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Online patient education for chronic disease management: consumer perspectives

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Abstract

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Abstract

Patient education plays an important role in chronic disease management. The aim of this study is to identify patients' preferences in regard to the design features of effective online patient education (OPE) and the benefits. A review of the existing literature was conducted in order to identify the benefits of OPE and its essential design features. These design features were empirically tested by conducting survey with patients and caregivers. Reliability analysis, construct validity and regression analysis were performed for data analysis. The results identified patient-tailored information, interactivity, content credibility, clear presentation of content, use of multimedia and interpretability as the essential design features of online patient education websites for chronic disease management.

Keywords

Patient education; online patient education; design features, tailored information; persuasive systems design

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1. Introduction

Patient education provided to consumers has had a long history of improving health outcomes, particularly for patients who suffer from chronic diseases [1]. Chronic diseases are life long, and improving health literacy and health efficacy is important for better disease management as consumers who understand their disease condition will be more involved in their healthcare [2] and obtain better health outcomes [3]. Patient education has been an integral part of healthcare management as this will enhance patient's health literacy. With the advancement in technology and the availability of the Internet, patient education through online media has the potential to become a good source of health education for patients. Patients have often complained of the inadequacy of face-to-face patient education [4]. There are many reasons for this such as: staff workload, poor communication skills [4], or a need to impart too much information to the patient in too short a period of time [5] .

Chronic disease outcomes are determined by patient behaviour and education is an important factor for changing patients' behaviour. Traditionally, patient education is provided by healthcare providers, but this takes time and may not be convenient for the patient because of the initial shock to learn about a particular condition that one suffers from [6]. Online Patient Education (OPE) will enable education programs to be viewed by patients at their convenience. They can revisit the sites and will be able to absorb more information when they feel more relaxed and calm. Therefore, OPE is to assist patient education, rather than replacing the important patient-physician relationships. In order to do this successfully, serious consideration must also be given to the design of these materials [7]. Although a variety of patient education websites have been developed by a number of healthcare organizations for various diseases, to the best of our knowledge, there has been limited research into the design of such sites or consumers' opinions regarding their design. The aim of this study is to understand patient's preferences in regard to the design features of online patient education and the benefits of such education.

1.1. Benefits of online patient education

Online patient education (OPE) improves health outcomes and also increases the social support for patients. It has been reported in the literature that various OPE websites have improved health outcomes for chronic diseases such as chronic asthma, cardiovascular disease, chronic kidney disease, diabetes and cancer health outcomes [8,9]. Continuing care and OPE help to maintain good control of the disease and prevent complications [2] .

Literature also reported that OPE had positive effects on patient knowledge and health education. Several studies found that OPE offered better health education and improved disease-related knowledge amongst patients [8,1].

Educating patients in managing their daily life is an important goal of therapy today, particularly when such patients suffer from chronic diseases such as heart disease or diabetes mellitus [10]. Through the Web, those with chronic diseases are clearly learning how to manage their conditions correctly. For instance, after seeking information from disease-specific websites, chronic disease sufferers reported taking their medications more regularly and adhering to treatment [11].

OPE can also improve a patient's emotional state and satisfaction [1]. Patients utilising OPE in conjunction with clinical consultations will ultimately save more time than those who seek information solely from their physicians. OPE therefore leads to higher patient satisfaction [12,5], because patients usually value their physician's advice and guidance.

Providing OPE will save time for both the consumers and health professionals. Consumers' knowledge will be increased through OPE and they will spend less time asking information unrelated to their diseases [1] . Less time will be needed to explain about misleading medical recommendations and theories to consumers, which frustrate both patients and their physicians. By using OPE, time spent with patients discussing treatment can be saved, compared to those seeking information solely from their physicians.

It has been demonstrated that OPE is more cost-effective, because it reduces patients' expenses associated with travel to the hospital or medical centre [13]. It also saves patients' time by reducing general time spent travelling, especially during peak-hour [14].

A number of studies agreed that online patient education can improve the quality of communication between patients and their doctors [15]. Most studies found that patients who use online patient education tend to have interactions and communications of a higher quality with their doctors or physicians. This is due to the knowledge that the patient procures from health websites; which, in turn, helps them to direct relevant questions to their doctors, thus reducing unnecessary and time consuming discussions.

