing you about mobile teledermoscopy may enhance your intention to use it in your practice.

Risks or Discomforts:
Taking this survey presents no known risks to you.

Confidentiality:
Your responses will be kept confidential. The survey responses will be held in an account created by Survey Monkey that is protected by a username and password and only accessible by the investigators. Your name or any other identifying information is not on the survey. The investigators will export your responses into a statistical analysis program that also will be secure. Only the investigators will be able to see your responses.

Decision to Quit at any Time:
Your participation in this study is voluntary. This means that you are able to withdraw at any point during this study. If you have already started the survey and do not wish to continue, then you may leave the website. If the survey is not submitted once you have finished, then your answers will not be saved. If you choose not to participate in the survey, you will not be removed from the listserv.

How the Findings will be used:
The findings from this research project will be used for scholarly purposes only. The results from the study will be presented in a professional conference and may be published in a research article.

Consent:
By clicking on the "next" button and proceeding to complete this, I provide my consent to participate in the study.
Definition of Mobile Teledermoscopy (MTD)

Teledermatology is the transfer of dermoscopic images of pigmented skin lesions through telecommunication networks such as email or the Internet. Mobile teledermoscopy (MTD) is the use of mobile smart phones, specialized applications (app) and specialized dermoscope attachments for the phones (see Figure 1 below). The user installs the app on the phone and then slides the dermoscope attachment over the phone to create the mobile teledermoscope. The dermoscope applies polarized light to the skin, allowing distinct features of a pigmented skin lesion to be seen clearly. The steps for conducting MTD using a smart phone are the following:

1. Slide the smart phone into the dermoscope case to ensure tight fit and optimal position of the lens system exactly in front of the smart phone camera.
2. Switch on the dermoscope light and open the app to ready the screening function. Activate a millimeter scale that is saved in the photo.
3. Put the dermoscope lens on the patient’s skin over the suspicious lesion. Tap screen to freeze and save the image.
4. View and magnify the image full screen on smart phone. In the chronological list provided by the app, images are labeled with shooting date and time. Photos can be tagged with patient data, localization and comments and transferred to a computer.
5. Make an assessment of the pigmented lesion, or e-mail the photos to the teledermatologist using the smart phone connectivity features.
Case Exemplar for MTD (using iPhone)

Jane Doe, FNP, has completed a physical assessment on patient, a 50-year old white male. She noted on skin examination that the patient has a suspicious-looking mole on his upper back. The mole has an irregular border and appears asymmetric. Instead of immediately referring the patient to a dermatologist, Jane decides to use MTD to further assess the lesion. Jane retrieves the dermoscopic attachment that is in a drawer in her exam room. She inserts her smartphone into the dermoscopic attachment, opens the dermoscopy app; and then proceeds to visualize the mole using the smartphone camera optics and magnification provided by the dermoscope. Jane is able to clearly see the shape, color, and structures within the mole, and photographs the magnified lesion using her smartphone camera. As with any photo, Jane then re-sizes the image on the phone to see a larger version of the image. At this time, Jane can use her pigmented lesion identification skills to determine whether the lesion needs a referral to a dermatologist. Or, if she has access to a teledermatologist, she can use the smartphone messaging functions to send the image of the mole to the teledermatologist for further review. Jane also can directly upload the image to the medical record and send the image to the patient or provide him with a copy. Your opinion is important. Please complete this survey. This information will be analyzed confidentially. There are no right or wrong answers to the questions.
Gender (Male or Female)

Age (in years)

NP certification specialty (FNP, ANP, GNP, PNP, WHNP)

Type of NP practice (Group or Individual)

Indicate the number of years in clinical practice

Highest degree obtained (Masters NP certification, DNP, DNP+PhD)

Other information
Here are the 33 statements related to various factors that may be involved in the acceptance of mobile teledermoscopy as a working tool. Please indicate your level of agreement with each of the following statements using the scale provided below. Remember to select a single option for each statement:

