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Using an mHealth Application in a Private Dermatology Practice to Improve Sun Protection Behavior in Adolescents and Young Adults

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ABSTRACT: In the United States, very few young people use adequate or any sun protection (American Cancer Society, 2013). Skin cancer rates are rising, engendering significant costs to the public and healthcare systems. Despite efforts to educate the public on the harms of excessive ultraviolet radiation, personal sun protection practices have improved very little in recent years (American Cancer Society, 2013). Further interventions and innovations are needed to reach and engage vulnerable segments of the population in behavior change to improve sun protection practices. The United States Preventative Task Force has recommended sun protection counseling for the 10- to 24-year age group and is likely to achieve modest net benefit (Moyer, 2012). One innovation that may have implications for more widespread intervention is the use of mHealth applications to encourage and educate the properly motivated user on proper sun protection practices (Abroms, Padmanabhan, & Evans, 2012). These mHealth applications have the potential to benefit the educational program of a private dermatology practice. The introduction of this type of innovation will require careful implementation planning to incorporate the educational tool seamlessly into the current workflow.

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In the United States, very few young people use adequate or any sun protection (American Cancer Society [ACS], 2013). Skin cancer rates are rising, engendering significant costs to the public and healthcare systems. These costs may be tangible in the form of procedures and medications, and some are intangible, such as time involved in seeking care and reduced ability to work or perform daily activities (Bickers et al., 2006). A number of factors can be associated with this recent increase in skin cancer, but an important one is the social importance of tanned skin as a sign of beauty. Despite efforts to educate the public on the harms of excessive ultraviolet radiation (UVR), personal sun protection practices have improved very little in recent years (ACS, 2013). Further interventions and innovations are needed to reach and engage vulnerable segments of the population in behavior change to improve sun protection practices. The United States Preventative Task Force (USPTF) has recommended sun protection counseling for the 10- to 24-year age group and is likely to achieve modest net benefit (Moyer, 2012). One innovation that may have implications for more widespread intervention is the use of mHealth applications to encourage and educate the properly motivated user on proper sun protection practices (Abroms, Padmanabhan, & Evans, 2012). The currently available mobile applications have limited interactivity and can provide the user with location-specific information on UVR, such as ultraviolet (UV) index, and sun protection advice. Improvements in the available technology will require input from the potential user to maximize any benefits in behavior change. These mHealth applications have the potential to benefit the educational program of a private dermatology practice. The introduction of this type of innovation will require careful implementation planning to incorporate the educational tool seamlessly into the current workflow.

ESTABLISHING THE NEED FOR INNOVATION TO IMPROVE SUN PROTECTION PRACTICES

Costs of Skin Cancer

UV radiation, from natural and artificial sources, causes premature aging of the skin and cellular damage that can lead to melanoma and nonmelanoma skin cancer (NMSC; ACS, 2013). Skin cancer, before 1970, was mainly a disease of outdoor workers. Shifts in societal norms with tanned skin becoming a sign of health and beauty have led to the spread of skin cancer to the general population (Randle, 1997). In the 1940s, the medical community encouraged sun exposure as a means to improve health (Randle, 1997). In the 1980s, the message changed to promotion of sun protection to decrease the risk of skin cancer and photo-aging (Randle, 1997). Age-adjusted incidence rates for melanoma among Caucasians have increased from approximately 8.7 per 100,000 in 1975 to 25.3 per 100,000 in 2007 (Lin, Eder, & Weinman, 2011). This increase is significant not only for loss of life and morbidity but also in monetary terms with U.S. $3.143 billion in direct and indirect costs estimated for 2004 (Bickers et al., 2006). More than two million cases of NMSC are diagnosed each year in the United States (Lin, 2011). Although less significant for loss of life, these cancers are still costly in morbidity and monetary terms. In 2004, the direct and indirect costs for NMSC were estimated at more than U.S. $2.4 billion (Bickers et al., 2006). It is apparent that further and more innovative efforts are needed to try to halt this escalation.

