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Abstract:

This article describes the development of a multilevel theoretical model, w hich explains electronic symptom reporting (ESR) in the context of chronic disease management. ESR entails the use of patient-held technologies, such as electronic personal health records (ePHRs), for recording patient symptom data so that the information can be transmitted to a physician for interpretation. As patient recall of symptoms is critical to treatment effectiveness, ESR offers several advantages over traditional symptom reporting methods. The patient has the ability to conveniently collect symptom data, w hich can subsequently be view ed by the physician in an interpretable and relevant manner. This article proposes a theoretical model, w hich integrates the perspectives of both patient and physician, in order to inform theory development in this area.

Keywords: electronic symptom reporting; patient-centered e-health; electronic personal health records; patient-generated data; clinical w orkflow ; multilevel model

Editor's Note: The article w as handled by the Department Editor for Special Section on Patient-centered e-Health

I. INTRODUCTION

The increasing availability of health information technology creates opportunities to enhance the delivery of health care for a variety of stakeholders in a number of unique settings. The area of patient-centered e-health (PCEH) [Randeree and Whetstone, 2009; Wilson, 2009] is a research approach that focuses on technology that enhances the patient's capability to participate in processes concerning his or her own health care. One relevant yet underrepresented application of PCEH is in the facilitation of patient symptom recall by electronic means, referred to as electronic symptom reporting (ESR) [Johansen, Henriksen, and Berntsen, 2011; Johansen, Henriksen, Horsch, Schuster and Berntsen 2012]. ESR entails the use of patient-held technologies to capture clinically relevant data and transmit it to a physician for interpretation in various clinical processes. Enhanced symptom reporting in this manner can enable the physician to provide better care to patients [Barratt, Kalantzis, Polymeros and Forbes, 2005].

In light of the potential benefits of ESR tools, several issues must be addressed if they are to be effectively implemented. First, successful adoption of patient-held technologies may be difficult [Daglish and Archer, 2009]. The unique perspective that patients hold of their illness may provide valuable insight as to how adoption can be achieved, as it relates to the degree to which patients engage in disease-coping activities [Carver, 1997; Diefenbach and Leventhal, 1996]. Further, this perspective can provide insight into how patients decide what symptoms to log and how to log them, impacting the accuracy of the information seen by the physician. Second, the effective integration of patient symptom data into clinical workflow requires presenting the data in a way that enhances, rather than impedes, the physician's ability to gain insight into the patient's condition [Huba and Zhang, 2012]. This feature is important, as communication of symptoms with physicians is necessary for evaluating the effectiveness of treatments in chronic diseases such as inflammatory bowel diseases (IBD) [Robinson, 2001] and rheumatoid arthritis [NCCCC, 2009]. As such, effectiveness of ESR tools in a chronic care setting relies on the perspectives of both patient and physician. An applicable theory for this application is not known to exist.

This article proposes a theoretical model to explain the use of ESR tools in a chronic care setting. Such applications are posited to enhance the effectiveness of transmitting clinically relevant symptom data from the patient to the physician. This improves the physician's ability to gain insight into the patient's condition, resulting in an increased ability for the patient to actively cope with the illness. For this reason, the proposed theoretical model will integrate the perspectives of both the patient and physician. This article is organized as follows. The second section will characterize the use of ESR tools in the context of patient-centered care. The third section will outline several theories applicable to the context, and will articulate the rationale for this novel approach. The fourth section will outline the multilevel research model proposed in this article. The fifth section will address some of the limitations of the model, and the sixth section will contain a discussion of this model, including directions for future research.

II. BACKGROUND

The prevalence and incidence rates of many chronic diseases have increased steadily. Diabetes mellitus (DM) and inflammatory bowel diseases (IBD) provide two examples. DM is a condition in which glucose builds up in the blood due to a diminished ability for the body to produce insulin [CDA, n.d.]. DM affects roughly 285 million people worldwide [CDA, 2011] and this number is projected to grow [Ohinmaa, Jacobs, Simpson and Johnson, 2004]. IBD manifests as inflammation or ulcers within the gastrointestinal tract due to an immune system reaction [Carter, Lobo and Travis, 2004; CCFC, 2008]. The Canadian prevalence and incidence rates are among the highest in the world with 201,000 cases in 2008, an increase of almost 10,000 new cases per year. There are also notable increases elsewhere in the world [Loftus, 2004]. These two diseases, in particular, have contributed to a financial burden on healthcare systems and the economy. DM is projected to cost the Canadian healthcare system $16.9 billion per year by the year 2020 [CDA, 2011]. It is estimated that the American financial burden of IBD is more than $1.7 billion per year, including physician visits, hospitalization, disability, and surgery [CDC, n.d.]. The cost to Canadian taxpayers to treat IBD is $700 million per year, with an economic impact estimated at $1.1 billion per year [CCFC, 2008].