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<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Slightly Disagree</th>
<th>Disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Slightly Agree</th>
<th>Strongly Agree</th>
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<td>I feel comfortable with information and communication technologies.</td>
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<td>Mobile teledermoscopy could help me to diagnose my patients more rapidly.</td>
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<td>I think that I could easily learn how to use mobile teledermoscopy.</td>
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<td>I think it is a good idea to use mobile teledermoscopy for the diagnosis of my patients' skin lesions.</td>
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<td>I have the intention to use mobile teledermoscopy in my practice.</td>
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<td>The use of mobile teledermoscopy may involve major changes in my clinical practice.</td>
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<td>The use of mobile teledermoscopy may improve the diagnosis of my patients.</td>
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<td>I think it would be easy to perform the tasks necessary for the diagnosis and management of my patients using mobile teledermoscopy.</td>
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<td>Most of my patients will welcome that I use mobile teledermoscopy.</td>
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<td>I think that my practice has the necessary infrastructure to support my use of mobile teledermoscopy.</td>
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<td>Mobile teledermoscopy could help me get the most out of my time.</td>
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<td>I think that the diagnosis made through mobile teledermoscopy will be clear and easily understandable.</td>
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<td>The use of mobile teledermoscopy is compatible with my work habits.</td>
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<td>Most of my colleagues will welcome the fact that I use mobile teledermoscopy.</td>
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<td>Mobile teledermoscopy can improve my performance in patients care.</td>
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<td>I think that mobile teledermoscopy is a flexible technology to interact with.</td>
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<td>I find it interesting to use mobile teledermoscopy for the diagnosis of my patients' skin lesions.</td>
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<td>I have the intention to use mobile teledermoscopy when necessary to provide healthcare to my patients.</td>
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<td>I have already used mobile teledermoscopy for the diagnosis of my patients’ skin lesions.</td>
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<td>Health managers would welcome the fact that I use mobile teledermoscopy.</td>
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<td>Mobile teledermoscopy can help to diagnose my patients.</td>
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<td>The use of mobile teledermoscopy may promote good clinical practice.</td>
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<td>The use of mobile teledermoscopy is beneficial for the diagnosis of my patients.</td>
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<td>I think I find it easy to acquire the necessary skills to use mobile teledermoscopy.</td>
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<td>I would use mobile teledermoscopy if I receive adequate training.</td>
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<td>Other health professionals (physicians, other specialists etc...) would welcome the fact that I use mobile teledermoscopy.</td>
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<td>In general, mobile teledermoscopy may be useful to improve the diagnosis of my patients.</td>
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<td>I have the intention to use mobile teledermoscopy routinely with my patients.</td>
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<td>The use of mobile teledermoscopy may interfere with the usual follow-up of my patients.</td>
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<td>I think that mobile teledermoscopy is easy to use.</td>
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<td>In my opinion, the use of mobile teledermoscopy will have a positive impact.</td>
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<td>I would use mobile teledermoscopy if I receive technical assistance when I need it.</td>
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<td>I often use information and communication technologies in my work.</td>
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</table>
Thank you very much for completing this survey.

The results from this study will be posted on the Coalition for Arizona Nurses in Advanced Practice (CAZNAP) listserv and the Southern Arizona and Advanced Practice Nurse/Nurse Practitioner Society (SAZAPN) listserv where you first received information about the study. Any additional comments are welcome:

References

Appendix C. Permissions

Permission to use the Teledermatology Acceptance Survey:

-----Original Message-----
From: Marie-Pierre Gagnon [mailto:Marie-Pierre.Gagnon@fsi.ulaval.ca]
Sent: Monday, January 27, 2014 2:13 AM
To: Loescher, Lois J - (loescher)
Subject: RE : Letter of support

Dear Lois,
Your student can adapt our questionnaire to survey mobile teledermoscopy acceptance, as long as the source is cited.