Sun Protection as a Means to Reduce Excessive UV Exposure

In the Institute of Medicine report, "Crossing the Quality Chasm," we find the concept that quality patient care begins with the consistent adoption of healthcare practices based on the best available scientific evidence (Institute of Medicine, 2001). Currently, the best available evidence suggests that sun protection counseling for those aged 10–24 years could have an impact on sun protection behavior that is not likely to produce harm and may have a net benefit on skin cancer risk (Moyer, 2012). A similar benefit of counseling for those over the age of 24 years was not evident (Moyer, 2012). A number of important findings occurred as a result of this analysis on behalf of the USPTF.

- Intermittent UVR in childhood was associated with increased risk of basal cell carcinoma, squamous cell carcinoma, and melanoma; a similar association was not apparent when total UVR exposure was measured.
- Sun protection counseling focused on skin cancer prevention, and positive effects on appearance showed more benefit.
- Interventions included in the analysis included age-appropriate booklets, video showing photoaging, computer-based education, peer counseling, and linking a short message to another resource.
- There is difficulty linking the change in behavior and improved sun protection with improved outcomes and reduced skin cancer incidence.
- Further research will need to target optimizing interventions that improve sun protection behavior, continued analysis to maintain behavior change, and long-term follow-up to link behavior change with improved outcomes (Moyer, 2012).

Education on limiting excessive UVR exposure should include advice to limit outdoor activities when the sun is more intense, using protective articles of clothing and sunglasses, using adequate amounts and types of sunscreen, and avoiding artificial UVR (ACS, 2013). Sunscreen is one of the most commonly practiced sun protection behaviors and, when used appropriately, has been shown to decrease sunburn (intense intermittent UVR), nevus production in children (a strong risk factor for melanoma), and precancerous lesions (actinic keratoses; Saraiya et al., 2004). The need for improvement in sun protection practices for adolescents and young adults is strikingly illustrated by the 2011 Youth Risk Behavior Surveillance survey finding that high school students report using sunscreen only 10.8% of the time (Centers for Disease Control and Prevention, 2012). These findings represent an insignificant increase of 1.5% since 1999, despite increased efforts from multiple avenues to educate the public on the importance of sun protection (Centers for Disease Control and Prevention, 2012).

USING MHEALTH AS A MEANS TO IMPROVE SUN PROTECTION PRACTICES

An mHealth application has the potential to reach a significant portion of the target population, those aged 10–24 years. In one survey, 83% of adults in the United States have a cell phone, and 35% of them have a smartphone (Smith, 2011). The proportion of smartphone users is higher for younger age groups, with 49% of those aged 18–24 years reporting that they have a smartphone (Smith, 2011). The proportion of teens, aged 12–17 years, who report having a smartphone is 47% (Madden, Lenhart, Duggan, Cortesi, & Gasser, 2013). Smartphone users will be very likely to carry the device with them at all times (Riley et al., 2011). The availability allows for timely and unobtrusive delivery of healthcare advice at the point and time of decision making (Dennison, Morrison, Conway, & Yardley, 2013). Some major concerns do exist: there is limited quality research on the adoption and use of mobile technology on this or any age group; few of the mobile applications that are available at this time are developed by authoritative sources and are not founded on evidence-based guidelines and do not use behavior change theory to maximize benefit (Dennison et al., 2013).