Addressing chronic disease compels a healthcare system to be capable of providing care that is longitudinal in nature, as opposed to addressing exacerbations as episodic occurrences [Wagner et al., 2001]. This model of care values patient-physician relationships for the ability to benefit the patient's health, as well as healthcare systems. Through these relationships, physicians gain a deeper understanding of the patient as an individual and collaborate on the nature of the healthcare provided to the patient, with the patient serving as an informed and active participant in his or her own care [Goldberg, 1995]. Referred to as patient-centered care, this approach puts the patient's

individual wants and needs at the center of health care through enabling patients by enhancing their knowledge, empowerment, and skills [Gerteis, Edgman-Levitan, Daley and Delbanco, 1993]. Particular to chronic disease care, patient-centered care is implemented in processes that seek to gain a deep understanding of the patient, as well as his or her illness experience, and develop and support a long-term partnership [Hudon et al., 2012].

Patient-centered e-health (PCEH), based on patient-centered care, pertains to the use of technology for high-quality information interchange between patient and healthcare provider, in a way that enhances the patient's ability to actively participate in his or her own care, and informs others that are involved in the care [Dawson and Horan, 2009; Randeree and Whetstone, 2009]. Patient-held technologies, such as electronic personal health records (ePHRs) [Daglish and Archer, 2009; Tang, Ash, Bates, Overhage and Sands, 2006], can implement information interchange by providing the means for patients to record, share, or access information relevant to their care [Randeree and Whetstone, 2009]. ePHRs can take many forms, including Web portals [Osborn, Mayberry, Mulvaney and Hess, 2011] or mobile applications [Wickramasinghe, Troshani and Goldberg, 2010]. ePHRs have been successfully implemented in a variety of contexts, for instance, self-management of diabetes [Bridgford and Davis, 2001] or providing test results to heart failure patients [Earnest, Ross, Wittevrongel, Moore and Lin, 2004].

One application of patient-held tools involves tracking disease symptoms, and reporting this data to the healthcare provider, so that they may be interpreted by a physician. This application is referred to as electronic symptom reporting (ESR) [Johansen et al., 2011; Johansen, Berntsen, Schuster, Henriksen and Horsch, 2012; Johansen, Henriksen, et al., 2012]. ESR tools have been implemented in the form of Web portals, smartphone applications, and others [Johansen, Henriksen, et al., 2012]. ESR tools have focused on innovating consultation and self-management, monitoring processes, and facilitating relationships where communication between patient and physician is exclusively electronic [Johansen, Berntsen, et al., 2012]. One example of a technology that can be used for ESR is Gi BodyGuard [CDHF, 2011]. This iPhone application is designed to track symptoms relevant to the care of IBD, such as stool qualities, episodes of pain, and food, water, and medication intake. This information can be recorded in between appointments by the patient, and presented to the physician before or during a patient encounter.

III. THEORETICAL REVIEW

ESR can potentially address problems with reporting symptoms and exchanging information within a patient-physician relationship [Johansen et al., 2011], as information is not always clearly communicated by the patient or understood adequately by the physician [Broderick et al., 2008; Roter and Hall, 1987]. Despite this, ESR presents unique challenges to both the patient and the physician, either of which may hinder the implementation of ESR. The patient, while appraising the value of the tool in relation to the disease, must adopt the ESR tool for the long term. Further, an ESR tool on its own will not prevent patients from entering data that is clinically irrelevant, if the patient is ineffective at interpreting symptoms of his or her own disease. The physician must be presented with a tool that does indeed add value to clinical workflow, resulting in insight that the physician may offer the patient. In other words, if the implementation fails for either the patient or physician, the tool will provide no benefit to any party, and will not effectively be used. Therefore, a unique approach to ESR should integrate the perspective of both the patient and physician by guiding knowledge accumulation in this area.

