Heart, Lung and Circulation (2019) **28,** 761–770
1443-9506/04/$36.00
https://doi.org/10.1016/j.hlc.2018.03.013

ORIGINAL ARTICLE

Evaluating the Effectiveness of an Online Cardiac Rehabilitation Resource (www.svhhearthealth.com.au) in Improving Knowledge and Confidence for Patients With Newly Diagnosed Cardiac Conditions: A Pre-Experimental Pilot Study

Nikki Molan, MD [a,b], Sam Emmanuel, MBBS [a], Tamra Langley, BN [a], Cameron J. Holloway, MBBS, MRCP [a,b,c,d*]

[a]St Vincent's Hospital, Sydney, NSW, Australia
[b]University of Notre Dame, Sydney, NSW, Australia
[c]St Vincent's Clinical School, University of New South Wales, Sydney, NSW, Australia
[d]Victor Chang Cardiac Research Institute, Sydney, NSW, Australia

Received 16 May 2017; received in revised form 10 March 2018; accepted 12 March 2018; online published-ahead-of-print 27 March 2018

Background Cardiac rehabilitation (CR) is an important tool for the secondary prevention of cardiac disease. Despite its proven effectiveness, CR remains vastly under-utilised especially amongst the most disadvantaged patients. As an adjunct to CR, the St Vincent's Heart Health website (SVHHH) was created by the St Vincent's Hospital CR team to provide information via simplified medical text, videos and animations. We evaluated the effectiveness of the website in educating patients about their heart condition.

Methods Patients with a newly diagnosed cardiac condition were recruited from St Vincent's Hospital inpatient wards and outpatient clinics (n = 67, age 63+/−11) and given 30 minutes to interact with our online resource. Using a pre-test post-test design we evaluated the success of the website in improving patients' knowledge of their condition using a modified Brief Illness Perception Questionnaire and Patient Activation Questionnaire.

Results After interacting with the website, participants rated a 50% improvement in the control they felt over their heart condition ($p < 0.01$). Understanding of investigations, medications and management improved by 38%, 31% and 38%, respectively (all $p < 0.01$). Subjects' understanding of their heart condition improved by 34% and confidence improved by more than 18% ($p < 0.01$). These improvements were seen irrespective of age and primary place of residence. While older subjects had the lowest confidence using the internet, they demonstrated the greatest self-reported improvement in knowledge. There was no improvement in patients' perceived concern about their illness.

Abbreviations: CR, Cardiac Rehabilitation; CVD, Cardiovascular Disease; SVHHH, St Vincent's Hospital Heart Health

*Corresponding author at: St Vincent's Hospital, 390 Victoria Street, Darlinghurst NSW 2010, Australia., Email: cholloway@svha.org.au

Conclusions The St Vincent's Heart Health website shows real promise as an educational tool for patients, as an adjunct to standard CR and for patients in remote settings. Online health resources will likely become an important adjunct to traditional teaching methods across all medical specialties to improve patient outcomes.

Keywords Cardiovascular disease • Cardiac rehabilitation • Secondary prevention • Web-based • Internet • Online

Introduction

Cardiovascular disease (CVD) is the leading cause of death globally, accounting for 31% of all deaths [1]. In Australia one in five adults suffers from CVD, with a 30% higher incidence for those living in remote and rural areas [2]. Improvements in pharmacological and interventional therapies have led to a dramatic increase in survival rates following an acute coronary event, however, one third of people will have another cardiac event within 5 years of the initial insult [3].

Cardiac rehabilitation (CR) is an effective secondary prevention intervention that decreases mortality by up to 20% [3], reduces hospital admissions, strengthens adherence to medications, improves knowledge of risk factors, decreases depression and anxiety and enhances quality of life [4]. The World Health Organization and the National Heart Foundation of Australia suggest that CR should be recommended to all patients admitted to hospital with an acute coronary event or procedure [5,6]. Yet, despite these recommendations and the overwhelming evidence supporting its use, CR remains underutilised with only 30% of eligible patients attending. Furthermore, disadvantaged patients, including those from lower socio-economic backgrounds, of older age and those living in rural areas have even lower attendance rates [7].

There is increasing evidence that delivering information via the internet is an effective way to improve health outcomes. Bashi et al. [8] piloted a web-based self-management program for heart failure patients and found that websites were effective in improving patient knowledge and quality of life, in addition to reducing symptoms of heart failure. Varnfield et al. [9] demonstrated that a smartphone-based home care CR was as effective as traditional CR in improving physiological and psychological health outcomes after acute myocardial infarction. Web-based education has the potential to reduce the disparities in access to CR programs by overcoming some of the practical difficulties that deter attendance to traditional cardiac rehabilitation programs.