OPE has been shown to improve social support amongst patients who suffer from chronic diseases. Studies demonstrated that computer-based and online health interventions improved information seeking, comfort with care, confidence in the medical doctor, social support, and information competence, amongst breast cancer patients [16,17]. Encouragement from support groups or other patients who share the same disease also help patients to be more comfortable in coping with their disease. Social support and the related "connectedness" are highly important factors for chronic disease patients who need all the support that they can get in order to cope with their illness [18].

Newly diagnosed cancer patients tend to perceive the Web as a powerful tool, both for acquiring information and for enhancing the confidence required to make informed decisions [19]. Another study showed that persons with coronary artery disease reported an increased confidence in their choice of treatment after viewing an interactive educational video online [20]. Other benefits of OPE, as perceived in literature included improved patient awareness toward the disease, reduced hospitalization, and easy access to educational material[1]. Chronic diseases like obesity, anxiety, and depression show the highest level of improvement (in patient awareness) subsequent to involvement with online patient education procedures. Similarly, asthma, cardiovascular disease, and diabetes patients show lower rates of hospitalization after undergoing online patient education [21, 22]. The patients would be able to access educational material at their time of convenience and that will improve their understandings of the disease information [6, 2]. OPE is unequivocally amongst the most effective methods of patient education [23, 24]. Therefore, it is highly likely that OPE will assist carers and professionals in providing health education to patients and healthcare consumers. Several programs have assisted health professionals through online communication such as Teleconsultation through telemedicine [25], online medical education [26] and electronic health records [27]. It is important to assist consumers towards their health management.

Table I
Health Benefits.

Perceived Benefits in Health Aspects (BH)	Articles
Improved health outcomes	[23, 28]
Improved health education and knowledge acquisition	[8, 29]
Improved patient awareness	[30, 31]
Increased patient confidence towards treatment	[32, 33]
Improved Self-care behavior and self-care management	[10, 34]
Reduced hospitalizations	[22, 35]
Adherence to treatment	[7, 11]

Table II
Social Benefits.

Perceived Benefits in Social Aspects (BS)	Articles
Improved quality of interaction with physician	[15, 36]
Easy access educational material	[7, 31]
Time Effectiveness	[37, 14]
Cost Effectiveness	[37, 14]
Improved Social Support	[16, 38]
Improved patient emotional state and satisfaction	[7, 38]

1.2. General design features of online patient education

OPE offers significant benefits to those who suffer from chronic disease, but only if the site is well designed. A specific set of design criteria must be followed in order to ensure that patients can benefit from using the site. Design considerations for OPE have been identified after reviewing the current literature.

Patient Tailored information

Tailored information is needed for OPE as patients will get individualised information and feedback [39]. The tailored content may be guaranteed by generating a well-defined outline of tailored information which must be clarified before designing an OPE. [40] emphasize the importance of tailoring health communication messages to individual characteristics in order to maximize the effectiveness of patient education. Tailored information can be provided to patients after allowing the users to choose the options after giving them the available information or after asking questionnaire to profile the users, for example: “receive computer-tailored advice based on their answers”[41], tailored advice and action plan [42]. Tailored information can be provided to patients as feedback and reminders [43], “tailored recommendations.”[44], ”tailored interactive text encouragements[45].

Interactivity

Unlike traditional patient handouts, the OPE should offer patients a sense of interactivity and engagement which can enhance the process of learning and understanding [46]. Glasgow, Boles, McKay, Feil, and Barrera (2003) reported that participants who were randomized to a peer support website (which included bulletin boards and live chat sessions) accessed the Web site more frequently than participants that were randomized to a behavioural counseling website [47]. Ferney and Marshall reported that presence of interactive features together with relevant information is needed for physical activities intervention website [48]. The study also noted that using live chat and forums in web-based interventions help patients and their involvement [48].