The theoretical background chosen for investigating ESR tools in the area of chronic disease care has been guided by a literature review of relevant theories and related empirical knowledge. Self-regulation theory (SRT) [Diefenbach and Leventhal, 1996] offers an approach to understanding how people with diseases form subjective perspectives of their illness through interacting with their environment, which in turn impact disease-related coping activities. Information systems continuance (ISC) [Bhattacherjee, 2001], an adaptation of the Technology Acceptance Model (TAM) [Davis, 1989; Venkatesh, Morris, Davis and Davis, 2003], provides a framework for understanding long-term use of information systems. Information quality and satisfaction (IQS) [DeLone and McLean, 1992, 2003; Wixom and Todd, 2005] involves the appraisal of the beliefs and attitudes associated with the information produced by a system as a result of its use.

Self-Regulation Theory

Self-regulation theory (SRT) describes the psychological processes that form perceptions of disease held by a patients, formed by the patient's experiences, as well as knowledge gained from other sources. These perceptions are referred to as a "personal model" of a disease, or an "illness representation". Dimensions of the illness representation include *identity* (the type of diseases), *cause* (ideas the individual has about the etiology of the condition), *timeline* (individual perceptions of the duration of the condition), *consequences* (the individual's beliefs about how the condition will impact his/her life), *illness coherence* (the individual's ability to understand his or her illness and its related symptoms), and *curability/controllability* (the individual's beliefs about whether or not the condition can be cured or managed) [Broadbent, Petrie, Main and Weinman, 2006; Lawson, Bundy and Harvey,

2007; Moss-Morris et al., 2002]. Various versions of illness representations exist, whether specific for diabetes [Lawson, Bundy, Lyne and Harvey, 2004] or revisions of previous models [Moss-Morris et al., 2002]. Support exists for relationships between the dimensions of the illness representations and quality of life in chronic diseases such as Crohn's disease and ulcerative colitis [Dorrian, Dempster and Adair, 2009; Han et al., 2006].

The illness representation is dynamic and evolves over time [Cameron and Leventhal, 1995; Leventhal, Diefenbach and Leventhal, 1992]. The process by which this perception develops consists of responding to threatening internal or external stimuli, which can take many forms, such as new health information or physical symptoms. The response occurs at both the concrete and abstract level. The concrete level entails subjective knowledge based on the individual's somatic symptoms and experience with stimuli from the environment. The abstract level refers to the objective knowledge of the disease, its labels, and procedural knowledge for responding to threats; for example, the knowledge gained from reading a book about the disease. As a threat is perceived, the representation is formed by both concrete and abstract processes, and subsequent emotional and health coping cognitive appraisal procedures [Lazarus and Folkman, 1984] are put into action. Figure 1 depicts this process.
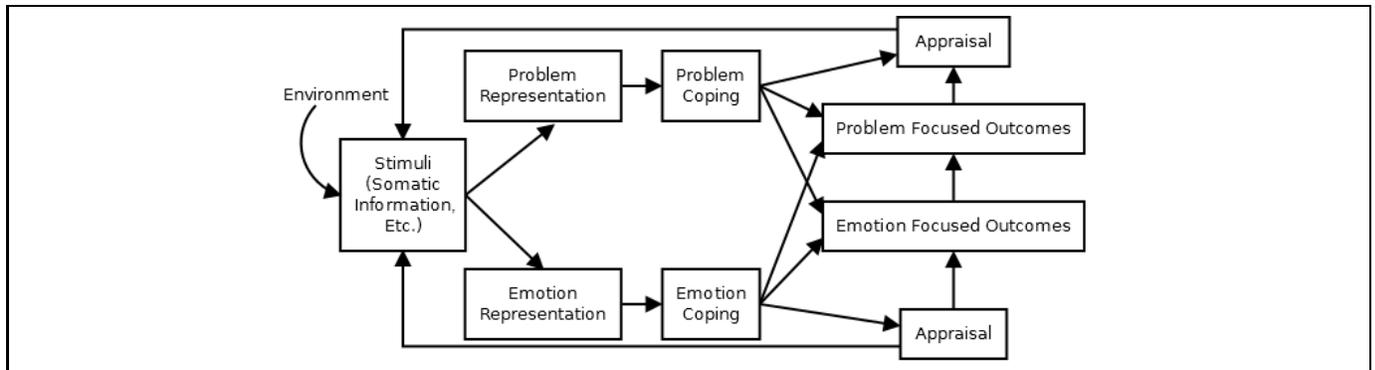

Figure 1. Self-Regulation Theory [adapted from Lazarus and Folkman, 1984].