Best regards,
Marie-Pierre
Marie-Pierre Gagnon, Ph.D.
Professeure agrégée
Faculté des sciences infirmières
Université Laval
Tel. 418 525 4444 poste 53169
Fax. 418 525 4194
marie-pierre.gagnon@fsi.ulaval.ca

De : Loescher, Lois J - (loescher) [loescher@email.arizona.edu] Date d'envoi : 24 janvier 2014 17:36 À : Marie-Pierre Gagnon Objet : RE: Letter of support

Hi Marie, I have an honors student who wants to use the questionnaire to survey mobile teledermoscopy acceptance in Arizona nurse practitioners. Does she need permission to use the scale (adapted for mobile teledermoscopy). If so, who provides that? Thanks, Lois

Lois J Loescher, PhD, RN, FAAN
Associate Professor
College of Nursing and Mel and Enid Zuckerman College of Public Health The University of Arizona
loescher@email.arizona.edu
Permission to use the CAZNAP listserv:

From: ewidemark@earthlink.net
Sent: Tuesday, March 12, 2014
To: Delaney Baker Stratton [mailto: dstratton@email.arizona.edu]
Subject: Honors Thesis Survey

I would be happy to. Please forward the link and some type of introductory email as well.

Erich Widemark, PhD, RN, FNP-BC
ewidemark@earthlink.net

From: Delaney Baker Stratton [mailto: dstratton@email.arizona.edu]
Sent: Tuesday, March 11, 2014 6:15 PM
To: ewidemark@earthlink.net
Subject: Honors Thesis Survey

Dear Dr. Wichmark,

My name is Delaney Stratton. I am an undergraduate honors nursing student at the University of Arizona. I am currently working a honors thesis research project. My thesis is about the acceptance of mobile teledermoscopy by Arizona NPs.

Mobile teledermoscopy a specialized dermoscope attached to a smartphone. This device allow magnification of suspicious skin spots to determine whether the skin spot should be further evaluated by a dermatologist. Mobile teledermoscopy also allows the user (potentially NPs) to send the image via the smartphone communication options to a dermatologist for further evaluation.

Once I receive approval from the University of Arizona Institutional Review board, would it be possible to “post” my technology acceptance survey information and link on your group’s listserv?

If you would like to learn more, I have attached my abstract to this email.

Thank you for your time and consideration.

Sincerely,

Delaney Stratton
Permission to use the southern Arizona advanced practice nurse listserv:

Date: Thu, Nov 14, 2013 at 10:35 PM
Subject: Undergraduate Honors Thesis
From: dstratton@email.arizona.edu
To: sazapn-owner@yahoogroups.com

Hi Delaney,

Congratulations on working on your honors research project! I would be happy to send out your survey to our organization of Nurse Practitioners. Do you have a simple link that I can send out or are there are other steps involved?

Thanks,
Valerie Kading, NP
Founder & Past President, Southern Az Advanced Practice/NP Society

To Whom It May Concern:

My name is Delaney Stratton. I am an undergraduate nursing student at the University of Arizona. I am currently working on my honors thesis research project. My thesis is about the acceptance of mobile teledermoscopy by Arizona NPs.

I was wondering if it would be possible to “post” my technology acceptance survey link on your group listserv?

Thank you for your time,
Delaney Stratton
Appendix D: IRB Approval

<table>
<thead>
<tr>
<th>Date:</th>
<th>March 31, 2014</th>
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</thead>
<tbody>
<tr>
<td>Principal Investigator:</td>
<td>Delaney B Stratton</td>
</tr>
<tr>
<td>Protocol Number:</td>
<td>1403265837</td>
</tr>
<tr>
<td>Protocol Title:</td>
<td>The Acceptance of Mobile Teledermatoscopy by Primary Care Nurse Practitioners In the State of Arizona</td>
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<tr>
<td>Level of Review:</td>
<td>Exempt</td>
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<tr>
<td>Determination:</td>
<td>Approved</td>
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</tbody>
</table>

This submission meets the criteria for exemption under 45 CFR 46.101(b).

- The University of Arizona maintains a Federalwide Assurance with the Office for Human Research Protections (FWA #00004218).
- All research procedures should be conducted in full accordance with all applicable sections of the Investigator Manual.
- Exempt projects do not have a continuing review requirement.
- Amendments to exempt projects that change the nature of the project should be submitted to the Human Subjects Protection Program (HSPP) for a new determination. See the Investigator Manual, 'Appendix C Exemptions,' for more information on changes that affect the determination of exemption. Please contact the HSPP to consult on whether the proposed changes need further review.
- All documents referenced in this submission have been reviewed and approved. Documents are filed with the HSPP Office. If subjects will be consented the approved consent(s) are attached to the approval notification from the HSPP Office.