Evidence of mHealth Use Improving Sun Protection

Some promising evidence exists for a simple text-message-based intervention to improve sunscreen application in the short term. In a research conducted by Armstrong et al. (2009), a simple short message service (SMS) format was used to remind study participants to apply sunscreen. All study participants, $n = 70$, were asked to use sunscreen daily, and the sunscreen supplied by the research team had an electronic cap that sent an SMS message to a data repository every time the cap was removed (Armstrong et al., 2009). Half of the participants also received a daily weather report with a UV index and the sunscreen reminder. At the end of the study period, the reminder group's daily adherence was significantly better, 56.1% (95% CI [48.1%, 64.1%]), $p < .001$, versus the group that was not reminded, 30% (95% CI [23.1%, 36.9%]; Armstrong et al., 2009). In comparison, the 2010 ACS statistic for adults that reported that they regularly used sunscreen was 32.1% (ACS, 2013). In this light, 56.1% adherence to daily sunscreen use would seem to have the potential for meaningful impact. The intervention group rated the reminders as positive and expressed a desire to continue use (69%) and would recommend to friends (89%; Armstrong et al., 2009). Applicability in a widespread community intervention, although promising, will be limited by an inability to monitor adherence (electronic monitor), purchase of sunscreen (it was supplied for this study), and maintenance of behavior change adherence for a long enough period to make an impact on what is ultimately the goal—to reduce skin cancer risk.

Maximizing mHealth Using Technology, User Input, and Science

The smartphone has even more potential than simple text messaging to educate and encourage better sun protection practices. In considering adoption of an mHealth application into an educational program, it will be important to bear in mind the concept that, if a patient has continuous input on an aspect of their health, they may be motivated to make a behavior change (MobiHealth News, 2012) and that the key to this concept is the purposeful engagement of the proposed user of the mobile application. What would an ideal mobile application look like? It is important to examine this not only as a developer but also from the user's standpoint and as a researcher. Current challenges to mHealth use may include the following:

- (How) Can we keep people using behavior change apps for an extended period?
- (How) Can we give users features that are desirable and effective without requiring unacceptable levels of effort?
- (How) Can we provide accurate and timely information, feedback, and advice without adverse effects on mood?
- (How) Can we harness context sensing in a way that users feel comfortable with, trust, and find useful?
- (How) Can we harness social media to make interventions engaging and provide social support in a way that users are willing to engage with? (Dennison et al., 2013, p. 9)

Technology Improvements Enhance the Capabilities of a Mobile Application

Smartphone technology has progressed far beyond the very basic ability to send a timed SMS message with pertinent information on which the user then, purportedly, makes a decision. Mobile applications now have the ability to be much more interactive, allowing the application to present timely and customized prompts rather than the user having to seek out the information. Position sensors can provide specific UV and weather information based on the user's location. The user of the application can then input skin type and current activity, such as sitting on a beach or snow skiing. Then, algorithms can then be used to provide specific instructions for sun protection and alerts on the appropriate time to reapply sunscreen and when sunburn is likely so the user can make a decision to go indoors (Buller et al., 2013). With the improvements in data capabilities and computing powers, the smartphone can use real-time personalized multimedia displays to engage the user and also track and store user-specific information for later contemplation or purposeful sharing with the user's healthcare provider (Buller et al., 2013).

User Input in Design

A mobile device is anticipated to be more beneficial than traditional educational materials as it can be tailored to the user and provides guidance and information at the time decisions are being made (Buller et al., 2013). A mobile application can make health behavior education more personal and engaging by allowing for customizable options, personalizing advice and information and encouraging accountability by creating "a sense of volition, choice and control" (Buller et al., 2013, p. 331). In particular, focus group subjects valued ease of use with attractive graphics, positive messages seen as encouraging continued use, trusted source of the health information, privacy in that the data could not be used by a third party, conditional sharing of the information, and the ability to control alerts and advice (Dennison et al., 2013). The research by Buller et al. (2013) and Dennison et al. (2013) can be helpful in guiding the development of a mobile health application and also in the evaluation process when an application is being considered for use in real-world education in a private practice. A summary of various features and conditions valued by potential users can be found in Appendix A.