The process in which threats are perceived and coping mechanisms are evaluated can be expressed in the lens of the cognitive appraisal process [Lazarus and Folkman, 1984]. Two types of questions are asked during the appraisal process by the patient. First of all, the patient assesses the stimulus as relevant; if it is, it is a threat. This is referred to as "primary appraisal." If it is perceived as a threat, the patient then evaluates the coping alternatives that are available. The evaluation of these alternatives is referred to as "secondary appraisal." The words "primary" and "secondary" when referring to these appraisal processes can be considered misnomers, as it is falsely implied that one occurs after the other, which is not always the case. Stimuli and coping strategies may be reappraised at any time following an initial appraisal.

Coping is defined as the execution of a plan that is created for the purpose of addressing a perceived threat [Lazarus and Folkman, 1984]. Coping strategies have been classified as problem-focused coping, which focuses on altering the source of the stress, and emotion-focused coping, which focuses on addressing associated emotional distress. Strategies can be functional, such as actively coping with one's condition, or dysfunctional, such as disengagement from coping efforts. The link between illness representation and coping strategy, monitoring and appraisals is supported in areas such as diabetes [Park, Simmons, Prevost and Griffin, 2008; Searle, Norman, Thompson and Vedhara, 2007]. The most common functional, problem-focused coping style is referred to as active coping [Carver and Scheier, 1989]. Active coping is the initiation of direct action in addressing the source of a health problem.

Technology Acceptance and Information Systems Continuance

Successful adoption of technology entails acceptance by the intended users [Davis, Bagozzi and Warshaw, 1989]. This widely researched subject contains many explanations of technology acceptance by end users. The Technology Acceptance Model (TAM) [Davis et al., 1989] is among the most popular theories on technology adoption. It posits that two factors are determinants of the intention to use technology: *perceived ease of use* and *perceived usefulness*. Perceived usefulness is the belief that using a particular technology will enhance performance when performing a specific task. Perceived ease of use is the belief that the use of a particular technology will require a low amount of effort. Among other antecedents of intention to use a technology is *subjective norm* [Venkatesh and Bala, 2008; Venkatesh et al., 2003], or the degree that an individual believes that other people that are important to the user believe that the individual should use a technology [Taylor and Todd, 1995].

The adoption-focused models such as TAM are regarded as valuable when the individual initially starts to use the technology. However, this model does not address long-term use of the technology. The Information Systems Continuance (ISC) model [Bhattacherjee, 2001] has been proposed to address this need. It is based on Expectation-Confirmation Theory [Oliver, 1980], which posits that repurchase is determined by a positive post-purchase confirmation of the expectations the purchaser has with a given product. This concept of confirmation has been extended to the reuse of software [Bhattacherjee, 2001]. Confirmation and perceived usefulness lead to satisfaction with an application. Satisfaction, along with perceived usefulness, subsequently predicts the intention to continue to use an information system.

Information Quality and Satisfaction

Physicians have expressed interest in integrating the data from patient-held technology into clinical workflow [Huba and Zhang, 2012; Witry, Doucette, Daly, Levy and Chrischilles, 2010]. Although many physicians see patients who track their symptoms and present data to the physician in paper form, low levels of awareness and use of this data by physicians present a fundamental challenge for its integration in care processes, [Fuji, Galt and Serocca, 2008]. Concerns expressed include the fear that irrelevant information will be entered by the patient, compelling the physician to spend undue time and mental effort to interpret the data [Huba and Zhang, 2012; Witry et al., 2010]. These reasons compel the need to ensure the quality of this data from the physician's perspective.