The value of online education tools as an adjunct to traditional CR is unknown. The St Vincent's Heart Health website (SVHHH) was created by the St Vincent's Hospital Cardiac Rehabilitation team in Sydney, in collaboration with a website developer, an animator, a videographer and a health writer. Within the first 12 months following launch, over 70,000 page visits had been recorded by Google analytics, with an average of 2.5 pages viewed per session, and an average time of 2 minutes 30 seconds per session. The vast majority of visitors were from Sydney, 75% were from Australia and 28% were returning visitors. The most visited sections of the website, included information about procedures, specialists, cardiac investigations and rehabilitation after cardiac intervention. The purpose of this study was to evaluate the success of the SVHHH website in improving the knowledge and confidence of patients with a newly diagnosed cardiac condition with the hope that this website will be able to enhance disease management for a wide population.

Methods

Trial Design

This was a quasi-experimental pilot study with a one-group pretest-post-test design. A questionnaire was devised to evaluate the usefulness of our heart health website www.svhhearthealth.com.au.

Development of the Website

The website includes narratives, text on screen, two dimensional (2D) graphics, three dimensional (3D) animations and videos. The content was developed by cardiologists, cardiothoracic surgeons and members of the allied health CR team from St Vincent's Hospital (examples are provided in Figure 1 and the sitemap in Figure 2). The website was designed to provide patients and their carers with access to the latest and highest quality medical information and rehabilitation guidelines with the purpose of empowering patients with knowledge through their cardiac journey: before procedures; during their inpatient stay and subsequent recovery period. With the emphasis on visual education and animation, it was designed to accommodate patients and caregivers with poor reading skills and those unfamiliar with using the internet.

Participants

During the recruitment period, study investigators screened cardiology inpatient lists and cardiology outpatient clinic lists to find suitable participants. If the patient satisfied the inclusion criteria, then they were approached and invited to participate in the study, as shown in Figure 3.

Inclusion Criteria

Eligible participants were those admitted as inpatients or presenting via outpatient clinics at St Vincent's Hospital with a new diagnosis of cardiac disease, including acute coronary syndrome (acute myocardial infarction or angina), requiring coronary revascularisation (percutaneous coronary angioplasty or coronary artery bypass grafting), valvular disease (aortic stenosis, mitral stenosis, aortic regurgitation, mitral regurgitation) or for insertion of a permanent pacemaker