Your proposal is in compliance with Federalwide Assurance 00004218. This project should be conducted in full accordance with all applicable sections of the IRB Investigators Manual and you should notify the IRB immediately of any proposed changes that affect the protocol. You should report any unanticipated problems involving risks to the participants or others to the IRB.

This project has been reviewed and approved by an IRB Chair or designee.
Disclaimer Acceptance of Mobile Teledermoscopy (Screen 1 in Qualtrics)

Purpose of the Study:
The purpose of this study is to collect preliminary information on the acceptance of mobile teledermoscopy by primary care nurse practitioners (NPs) in Arizona.

What will Occur:
We will ask you to complete an online survey containing 33 items that ask your opinion about technology and mobile teledermoscopy. These items ask your opinion about individual, technological, and implementation factors that may or may not influence your intention to use MTD in your practice. The survey also contains 6 other items that will ask you to provide basic demographic information, such as age, gender, NP certification, and etc.

Benefits of this Study:
The benefits of this study to you will be primarily educational. By taking this survey, you may gain an interest in skin cancer and mobile teledermoscopy. Informing you about mobile teledermoscopy may enhance your intention to use it in your practice.

Risks or Discomforts:
Taking this survey presents no known risks to you.

Confidentiality:
Your responses will be kept confidential. The survey responses will be held in an account created by Survey Monkey that is protected by a username and password and only accessible by the investigators. Your name or any other identifying information is not on the survey. The investigators will export your responses into a statistical analysis program that also will be secure. Only the investigators will be able to see your responses.

Decision to Quit at any Time:
Your participation in this study is voluntary. This means that you are able to withdraw at any point during this study. If you have already started the survey and do not wish to continue, then you may leave the website. If the survey is not submitted once you have finished, then your answers will not be saved. If you choose not to participate in the survey, you will not be removed from the listserv. For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact the Human Subjects Protection Program at 520-626-6721 or online at http://ocr.arizona.edu/hbpp. You may also contact the coordinator of this survey, Delaney Stratton at dstratton@email.arizona.edu or her advisor Dr. Lois Loescher at loescher@email.arizona.edu

How the Findings will be used:
The findings from this research project will be used for scholarly purposes only. The results from the study will be presented in a professional conference and may be published in a research article.

Consent:
By clicking on the “next” button and proceeding to complete this, I provide my consent to participate in the study.
Appendix E: Recruitment Email to Post on Listservs

Dear valued nurse practitioner,

My name is Delaney Stratton and I am an honors student in the BSN program at the University of Arizona College of Nursing. I am aspiring to be an NP and am very interested in skin cancer and skin cancer detection. For my honors project I am conducting a survey of primary care NPs in Arizona to determine their acceptance of a technology called mobile teledermoscopy (MTD). **If you are an NP certified in primary care, gerontology, or family practice, please read on!**

MTD is a form of teledermatology that involves use of a smart phone, a specialized app, and a specialized dermoscopic attachment for the phone. The smart phone with the installed app and the attached dermoscope create a mobile teledermoscope. This device can be used to assess pigmented lesions on the skin and help to determine whether those lesions (1) require biopsy or referral to a dermatologist, or (2) are not suspicious.

The app and dermoscopy device are available commercially, but I am curious to know if primary care NPs may consider using MTD in their practice. So, in collaboration with my advisor, Dr. Lois Loescher, I am conducting a brief, electronic survey of primary care NPs’ potential acceptance of MTD. The link to the survey is at the bottom of this email. It should take no longer than 10 minutes to complete the survey. You will not be identified on the survey.

An Institutional Review Board responsible for human subjects research at The University of Arizona reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

By completing and submitting the survey, you are giving consent to be a participant in the study. Your participation in this study is voluntary and you are free to stop the survey at any time. There are no risks associated with this study.

Please click on the survey link below and provide us with your feedback no later than May 1st, 2014 at 11:59 pm.

https://uarizona.co1.qualtrics.com/SE/?SID=SV_40gOhux2WpfAwmN

Thank you in advance for your interest and for your participation!

Sincerely,

Delaney Stratton
BSN Honors Student
The University of Arizona College of Nursing
References