Credibility

Reliability, credibility, accessibility and readability of information are the main consumer concerns regarding health information websites [49]. All Web-based information must follow specific guidelines according to the disease-type under discussion [50]. “Health on the Net foundation” and the “Health Summit Working Group” have identified criteria for health information websites, which included credibility, content, disclosure, links, design, interactivity, and caveats [51,52]. Credibility, trustworthiness and authority represent reliability of information source [53]. Oinas-Kukkonen and Harjumaa also identified trustworthiness, expertise, authority, verifiability are features of system credibility support category [54]. Therefore, credibility of the information is an important aspect for the OPE.

Presentation of Content

Presentation of content in text form, graphical displays and audios have been suggested for health websites in different studies [2, 55]. Colours should be used sparingly according to the age group [56] or to address the colour vision deficiency [57]. Another important feature in the presentation of contents is the navigational instructions used within OPE. Several studies demonstrate that providing clear navigational instructions which are appropriate for users at all levels of experience are likely to increase the chances of health consumers visiting the OPE site subsequently [48, 58]. A multilingual function has also been shown to help OPE site users function more effectively [59]. The layout and content of OPE websites should use simple and realistic pictures to illustrate medical concepts [60, 61].

Interpretability

It was identified that complexity of the medical terms used in health information sites led to the low readability [62]. Patients desire educational sites that are easy to understand, unhindered by complex medical terminology, and provide a detailed glossary when the use of such jargon is unavoidable. It is argued that this will ensure that the patient who uses the site will have a better understanding of the information related to the OPE process [59,63].

Table III
OPE Design Features.

Groups	Design Features	Articles
Patient Tailored Information (5 items)	Information tailored to patient's symptoms	[4, 64]
	Guidance to patient's self-care management	[28, 5, 65]
	Advice tailored to patient's personal treatment preferences	[65, 42]
	Tailored feedback	[5, 43]
	Mode of delivery of treatment information	[48, 66]
Interactivity (6 items)	Live chat	[67, 59]
	Animations and interactive learning material	[48, 68]
	E-mail function	[48, 66]
	Linked to social networks, e.g. Facebook or Twitter	[69, 70]
	Patient forums	[48, 59]
	Interactive quizzes	[68, 41]
Credibility (8 items)	Date of content update	[71, 72]
	Accredited by a recognized health organization	[52, 73]
	Patient's rights displayed on homepage.	[74, 75]
	Accreditation by a health organization displayed	[49, 71]
	Author's name and contact information displayed	[68, 71]
	Adhere to quality guidelines	[49, 28]
	Personal info is secured	[76, 77]
	Must login/password to see patient's personal information	[2, 74]
Presentation of content (6 items)	Colour contrast-readability	[68, 74]
	A screen reader that reads aloud the text on sites	[68, 74]
	Multilanguage functions	[59]
	Descriptive text/captions	[60, 61]
	Simple, realistic pictures to show medical concepts	[48, 61]

	Easy navigation for all levels of users	[48, 68]
Interpretability (2 items)	Free of medical jargon	[5, 2]
	Glossary of medical terms	[59, 2]

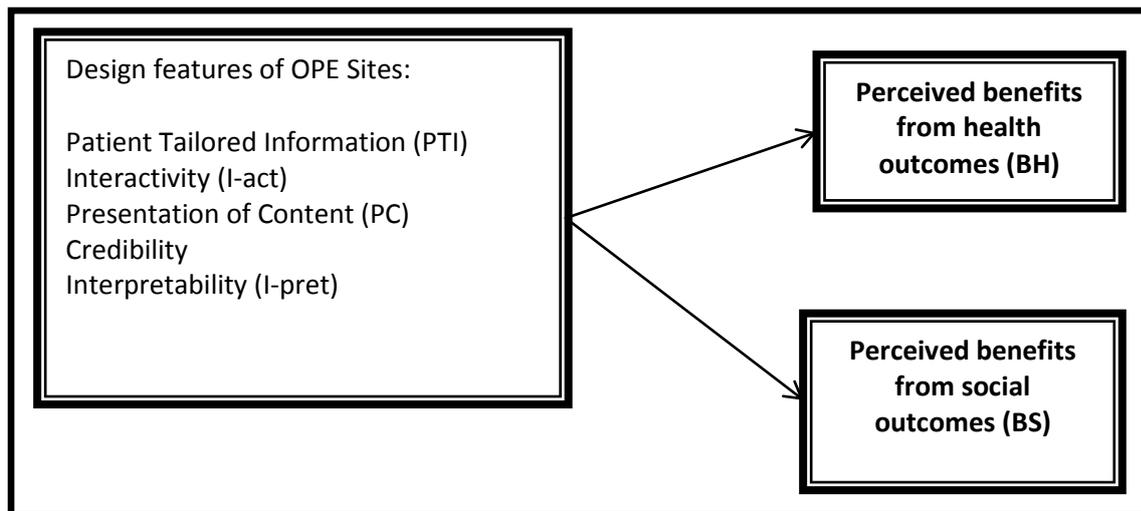
1.3. Design features and perceived benefits