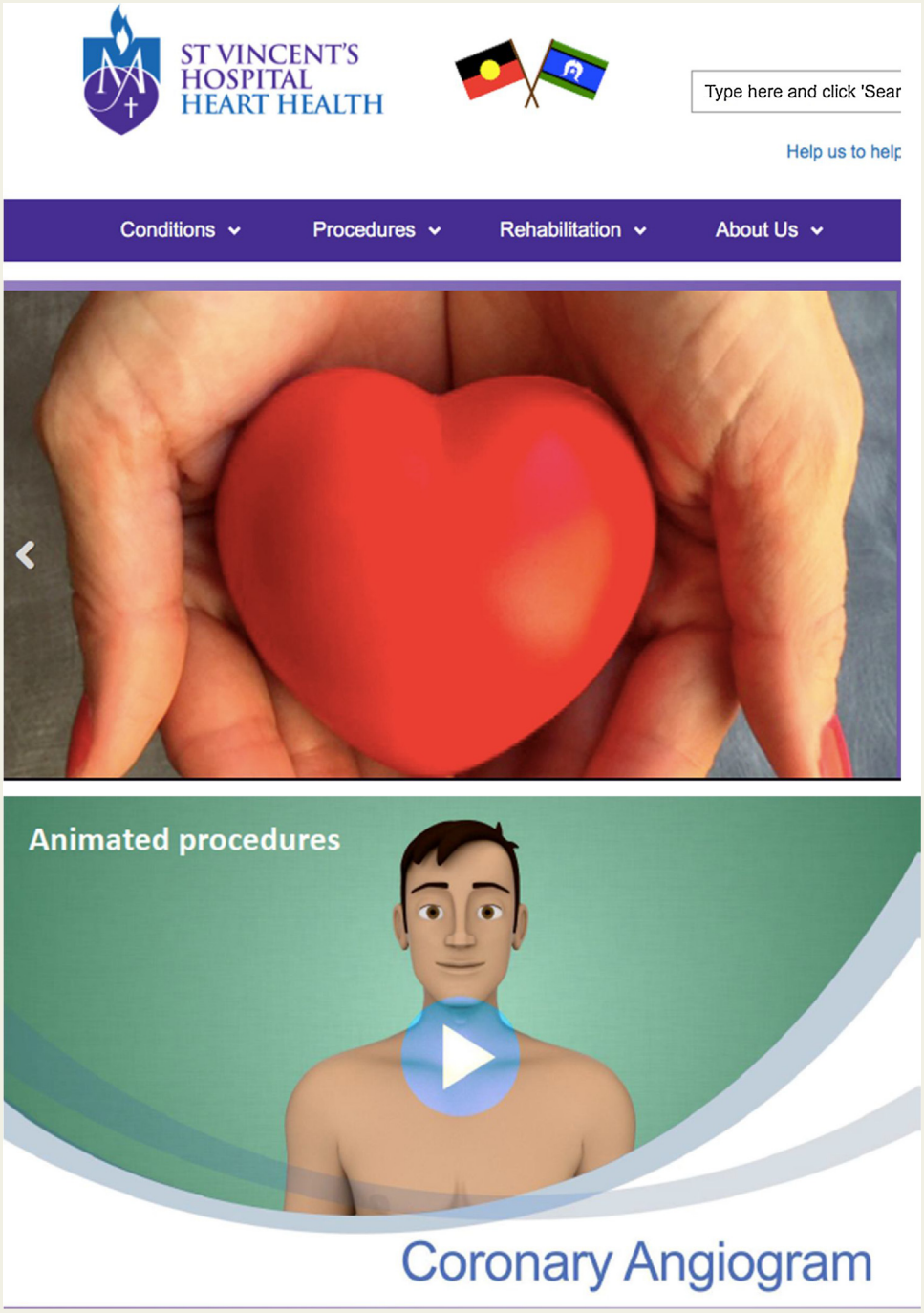

Figure 1 Example of website content, with still image of an example of a page of the website (above) and of an example of an animation (below).

(PPM) or implantable cardioverter defibrillator (ICD). Screening, recruitment and participation occurred during this initial presentation or admission. Thus, the sample only included patients diagnosed with coronary disease for the first time.

Exclusions

Participants were excluded if their cardiac condition was pre-existing, as it was assumed that many of these participants might already be educated on their cardiac condition.

Intervention

This involved 30 minutes of interacting with the SVHHH website either from the participant's own device, or a tablet provided by St Vincent's Hospital.

Outcome Measures

There are no validated tools specifically available for assessment of health websites. We therefore combined two validated questionnaires: The Brief Illness Perception Questionnaire and