Applying Science to the Development of a Health Behavior Mobile Application

It is very early in the development of scientific theory as applied to mobile devices and their use as a means for health behavior change. As discussed earlier with Armstrong et al.'s (2009) intervention using SMS messaging, there is some promising evidence for short-term sun protection behavior change. However, there is no inclusive theory that has been thoroughly applied to the development and use of a mobile application for health behavior change, and much more work on such theory is vital to maximize the potential of currently available technology (Buller et al., 2013). The immediately obvious advantages of mobile technology, according to Buller et al. (2013), include "a large market reach, the ability to enhance engagement through multimedia displays, proactive, unobtrusive, confidential and repeated contact, and urgency to respond and real-time, 24/7 availability anywhere" (p. 331). Can behavior change models such as Health Belief Model, Theory of Planned Behavior, Social Cognitive Theory, the Transtheoretical Model, and Self-Determination Theory conform to the complex and dynamic needs or capabilities of the mobile device? A review by Riley et al. (2011) found that very few of the scientific articles actually applied behavior change models to the development and evaluation of health behavior mobile applications. It is clear that more rigorous science is needed in the development and use of mobile applications designed to modify a person's current health behavior. Simply relating an intervention to a behavior change theory is inadequate; it is necessary to apply theory to the interventions to improve the quality of an intervention and allow for translation of mHealth interventions (Riley et al., 2011). Using behavior change theory in the interventional process is needed to better understand both the effects of the intervention and to generate a better understanding of human behavior to guide improvements (Riley et al., 2011).

Analysis of a Currently Available Mobile Application

Evaluation of a proposed mHealth application should be included in the decision-making process for a practice considering adding an innovation to their patient educational plan. One currently available mHealth application is US UV, produced by MetaOptima (http://www.metaoptimacom/; Sadeghi, Kaviani, & Mohabbati, 2013). This mobile application is free and available on both iOS and Android platforms, covering about 59% of all smartphone users in the United States (Smith, 2011). This application is sponsored by the British Colombia Cancer Agency, part of the Canadian Provincial Health Services Authority (http://www.bccancer.bc.ca/default.htm); the Save Your Skin Foundation, a public advocacy group (http://www.saveyourskin.ca/the-foundation); and Environment Canada, the governmental weather agency (http://weather.gc.ca/). These entities would be considered authoritative for the purposes of providing weather-related cancer prevention advice. The basic functions, with attractive graphics, of the application include a daily sun protection hint, the ability to look at other hints, a skin type selector with pictures, and a time-to-burn countdown feature with an alert letting a users know when their time is up. The user can input information about their current environment: snow, beach, city, or park. The skin type selector has visual examples to aid the user such as a photo of magnified skin and a celebrity exemplar. This skin type selector tool seems reasonable, but no information was found that it was tested for accuracy. The countdown feature is likely to assist the user or a parent of a child to help avoid sunburn, but avoiding sunburn is not the only educational goal. It would be helpful to include a feature to track overall UV exposure and actual sun protection behaviors. Then, the data could be downloaded and purposefully shared in graphic form with the healthcare provider or the user's support system. The application does not include an alert to reapply sunscreen, and advice on the type of sunscreen to use must be sought by the user. This application could be beneficial to the very motivated user but does not take full advantage of the currently available technology. Screen shots of this mobile application can be found in Appendix B.

Integrating mHealth Into the Educational Program in a Private Dermatology Practice

Optimizing implementation of an mHealth application, in a dermatology or any private practice, will need to include a detailed analysis of educational needs and rigorous implementation planning with transparency and interaction of all stakeholders. Adding an mHealth application to an educational program is timely in that healthcare is currently working toward a comprehensive system of electronic records with an emphasis on patient safety and satisfaction and the increased importance of involving the healthcare consumer in their healthcare decision making (Registered Nurses' Association of Ontario [RNAO], 2009). The trigger for change, adding a new educational innovation to improve sun protection practices, is the lack of improvement in nationwide sun protection practices with current educational programs. The start of any analysis will begin with an examination of the current educational plan for teaching sun protection and what technological innovation might address any issues with the current plan. The technology innovation worksheet (RNAO, 2009) can be used to guide this analysis (see Appendix C). Customary education on sun protection has yielded no evidence of improvement in behavior (ACS, 2013) despite the USPTF finding that counseling could be of benefit for those aged 10–24 years (Moyer, 2012), so value may be added by innovation using an mHealth application. The costs to the private practice will mainly be in the form of time: time involved in planning, implementation, introduction, and follow-up on the mHealth application. The currently available applications do not take full advantage of available technology but could still be of some benefit if, in the implementation process, the private practice takes the time to carefully collect and analyze the data that are available.