According to the theory of reasoned action [78], individuals consider the consequences of an action before performing it. Therefore, a person's attitude will influence his/her intention to act. As intention develops from an individual's preference for a particular type of behavior, it is important in online patient education to understand patients' preferences regarding this type of education and their attitudes towards its benefits.

The aim of patient education is to inform patients about health information and to encourage them to improve their behaviour in healthcare management. Therefore online patient education systems need to consider the principles of the behavioral change support system (BCSS). They summarised the persuasive system design principles as primary task, dialogue, system credibility and social support. User satisfaction with a system could be enhanced through intrinsic motivational factors similar to those identified by Herzberg theory of Hygiene [79]. A two factor theory of website design, website hygiene factors were those that provide the basic content and structure of a website and motivating factors are those that contribute to user satisfaction [79]. This would mean that patient tailored information, interactivity, presentation of content, and the content would be the key features to be included for the basic architecture of chronic disease management, and the perceived benefits would be the motivating factor that can be applied to a two factor theory of website design. Moreover, these satisfy the definition of behavioral change support systems [80] as items in patient tailored information are related to primary task category, credibility items are related to the system credibility category, and items in interactivity are related to computer-human dialogue and social support. Therefore, the design features identified in this study satisfy the behavioral change support system definition. As such, it will satisfy the purpose of patient education "the provision of information and advice and behavior modification techniques, which influence the way the patient experiences his illness and/or knowledge and health behaviors" [81].

The construct of perceived benefits is defined as beliefs about the positive outcomes associated with behavior in response to a real or perceived threat [82]. The perceived benefits construct is also defined as an individual's belief that specific positive outcomes will result from a specific behavior [83]. Research conducted over the last three decades has demonstrated the use of this construct in predicting behavior, but several measurement issues continue to warrant attention when employing a perceived benefits scale. The perceived benefit construct is included in many health behavior models, for example, it is one of the four major predictors of health-related behavior in the Health Belief Model [84].

Figure 1: Design features and perceived benefits of online patient education



2. Methodology

Review Process

A literature in patient education was extracted and consumers' preference of design features and perceived benefits of OPE were explored. The initial list of design features was examined by experts on the subject, resulting in several changes in wording, and deletion of redundant items. The five experts who gave feedback included medical practitioners, health informaticians and experts in health informatics and information systems. It took six weeks to generate opinions from expert team. A draft of 12 items on perceived benefits and 31 items in design features were included in the draft questionnaires before given to the reviewers. The result from the content validity by the experts resulted in the number of items being reduced from 31 to 27. A pilot study was then conducted using semi-structured interviews and close-ended questionnaires to generate the quantitative survey instrument. Twenty respondents participated in the pilot test questionnaire. Questionnaires were then refined based on the pilot test. Then, another set of questionnaires was administrated to a convenient sample of target population.

Data Collection

Participants were contacted via Diabetes Australia websites and were all chronic disease patients or family members of these patients who used OPE sites. The final version of the questionnaire comprised the 27 design features and 13 benefits. Chronic disease websites were identified for the sampling procedures. More than 45 chronic disease websites from Australia were available for the public. These were evaluated by our research team, excluding sites that focused more on commercial activity. A formal email was sent to seek information about the sites membership which comprised of health professionals and patients/carers of chronic disease. A final list of 27 websites was identified from which 7 sites had given permission to provide survey information for gathering data. Of the 215 respondents participated in survey, 74 participants were health professionals and 145 respondents were patients/carers. The analysis for patient/carer is presented in this study. Of these, 4 were eliminated because they had omitted over 25% of the questions, leaving 141 patient/carer respondents (44 male and 97 female). Respondents were aged as follows: 9.9% from 25-34 years, 8.5% from 35-44 years, 15.6% from 45-54 years, 24.1% from 55-64 years and 41.8% aged 65 years and over.