In the information systems literature, satisfaction [DeLone and McLean, 2003; Wixom and Todd, 2005] is an attitude held by a user concerning aspects of a system, based on a judgment formulated from its use. Satisfaction has been employed to judge the system itself, the information that is produced by the system, and the service available to support users of the system. An important feature in this approach is the theoretical linking of judgment of satisfaction to characteristics of the system, which is proving to be a useful body of knowledge for system designers [Wixom and Todd, 2005]. These characteristics, such as interpretability of information produced by the system, are antecedent to the belief the user has about the quality of the information, which is antecedent to information satisfaction.

Antecedents to quality are selected based on their pertinence to the context of use [Wixom and Todd, 2005]. Two such antecedents to information quality in the context of chronic disease care from the physician's perspective are relevance and interpretability [Lee, Strong, Kahn and Yang, 2002]. Relevance is the degree to which information from a system is useful and appropriate within a context of work [Wang and Strong, 1996]. It is pertinent to integrating symptom data into clinical workflow, as data that is meaningful to the patient may not be meaningful to the physician. Interpretability is defined as the degree to which the meaning of information presented in a system is interpreted without difficulty [Lee et al., 2002]. Relevance is also important in this context, as physicians would use symptom data for gaining insight to the patient.

IV. RESEARCH MODEL AND PROPOSITIONS

Figure 2 depicts the multilevel theoretical model that is proposed to explain the use of ESR tools in chronic disease care, integrating the views of the patient and physician. The propositions and their corresponding rationale are presented in the following text, and partitioned into patient, physician, and cross-level models.
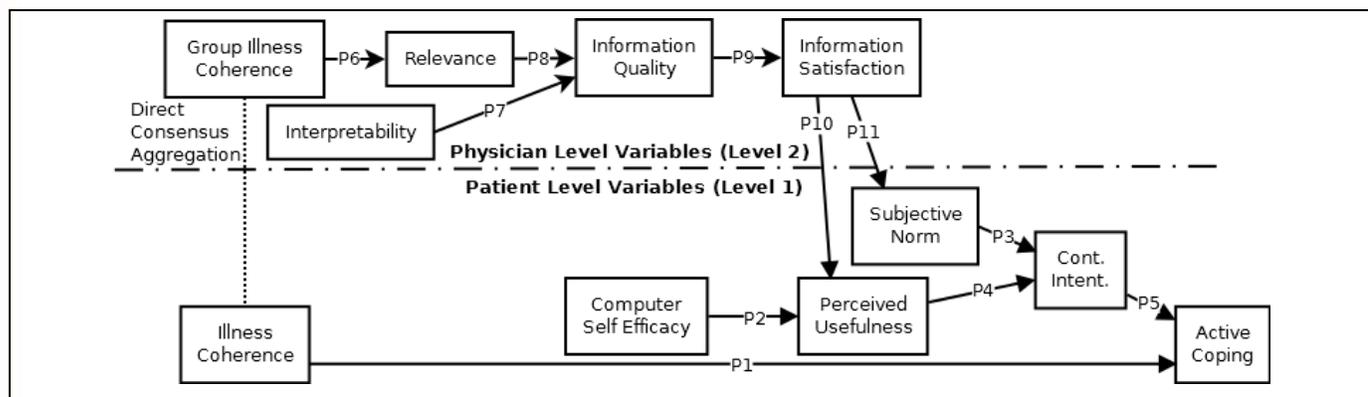

Figure 2. Multilevel Variance Model Explaining the Use of ESR Tools in Chronic Disease Care

Patient Model

P1: Illness Coherence Will Positively Impact Active Coping

Rationale: Illness coherence pertains to the patient's ability to understand his or her disease and its related symptoms [Broadbent et al., 2006; Moss-Morris et al., 2002]. This illness representation variable is posited to positively impact the amount of active coping the individual participates in. This refers to the amount of effort the patient expends in managing his or her condition or eliminating problems related to the disease. Additionally, illness coherence has been found to be a significant predictor of active coping in IBD patients [Dorrian et al., 2009] and those with diabetes [Lawson, Bundy, Belcher and Harvey, 2010].

P2: Computer Self-Efficacy Will Positively Impact Perceived Usefulness of the ESR Tool

Rationale: In general, self-efficacy is the belief that an individual can perform a given activity to a level of performance that will allow the individual to influence a related aspect of his or her life [Bandura, 1977]. Computer self-efficacy refers to the beliefs that an individual possesses the necessary capabilities to effectively use a computer for a given purpose [Compeau and Higgins, 1995]. It is proposed that individuals must feel that they have the competence necessary to effectively use the tool before they will perceive such a tool could increase their performance at a given task. Depending on the nature of the tool, other self-efficacies may be relevant, for example, mobile self-efficacy [Keith, Babb, Furner and Abdullat, 2011] for mobile devices.