Next, a readiness assessment of the practice will answer important questions to guide implementation of the new educational tool (see Appendix D for an example). These questions will involve external and internal organizational factors that can affect the innovation's implementation. The increasingly widespread use of the smartphone and interest in its use for health behavior change is an external factor (Buller et al., 2013; Dennison et al., 2013; Riley et al., 2011). An organization's willingness to adopt new or improve current practices is an example of an internal factor (RNAO, 2009). Potential implementation will be advantaged by the fact that most office staff is likely to be familiar with the use of a mobile application and that the innovation does not require any addition to or interaction with the current electronic health record. It is important to note here that, although the currently available mHealth applications do not offer the ability to store and track application data, such an enhancement should be sought in the near future.

Identification of stakeholders or those that will be affected by the proposed innovation is the next vital step in planning a successful implementation (see Appendix E for an example). The role of the nurse in education, innovation, and advocacy is well founded in our history and will augment acceptance in many organizations as a leader in innovation (RNAO, 2009). Key stakeholders in patient education will include all persons involved in the educational process, for example, the physician/owner, clinicians, nurses, and medical assistants as well as patients and parents. Without intimate involvement of all stakeholders, widespread adoption is not likely to occur, and without consistent adoption, success is limited (RNAO, 2009). Some key issues to address in the addition of the mHealth educational tool will be to show the potential value of the innovation, gain the engagement or buy-in of all who will be involved in the implementation, and seamlessly incorporate the innovation into workflow (RNAO, 2009). The value of the innovation, improvement in sun protection practices, will not be immediately apparent other than the most obvious—the patients report that they use sun protection more often. Population-level adoption of improved sun protection behavior will need to be maintained for the long term to have a chance to show the ultimate outcome, a reduction in skin cancer rates.

DISCUSSION

For many reasons, the most important element of information technology innovation will be the ability to share data: sharing of data between patient and provider by providing feedback to improve and maintain behavior change and sharing of data with researchers to enhance the understanding of mHealth's interaction with behavior change and to critically examine results for future improvements in design. Throughout this process, emphasis on respecting the trust and privacy of the healthcare provider–patient relationship will be vital to ensure success. It is not known, at this time, how long it would take for a change in behavior, improved sun protection, to have an effect on the desired health outcome, reduced risk of skin cancer (Kyle et al., 2008). According to the World Health Organization, 85% of the world is now covered by a wireless signal, making mobile phone networks more prevalent than paved roads, electricity, or fixed internet (World Health Organization, 2011). As the data capabilities of these wireless networks improve, so too does the potential for better, faster, and more complex applications.

Challenges in widespread mHealth adoption will include optimal adaptation of the tool for users (the consumer and the healthcare provider) on both ends of the application, rigorous science once the device is in use to show benefit, and establishing mHealth standards that balance the business of technology enhancement and public safety (MobiHealthNews, 2012). An essential concept to consider in implementing mHealth is how benefit will be shown (MobiHealthNews, 2012). The value of the mHealth tool must be shown for all users: the consumer, the healthcare provider, and the researcher. ■

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APPENDIX A. Comparison of Focus Group Input