Methods used for validation

The reliability of the instruments for each feature and benefit was tested using Cronbach's Alpha and the results are discussed in the next section. Construct validity was then assessed using Exploratory Factor Analysis (EFA). The factor extraction method chosen for this study is Principal Axis Factoring because it is recommended if the assumption of multivariate normality is "severely violated". The goal of rotation is to simplify and clarify the data structure [85]. Statistical analyses were performed using SPSS Version 19.0.

Factor analyses were carried out in order to find an item reduction scheme that shows how the items cluster which points out significant overlap among subgroups of items. Two converging criteria for deciding how many factors to retain were observed: the Kaiser rule (choosing all factors with Eigen values $\lambda > 1$) and the Cattell screen plot method (retaining all principal components located in the steeper part of the graph). To test whether Factor analysis is satisfactory, we used the Kaiser–Meyer–Olkin [86] and Bartlett's tests to measure the sampling adequacy. In addition, to examine the effect of OPE design features on the perceived benefits of OPE sites, PLS was conducted.

3. Results

Reliability and the construct validity of the items were tested. The results are displayed in table V.

All scales demonstrated acceptable Cronbach's alphas and composite reliabilities [87] except for interpretability, which had a Cronbach's alpha of 0.622, which falls below the usual threshold of 0.7. However, it was decided not to eliminate interpretability because the features in that group are strongly represented in the literature, and are intrinsically relevant. The results could be explained as those participating in the survey were those used to access the chronic disease website or they have been the chronic disease patients for a long period. The remaining items that were characterized through inter-rater reliability into five factors were evaluated using EFA. On the basis of item-total correlations and factor loadings, three design features were eliminated; two from Credibility: must login to see personal information, personal information is secured; and one from Presentation of content: easy navigation for all level of users. "Interactive quizzes" feature from the "Interactivity" is loaded under Patient Tailored Information. This left only 24 of the design features for the remaining analyses. The same tests of validity and reliability were carried out for the 13 benefits of OPE. The Cronbach's alphas and composite reliabilities were within the accepted range for both scales, so we accepted all 13 benefits as being valid. To investigate the underlying factors in the 24 design features, principal axis factoring with varimax rotation was carried out. Prior to running the Principal Axis Factoring, examination of the data indicated that not every variable was perfectly normally distributed. However, given the robust nature of factor analysis, these deviations were not considered problematic.

Six factors with Eigenvalues exceeding 1 were identified as underlying the 24 design features. In total, these factors accounted for 56.75% of the variance in the data. All features of design features loaded according to the groups initially identified except the two which were associated with presentation of content did not load onto that factor but presented as a new factor, which we have called Multimedia.

Two factors with Eigenvalues exceeding 1 were identified as underlying the 13 OPE Benefits. In total, these factors accounted for around 60.66% of the variance in the data. "Adherence to treatment" loaded onto both of the underlying factors, Health benefit and social benefit with values of 0.595 and 0.507 respectively.

Table IV: OPE design features after the reliability test

Patient Tailored Information	Interactivity	Credibility	Presentation of content	Multimedia graphic	Interpretability
<ul style="list-style-type: none"> •Information tailored to patient's symptoms •Guidance is appropriate for patient's self-care management regime •Advice is tailored to patient's personal treatment preferences •Tailored feedback provided •Mode of delivery of treatment information •Interactive quizzes 	<ul style="list-style-type: none"> •Live chat •Animations & interactive learning material •Email function •Linked to social networks such as Facebook & Twitter •Patient forums 	<ul style="list-style-type: none"> •Date of content update •Personal information is secured •Accredited by a recognized healthcare organization •Patient's rights are displayed on the homepage •Accreditation by a healthcare organization is displayed •Author's name and contact information are displayed 	<ul style="list-style-type: none"> •Colour contrast-readability •A screen-reader that vocalizes the textual messages •Multilanguage functions 	<ul style="list-style-type: none"> •Descriptive text/captions •Simple and realistic pictures illustrating medical concepts 	<ul style="list-style-type: none"> •Free of medical jargon •Glossary of medical terms provided