P3: Subjective Norm Will Positively Impact Continuance Intention

Rationale: As discussed, subjective norm refers to the belief that people important to the individual believe that the individual should use a certain technology [Taylor and Todd, 1995]. It is likely that the patient will interact with others in ways that are pertinent to their chronic condition, including physicians, other healthcare professionals, family members, and other patients. Any of these people may try to influence the patient to use, or not use, the application.

P4: Perceived Usefulness of the ESR Tool Will Positively Impact Continuance Intention

Rationale: A high degree of perceived usefulness of the application is antecedent to continuance intention, and a high degree of continuance intention precedes greater application usage volume. This relationship is rationalized, both theoretically and empirically, generally and specific to health behavior change for patients [Bhattacherjee, 2001; Davis et al., 1989; Hagger and Chatzisarantis, 2009]. Empirical evidence for this relationship is also demonstrated in other areas, namely e-learning [Chen and Lin, 2012] and e-shopping [Al-Maghrabi, 2011].

P5: Continuance Intention Will Positively Impact Active Coping

Rationale: Patients who have a high intention to continue using an ESR tool designed to eventually benefit them will believe that it will help them reach their goals. In this case, patients are attempting to cope with the disease by using a tool that they believe will help them.

Physician Model

P6: Group Illness Coherence Will Positively Impact Relevance of Information Produced by an ESR Tool

Rationale: The level of illness coherence in a group is argued to positively impact the relevance of the information that the physician views from the ESR tool. This is due to the potential for a patient to record an unnecessarily large amount of data, inaccurate data, and data that is otherwise detrimental to the physician's workflow [Huba and Zhang, 2012], regardless of controls included in the tool. If a physician's patient population is typically coherent of its illnesses, that is, patients are cognitive and understanding of the symptoms that accompany their illness [Moss-Morris et al., 2002], they will be able to differentiate between a true illness symptom and a normal somatic function. If this is the case, then patients will be better equipped to detect what events are relevant when logging data. This results in a more relevant, and less irrelevant, information included in the ESR tool reports, and information that is more useful, applicable, and appropriate to the physician's work [Lee et al., 2002]. This dimension of the illness representation is also argued as relevant to ESR; therefore, it is the only one included in the interest of parsimony.

Conceptualizing group-level variables must be considered carefully [Burton-Jones and Gallivan, 2007]. Concepts that exist at an individual level do not necessarily have an analogous concept at a group level. These group-level constructs, often referred to as "collective constructs" [Hoffman, 2004], may have a different conceptual meaning at the group level. Aggregation is commonly justified through shared interaction among team members, which leads to "norms" or "shared values" being created (e.g. Turel and Zhang, 2011). The ability to demonstrate that the aggregated values exhibit an acceptable degree of within-group agreement [James, Demaree and Wolf, 1984; Luedtke and Robitzsch, 2009] shows that this collective concept does indeed exist. In the clinical context, it is justified by the fact that physicians have their own style of communicating with patients [Reise and Duan, 1999]; therefore, groups of patients can be homogenous with respect to disease and treatment-related concepts. As the

nature of chronic disease care involves many interactions with a single doctor or clinic, this homogeneity is likely. Its shared nature allows us to classify group illness coherence as a shared, direct-consensus construct [Chan, 1998].

P7: Interpretability of Information Produced by an ESR Tool Will Positively Impact Information Quality

P8: Relevance of Information Produced by an ESR Tool Will Positively Impact Information Quality

Rationale: The information quality of the application is pertinent to the physician. The physician will not actually use the ESR tool per se, but will consume information from the ESR tool in some form; for instance, integrated into the physician's own patient management software. Designers of information artifacts should focus on information system features and design in a way to influence their use [Wixom and Todd, 2005]. Further, in the evaluation of ESR tools, the designer should be conscious of the characteristics of the system that are pertinent to the context, in order that it serves its purpose better. Relevance of the information is certainly pertinent to this context, due to the issues that exist with using patient-generated data in clinical workflow [Huba and Zhang, 2012]. With respect to interpretability, as the ESR tool will be used for the purpose of gaining insight into the patient's condition, the physician must have the ability to interpret the meaning of events by the tool, to perceive that it is of high quality.