A preliminary checklist of valuable features of health behaviors applications

- Low effort and pleasant to use
- Sustaining interest over long periods of time
- Cost and effort free to download and set up
- Developed by legitimate experts and the developer's credentials made explicit
- Includes features to help users track health-related behavior, including setting and monitoring goals
- Provides feedback and advice that guide people in how they can change behavior
- Generates positively framed alerts and reminders that are relevant and timely but not too frequent
- Easily turned off or disabled (certain settings and the entire app)
- Accurate and reliable information and tracking functions
- Discrete and with adequate privacy settings
- Use of the app does not negatively impact or restrict any other uses of the smartphone
- Clarity about what app will do—no surprises

(Dennison et al., 2013, p. 9)

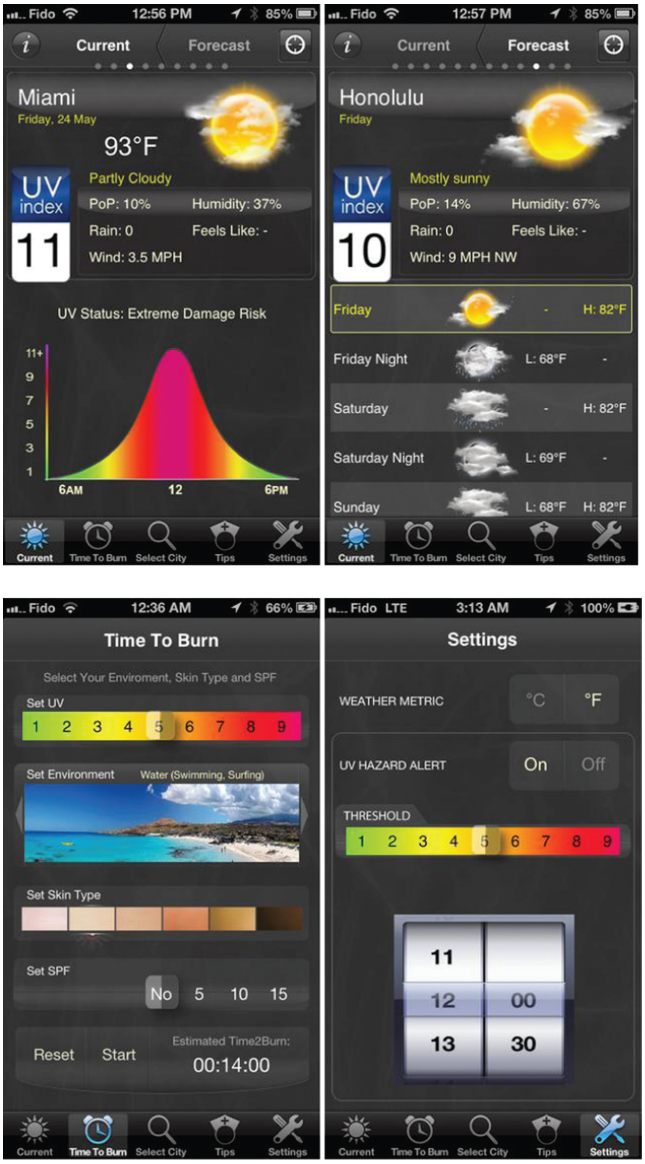
User Desired Functions

- Estimated time until sunburn
- Alert estimating when sun exposure was sufficient for vitamin D production
- UV forecast
- Alert to remind users when more sunscreen was needed with information on recommended SPF
- Different setting based on environment: snow, water
- Medications that can increase sun sensitivity
- Ability to collect and share cumulative UV data
- Sunburn treatment
- Alarm shut off
- Graphics rather than text
- Did not object to providing input for a profile as long as the information could not be used to locate the user and could be stored in the form of a profile for later use

(Buller et al., 2013)

APPENDIX B. US UV by MetaOptima

Screen Shots



(Sadeghi et al., 2013, retrieved from https://itunes.apple.com/us/app/uv-us-weather-forecast-uv/id599395265?mt=8).