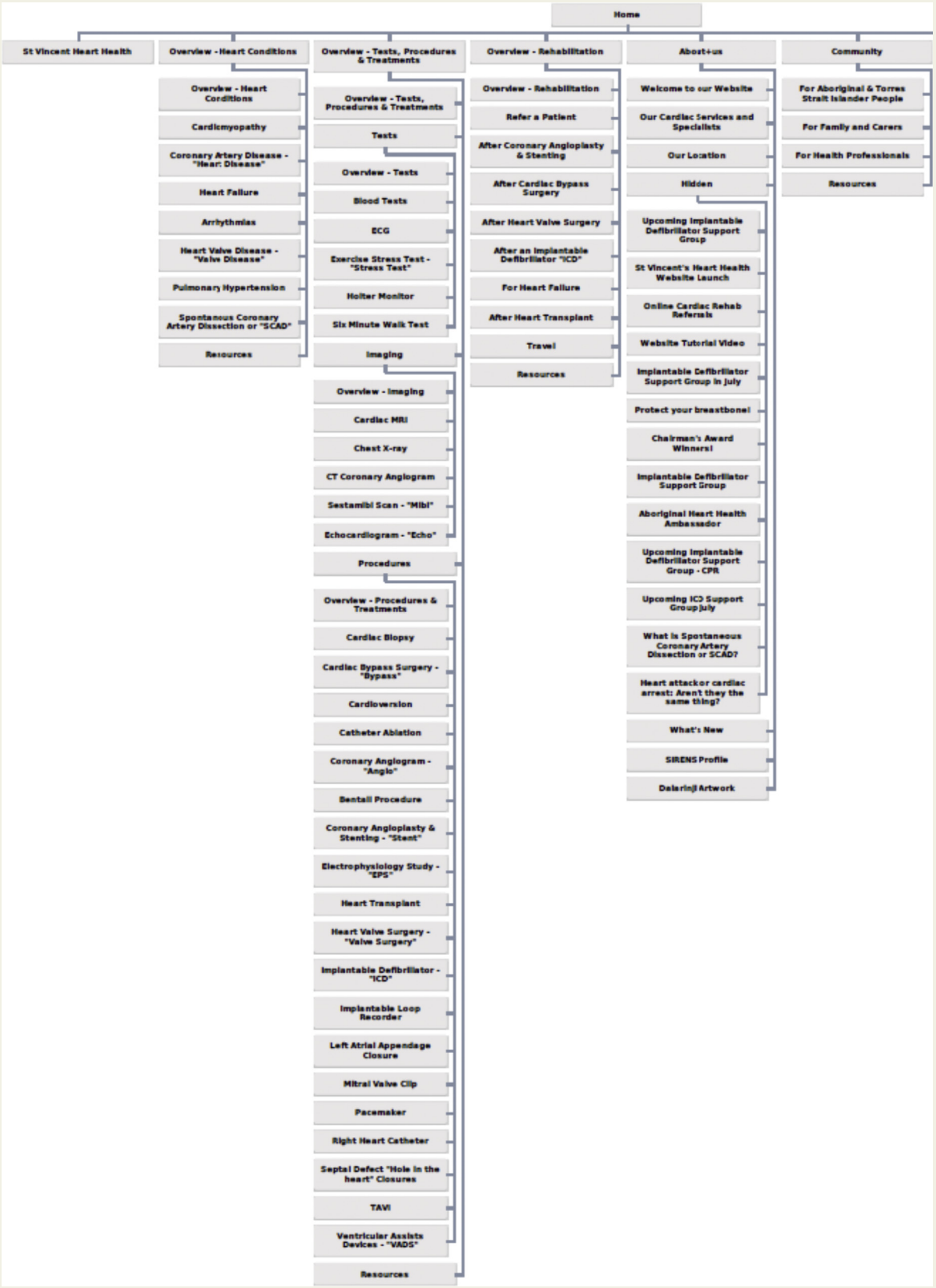

Figure 2 Site map of the St Vincent's Hospital Heart Health Website.

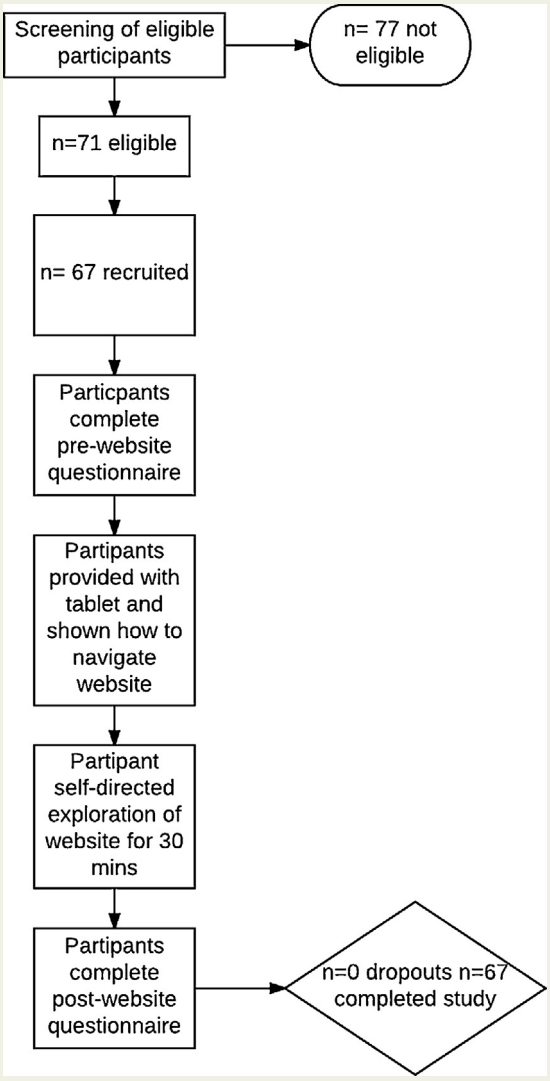

Figure 3 Flow chart of methods, including recruitment and completion the study.

the Patient Activation Measure (PAM) [10,11]. The Brief Illness Perception Questionnaire is used for the rapid assessment of the cognitive and emotional representations of illness. It has a good test-retest reliability ($r = 0.73$, $p < 0.001$) and adequate validity (0.47) [11]. The PAM measures the level of patient engagement in their health care. It has good test-retest reliability (0.81, $p < 0.001$) and respectable validity (0.86) [12]. Questions were combined from both of these questionnaires, to gather a broader scope of information.

Sample Size

This was considered a pilot study so a sample size was not calculated.