Table V: Correlation Analysis Between OPE Design Features and the Perceived Benefits

	BS	BH	PTI	I-act	Cred	PC	MG	I-pret
BS	1							
BH	.735**	1						
PTI	.560**	.497**	1					
I-act	.471**	.378**	.360**	1				
Cred	.371**	.361**	.415**	.374*	1			
PC	.360**	.306**	.312**	.459**	.311**	1		
MG	.365**	.363**	.330**	.308**	.385**	.301**	1	
I-pret	.311**	.350**	.362*	.394**	.311**	.315**	.376**	1

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

A correlation analysis was used to examine the strength of the relationship existing between the OPE constructs derived from the perspective of the patients/carers. As presented in table V, each correlation coefficient existing between the constructs is statistically significant ($p < 0.01$); and each correlation coefficient value is greater than 0.3 (from 0.301 to 0.735).

Table VI: Path Analysis for health benefits

Path analysis for health benefits				
Relationship	Coefficient	T- value	P-value	Support
PTI to BH	.425	5.083	.000	YES
I-act to BH	.206	2.434	.016	YES
Credibility to BH	.096	1.157	.249	NO
PC to BH	.064	0.772	.442	NO
I-pret to BH	.082	1.044	.299	NO
MG to BH	-.207	-2.444	.016	YES
Dependent variable: perceived benefits derived from social outcomes: Multiple R = .649a, $R^2 = .422$, Adjusted $R^2 = .396$, SE = .534				
Analysis of variance		df	Sum of Squares	Mean Square
Regression		6	27.895	4.649
Residual		134	38.261	.286
F = 10.823				

Significant F = .000*

Amongst the six features of OPE design features identified in this study, the patient tailored information feature had the greatest impact on the perceived benefits of OPE sites for chronic diseases, as evidenced by the responses from patients and caregivers. Interactivity was the second most significant feature that led to perceived benefits. Multimedia Graphics is believed to have led to perceived benefits in the case of health outcomes, but not social outcomes; on the other hand, Presentation of Content is believed to have led users to obtain the benefits of social outcomes and not health outcomes. From these findings, it can be inferred that users (i.e. patients/carers) of chronic disease OPE sites seek tailored information and more interactive features within OPE sites.

In addition, a multiple regression analysis was conducted in order to determine the relationships between six of the OPE design features and the perceived benefits. As evidenced in Table VI, the high multiple R² statistic of .326 indicates that the model fits well. The regression coefficient for PTI was significant ($p < .01$). Interactivity and Multimedia were also significant ($p < .05$); and all constructs except Multimedia were positive. Interactivity appears to have had the greatest impact ($\beta = .206$) on health outcomes. However, PTI ($\beta = .425$) and MG ($\beta = -.207$) were notably lower in impact compared to the interactivity design features.

Table VII: Path Analysis for Social Benefits

Relationship	Coefficient	T- value	P-value	Support
PTI to BS	.427	5.519	.000	YES
I-act to BS	.229	2.926	.004	YES
Credibility to BS	.015	0.191	.849	NO
PC to BS	.155	2.034	.044	YES
I-pret to BS	.077	1.050	.006	NO
MG to BS	-.005	-.063	.950	NO
Dependent variable: perceived benefits derived from health outcomes: Multiple R = .571, R ² = .326, Adjusted R ² = .296, SE = .533				
Analysis of variance	df	Sum of Squares	Mean Square	
Regression	6	18.504	3.084	
Residual	134	38.183	0.285	
F = 10.823 Significant F = .000*				

*One-tail (P-value is significant for $p < 0.05$)

As presented in Table VII, the regression coefficients for PTI and Interactivity were significant ($p < .01$). Presentation of Content was also significant ($p < .05$) and all results were positive. Presentation of Content appears to have had the greatest impact ($\beta = .155$) on social outcomes followed by Interactivity ($\beta = .229$). However, patient tailored information was notably lower in impact ($\beta = .427$) compared to the other two design features.