APPENDIX C. Technology Innovation Worksheet

Identification of Issues and the eHealth Innovation (See Pages 8–11 of eHealth Toolkit)

Question	Short Answer
Is there a particular issue in your work setting that you hope to address? (*Hypothetical if not in your own work setting*)	Sun protection in 10–24 year age group; awareness of, motivation to, compliance with
What eHealth innovation would be appropriate to address the issue(s)?	mHealth application with sun protection messages, reminders
Why is the eHealth innovation being proposed?	Sun protection practices have improved little over the last decades (ACS, 2013). In a systematic review by Lin et al. (2011), on behalf of the USPTF, it was determined that primary care relevant counseling on sun protection can increase sun protective behavior—in young adolescents, primary care counseling with computer support can decrease midday sun exposure and increase sunscreen use (Lin, 2011).
How will it assist client care?	Provide personal and timely reminders away from the office and a basis for feedback at follow-up visits.
How will it affect the clinicians' role?	Additional time for teaching
Who else will this innovation effect?	Parents
What exactly will the ``value added'' be to the clinicians using the innovation?	Provide for a more frequent reminder away from the office regarding sun protection, possible increased motivation for behavior change
What will the cost of this endeavor be? (*Can simply offer the broad categories of cost you anticipate, e.g., training, equipment, etc.*)	Application cost: free to $1.99 (Buller et al., 2013). Time for clinician to introduce the concept and discussion at follow-up.
When will this innovation be completely functional?	Several applications currently on the market.
Where will this innovation be implemented, and for what reasons?	Dermatology practice
How will this innovation be supported before, during, and after implementation?	At office visit as part of sun protection counseling
How will we know we have arrived?	On an individual level: at follow-up office visit; on a population level; decades in the future, if widespread implementation yields behavior change
What will the innovation look like? Can ``it'' be clearly and consistently articulated by its users?	The innovation can be easily introduced to all ``back office'' staff. Acceptance of the innovation is likely to be high and easily championed by MA and most clinicians.
At what ``level'' within the organization will the technology be primarily situated? (see pages 17–19 of eHealth toolkit)	1. *Department or unit-based information systems;* 2. *Client-care information systems; or* 3. *Organizational information systems.*

Registered Nurses' Association of Ontario (2009).

APPENDIX D. Basic Readiness Worksheet

Element	Question (See Page 13 of eHealth Toolkit)	Facilitators	Barriers
Organizational	Is the organization open to new ideas or ways of doing things?	Open and collaborative communication with primary decision maker, physician owner.	There is considerable variability within the organizational structure as far as openness.
	Does the power and governance structure within the organization enable change?	The conversion to EMR has opened the door to some degree.	The main decision-maker, physician owner, will need to be in favor of the change, and even then, there will be resistance to some degree.
	Are there new policy trends or clinical developments that are scheduled/mandated for your organization?	Meaningful use has introduced the idea to some staff/clinicians and physician owner that education and quality will be necessary to succeed in the future.	The conversion to EMR is still resisted, and workarounds are used.
Knowledge	Is there knowledge in-house regarding the innovation?	There should be no fees.	Limited to originator of the idea
	Is there knowledge regarding the contracting, fees, and vendor consultation processes?	Investment will be in staff time to introduce the innovation and educate both staff and patients.	
Staff skill	Are staff and users competent with similar systems?	Most staff should be familiar with and be able to use a mobile application (app).	
	Will clinicians require education or training to use the innovation effectively?	Computer competency is good: all staff is competent with computer skills due to EMR implementation.	
	What is the current computer competency of staff?		Not all staff utilizes the EMR to its full capabilities; some use ``workarounds.''
Technical	Is there a current in-house information technology support network?	Will not need integrated to current IT system initially. I do see the potential for future integration, but at present, I do not know how this would work. Add to education tools.	No in-house: contracted IT
	What is the readiness to integrate the proposed innovation with existing systems?		
	What type of technological infrastructure is required to support the proposed innovation?		
Operational	Is the organization ready to implement the proposed innovation?	Sun protection education is well accepted among clinicians.	Unknown whether the innovation will have any support.
	How will the proposed innovation fit/work with existing systems?		
Process	How closely does the proposed innovation fit with preexisting workflow and daily operations?	Sun protection education is widespread among clinicians.	Time to educate is limited, and requiring additional time will slow acceptance.
Resource	What types of resources will be required, and are they available currently (e.g., 24-hour technical help line, documentation, support technicians)?	Smartphone	Unknown whether the innovation will have technical support.
Value and goals	Does the proposed innovation fit with the mission, vision, and values of the organization? Is the culture of the organization ready for this innovation?	The concept of improving patients' sun protection practices will be well accepted and received.	Skepticism will exist as to whether the implementation will help or be a worthwhile effort.