P9: Information Quality Will Positively Impact Information Satisfaction

Rationale: As previously explained, the judgment of quality of an information system is antecedent to the satisfaction of that system held by the user, which is formulated from its use [DeLone and McLean, 2003; Wixom and Todd, 2005]. The physician will use the data provided by the patient through the ESR tool when attempting to assess disease activity and the effectiveness of the current treatment plan for the patient. The physician will perceive that the data is valuable for this purpose if it provides insight into these issues.

Cross-Level Model

P10: Information Satisfaction of the Physician Will Positively Impact the Perceived Usefulness of the ESR Tool by the Patient

P11: Information Satisfaction of the Physician Will Positively Impact the Patient's Perspective of Subjective Norm

Rationale: The satisfaction of physician use of an ESR tool is indicative of the perceived value of the information for determining the effectiveness of treatments for the patient, and its subsequent adjustment. The patient will appraise the degree to which the physician values the information through interactions between patient and physician. When a physician is satisfied with the ESR tool, the patient will believe that his or her effort in using this tool is valuable. As the subjective norm represents the patient's perspective about the opinions of important others regarding their use of the information system [Taylor and Todd, 1995], it is posited that the physician's opinion will influence this opinion. This "payoff" will also contribute to the degree that the patient believes the use of this tool is useful for its intended purpose [Davis, 1989; Venkatesh and Bala, 2008].

V. LIMITATIONS

Several limitations of the model presented in this article are identified. First, the model was constructed only from reviewing existing literature related to mutually compatible theories relevant to the implementation of ESR. Although some guidance and feedback was received by practitioners, this model can be regarded as the base of future theoretical development, incorporating quantitative or mixed methods so a rich description of use of ESR tools in the context of chronic disease can be constructed. Second, many propositions in this theoretical model are not known to have been previously tested in any context; therefore, several of them lack empirical evidence to reinforce their respective rationale. This limitation is acknowledged, but the authors feel that the potentially important contribution to knowledge justifies the inclusion of these novel propositions. Third, it has been suggested that the performance of illness coherence measures are substandard in certain contexts; for example, in IBD [McCombie, Mulder and Gearry, 2012] or diabetes [Lawson et al., 2004]. This implies the possibility of "disease-specific" versions of the model presented in this article, or the existence of other concepts (perhaps undiscovered) that are more appropriate in a general context. This possibility is acknowledged, although it is outside of the scope for this article.

VI. DISCUSSION AND CONCLUSION

A multilevel theoretical model that explains the usage of ESR tools in chronic disease care has been proposed in this article. ESR tools refer to patient-held technologies implemented in a context of chronic disease care, specifically for the purpose of recording symptoms experienced by patients and reporting them to a physician, so that this information can be interpreted for some purpose [Johansen et al., 2011; Johansen, Berntsen, et al., 2012; Johansen, Henriksen, et al., 2012]. ESR tools can provide advanced capabilities to chronic disease patients when the need arises to report information on disease exacerbations to a physician. These tools can be useful when many patient visits are necessary, or where there is a substantial amount of time between visits. Enhanced patient-

physician communication via these ESR tools can potentially provide positive outcomes for the patient, physician, and healthcare system [Johansen et al., 2011; Johansen, Berntsen, et al., 2012; Johansen, Henriksen, et al., 2012].

The rationale for proposing a multilevel research model in this manner is rooted in the fact that the patient-physician relationship is an integral part of practicing patient-centered care [Dawson and Horan, 2009; Goldberg, 1995]. Using technology in the context of patient-centered care entails the sharing of information between physicians and patients, in order to include the patient's perspective in clinical decisions [Dawson and Horan, 2009; Randeree and Whetstone, 2009]. The purpose of ESR is to therefore enhance the communication between patient and physician by providing a means in which clinically relevant data can be transmitted from patient to physician, and by extension, contribute to a deeper understanding of the patient by the physician. Given the potential benefit of these tools to implementing patient-centered care, theoretical development in this area is important.

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