4. Discussion and Conclusion

4.1. Discussion

Online patient education would be beneficial to patients as evidenced by the literature. This study identified the design features through the literature review and conducted studies with patients and carers of chronic disease and their opinion on online patient education. Although more features were identified, twenty-four design features identified initially received strong support in our survey of patients and carers, considering that these features would give more benefit to OPE sites for chronic disease management. Respondents viewed interactive quizzes as part of the tailoring features align with literature, given tailored feedback at the end of each questionnaire [88, 89]. Consumer behaviour studies [90] indicated that well designed websites will have an effect on consumers behaviour [91]. Therefore, design features identified for OPE will play an important role in patient behaviour change towards their healthcare management.

Patient tailored information and interactivity features appeared to be the most important among the designed features identified because they explained the largest portion (14.90% and 14.11%) of the total variance. Both factors had five scale items that addressed the OPE design features. The third factor, credibility, explained 11.73% of the variance. It measured “credibility” features such as date of content update displayed or accreditation by a recognised health organisation displayed. The construct, presentation of content, explained 6.68% of the variance and comprised three items which provide Multilanguage function, adjustable colour contrast and toolbar for screen reader to read text on sites. The construct, interpretability, explained 5.25% of the total variance and comprised of two items that provide, glossary of medical terms and free of medical jargon. This has been consistent with the previous studies on online patient education where the importance of glossaries and the understanding of medical jargons were highlighted [2]. The last group, multimedia, explained 4.08% of the total variance and also comprised of two items regarding presentation of multimedia in OPE sites.

Health benefits and social benefits were identified in this study. Health benefits appeared to be more important than the social benefits because they explained the larger portion (54.96%) of the total variance. The only concern we have in this result is with the item, adherence to treatment, where there is a strong cross loading onto social benefits. We decided to include adherence to treatment as a health benefit because that is logically where it belongs. However, additional research on this would be worthwhile.

From this study, it can be seen that 65.9% of participants are 55 years and over as older individuals as majority of older adults have chronic disease. As indicated by Ammann et al. computer mediated health intervention and health promotions are possible for older individuals [92] and online patient education could assist in promotion of health behavioural change. This will assist consumer empowerment in their healthcare management [93].

This study has its limitations. Our data was collected only from patients with chronic diseases and their carers who use the OPE sites at the specified time period. The study is mainly focused on chronic disease patients. There are several health education websites that focused on giving health education to patients and consumers on lifestyle modifications such as motivating physical activity and assisting patients to quit smoking. The benefits identified by these sites could be different. This study did not report data about the design features or benefits of OPE sites from medical practitioners or health professionals as the study focused on the consumer behavior and perceptions of OPE. This study was conducted online and opinions are from those that have used health websites and their perceptions of desired features on online patient education. Design features identified from patients are dependent on patient’s perception and recollection. The usability study has not been conducted.

Design features for OPE websites for chronic disease have been identified through literature review, feedback from health professionals, health informaticians and IT professionals and the consumers. However, this paper is focused only on patients and carers as they are the target users of OPE. Future work is to validate these through health professionals and IT professionals for stakeholders’ opinion.

4.2. Conclusion

In summary, this study has confirmed a set of OPE design features based on persuasive system design which includes patient tailored information, interactivity (especially social support), presentation of content, credibility

(especially system credibility), and multimedia information for chronic disease sites. Furthermore, this study has also identified and validated a set of benefits for OPE chronic disease sites, and health benefits and social benefits of OPE have been confirmed and items for those have been tested.

Patient education has been an integral part of chronic disease management. With advancement in information technology and availability of health information online, OPE will assist disease management and healthcare behavior. Therefore, understanding consumers perception on design of OPE will be beneficial for better health outcome and provide effective patient education. Continuation of this study will be emphasising more on persuasive features of online patient education as the purpose of patient education is to persuade patients to modify their behavior towards disease management.

Patient education plays an important role in chronic disease management. Face to face education involves a lot of human resources, time commitment and healthcare dollars. Developing OPE would assist in patient's education. Therefore, identifying effective design features will assist in patient education and research on online patient education is the area to be explored.