Registered Nurses' Association of Ontario (2009).

APPENDIX E. Stakeholder Assessment Worksheet

Stakeholder Assessment Tool (See Page 20 of eHealth Toolkit)

Distinguishing the Current Situation From the Desired Situation	**Short Answer**
What is the current state of knowledge or skills?	All employees are familiar with current recommendations for sun protection.
	Most employees have smartphones and are familiar with mobile applications.
	No ability to integrate with EHR at present.
What are the current work processes?	Sun protection education consists of verbal instructions, handout, various posters
What are the goals of the organization or unit?	Care and treatment of skin disease
How receptive is the organizational climate?	Poor
What are the needs versus wants?	The practice employees can verbalize a desire to teach sun protection but will want something that does not take extra time.
Identification of priorities and importance	
Will clinicians and clients notice or experience a benefit or value-add?	Not immediately; an increase in knowledge among patients 10–24, but as far as the ultimate goal, decreased skin cancer, this will be decades after widespread adoption of the behavior change.
Are there legal or ethical implications that need to be addressed?	Privacy; any mHealth application adopted will need to be perceived as safe and not infringing of privacy: GPS locator.
Who will be involved and why?	Clinicians, medical assistants, patients, and parents, as applicable.
How much will it cost (i.e., time, resources, and money)?	Time will be the main cost. The mHealth application will not cost the practice and ideally will be inexpensive or free, as in subsidized by a patient advocacy or governmental entity.
Is there leadership and clinician buy-in?	Verbal buy-in will be relatively simple; follow-through will be more challenging.
Identification of potential issues or barriers	
What will be the impact on the clinicians' workflow?	Provider meeting; to agree to mHealth application, training of use, and functions to clinician and staff. Can easily be presented at monthly provider meeting with one follow-up.
	Office visit; introduction of app and follow-up at subsequent visits
How will clients be impacted?	Introduction to mHealth app at initial encounter and review of data (ideally) at subsequent visits.
What is the long-term plan?	Introduction of UV protection mHealth application with follow-up discussion of real-world use at office visits.
What will training or education look like?	Staff; introduction and agreement to adopt at provider meeting, small group introduction, and training of office staff.
	Patient; one-on-one discussion and demonstration
Identification of solutions and opportunities	
Generate options in terms of eHealth innovation.	There are some mHealth applications available to provide information on UV index with sun protection hints or prompts. Some are customizable as to skin type. Some have a timer that, based on user input, can calculate ``time to sun burn'' based on environment, skin type, and sunscreen SPF.
Generate ideas regarding implementation strategies.	With widespread availability of the smartphone, these applications can provide some education and can modestly impact sun protection practices of the user.
Engage users to increase buy-in.	Establish focus groups of clinicians and medical assistants to discuss viability and options for mHealth applications.
Maximize benefits and outcomes for clients and clinicians.	Have the focus groups look for UV protection apps on their phones as a starting place.
	Develop a list and critically analyze the options in the group.

Registered Nurses' Association of Ontario (2009).

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