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Appendix

Benefits of Online Patient Education

For each statement below, please indicate your opinion by ticking (√) only one box from STRONGLY DISAGREE (column 1) to STRONGLY AGREE (column 5) in each row.

Benefits of Online Patient Education (OPE)	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
(1) I believe that an OPE can improve patients' health education and knowledge acquisition.					
(2) I believe that an OPE can improve patients' awareness and willingness to change.					
(3) I believe that by following the advice of an OPE can increase patient's confidence about their treatment.					
(4) I believe that by following the advice of an OPE can improve patients' self-care behaviour and self-care management.					
(5) I believe that by following the advice of an OPE can improve patients' health outcomes.					
(6) I believe that by following the advice of an OPE can reduce hospitalizations.					
(7) I believe that an OPE can help to persuade a patient to accept appropriate treatment suggested by their physician.					
(8) I believe that an OPE may improve the quality of interaction between patient and physician.					
(9) I believe an OPE improves patient access to educational material.					
(10) I believe that an OPE can be more time effective for both patient and healthcare providers.					
(11) I believe that an OPE can be more cost effective for both patient and healthcare providers.					
(12) I believe that an OPE may improve a patient's social support.					
(13) I believe that an OPE may improve a patient's satisfaction towards healthcare system quality such as reliable medical information are more likely make better use of the healthcare system.					
(14) I believe that an OPE may improve a patient's emotional state.					
Section C: Possible Design Features of Online Patient Education (OPE)					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

(15)	I want feedback that is tailored to my Disease Management Status.						
(16)	I want an OPE that tailors information for me according to my symptoms.						
(17)	I want an OPE that provides guidance appropriate to my own self-care management.						
(18)	I want an OPE that provides advice tailored to my personal treatment preferences.						
(19)	I want an OPE that allows me to choose the mode of delivery of my information i.e. result from health quiz send through email or on screen.						
(20)	I prefer OPE sites that allow me to take interactive quizzes.						
(21)	I prefer OPE sites that allow me to participate in patient forums.						
(22)	I prefer OPE sites that allow me to be involved in live chat.						
(23)	I prefer OPE sites that make recommendation of things to discuss with my doctors.						
(24)	I prefer OPE sites that include a toolbar on every page that lets me change the screen viewable format i.e. text size and colour contrast of the page.						
(25)	I prefer OPE sites that include a toolbar on every page that lets me activate a screen reader that reads aloud the text on the page.						
(26)	I prefer OPE sites that use simple, realistic pictures to illustrate medical concepts.						
(27)	I prefer OPE sites that include a descriptive caption that explains any picture.						
(28)	It would be good to have OPE sites that have easy navigation instruction for all levels of users.						
(29)	A Multilanguage function would help me to understand better if I am not comfortable reading in English.						
(30)	I would be more confident using OPE sites that are accredited by a recognised health organization.						
(31)	I prefer OPE sites that follow the specific quality guidelines recommended for a particular disease.						
(32)	I would feel more secure if an OPE displayed information about accreditation by a health organization.						
(33)	I feel more confident if an OPE site does not display marketing or advertising material.						
(34)	I feel more confident if the OPE displays the date on which the content was last reviewed.						
(35)	I feel more confident if the OPE site provides a reviewer's name and contact information.						
(36)	I would like to see the patient's rights displayed on the OPE homepage.						
(37)	I would feel more secure if an OPE site required a login and password for me to see my personal information.						
(38)	I prefer to have OPE sites that keep track of my usage by keeping my activity log.						
(39)	I would like to see the privacy policy displayed on the OPE homepage.						
(40)	I prefer that an OPE secures my personal information from being viewed, collected or otherwise misused.						
(41)	I would like to have OPE sites that are easy to understand and free of medical jargon.						
(42)	I prefer an OPE that provides a glossary that explains any medical term.						
(43)	I think it would be good to have an e-mail function that gave me private access to other users of the OPE site.						

(42) I prefer OPE sites that allow sharing of information as in a social network such as Facebook or Twitter.					
(43) I prefer OPE web sites that have calendar planner to help with my day to day schedule in managing my disease.					