Statistical Analysis

Continuous variables are presented as mean ± standard deviation (SD) and discrete variables are presented as percentage (number) unless otherwise stated. The Shapiro-Wilks test was used to determine normality of the data distribution and consequently, the non-parametric Wilcoxon signed-ranks test was used to analyse the differences in scores before and after viewing the Heart Health website. A p-value of less than 0.05 was considered significant. All analysis was completed using IBM SPSS version 24 (IBM, Armonk, NY, USA).

Results

Participant Flow

Shown in Figure 3.

After consenting to the study, participants completed a questionnaire that collected information regarding demographic details, cardiovascular diagnosis, intended investigations, intended treatment and their self-rated confidence with using the internet. Participants then completed the Heart Health questionnaire consisting of nine questions (pre-questionnaire, Figure 4). Participants were subsequently given an electronic tablet provided by St Vincent's Hospital, or shown how to access the website from their own tablet or computer. The study investigator spent up to 10 minutes showing participants how to navigate the website, depending on the participant's level of need and familiarity with using a computer. After 30 minutes of viewing, exploring and interacting with the website independently, participants completed the post-questionnaire which was identical to the pre-questionnaire. The questionnaires were collected by the study investigators or nursing staff for subsequent analysis.

Recruitment

A total of 67 participants were recruited from both St Vincent's Public and St Vincent's Private Hospitals in Sydney from August 2016 to January 2017.

The average age was 63+/−11 years. The largest group, 37% (25 subjects) lived in the inner city; however, there were also a large number of participants who lived in rural areas; 31% (21 subjects). The subjects were predominantly male (81%). Coronary artery disease was the principal diagnosis in 79% and coronary artery bypass graft surgery was the leading intervention in 48% (32 subjects), followed by coronary angioplasty and stenting in 21% (14 subjects).

Baseline Data

Baseline characteristics of the study participants are shown in Figure 5.

Outcomes

Self-rated confidence using the internet (rating 0 to 10; where 0 = no confidence and 10 = high confidence), varied widely from 0 to 10, with an average score of 6.3 (+/−3.6). As anticipated, there was a moderate negative correlation between age and internet confidence (Spearman's rho −0.420, $p < 0.01$), where younger patients had the greatest

1. How well do you feel you understand your heart condition?

0 1 2 3 4 5 6 7 8 9 10

Not at all Extremely

2. How well do you feel you understand the tests required to assess your heart condition?

0 1 2 3 4 5 6 7 8 9 10

Not at all Extremely

3. How well do you feel you understand the treatment for your heart condition?

0 1 2 3 4 5 6 7 8 9 10

Not at all Extremely

4. How much control do you feel you have over your heart condition?

0 1 2 3 4 5 6 7 8 9 10

Not at all Extremely

5. How concerned are you about your heart condition?

0 1 2 3 4 5 6 7 8 9 10

Not at all Extremely

6. How well do you feel you understand the long-term management of your heart condition once you leave hospital?

0 1 2 3 4 5 6 7 8 9 10

Not at all Extremely

7. How confident are you in knowing how to resume to regular activities once you leave hospital?

0 1 2 3 4 5 6 7 8 9 10

Not at all Extremely

8. How confident are you that you know how to live a healthy life?

0 1 2 3 4 5 6 7 8 9 10

Not at all Extremely

9. How well do you feel you understand your heart medications?

0 1 2 3 4 5 6 7 8 9 10

Not at all Extremely

Figure 4 Heart Health Questionnaire.

internet confidence, though all patients, despite age, were able to navigate the website with minimal assistance.

Each of the 67 participants answered all nine questions. The results of the survey are set out in Figures 6 and 7. Participants rated how well they understood their heart condition. This improved from 6.2+/−2.3 (out of 10) before viewing the website to 8.3+/−1.3, after viewing the website (34% improvement), $p < 0.01$. Participants rated their understanding of their cardiac investigations as 6.3+/−2.5 prior to viewing the website and 8.7+/−1.2 afterwards (38% improvement), $p < 0.01$. Their understanding of the required treatment was 6.3+/−2.4 before viewing the website and 8.7 +/−1.1 (38% improvement) after viewing it, $p < 0.01$. Participants rated their understanding of the long-term management of their heart condition as 5.6+/−2.8. This increased to 8.4+/−1.3 post website viewing (50% improvement), $p < 0.01$. Participants rated their baseline understanding of their heart medications as 5.0+/−2.2. After acquiring knowledge from the SVHHH website, they rated their understanding as 7.3+/−2 (31% improvement), $p < 0.01$ (Figure 7).

In addition to knowledge, participants also showed significant improvement in their confidence, as well as a rise in the control they believed they had over their heart condition. Confidence in returning to regular activities improved from 6.2+/−2.7 out of 10 before viewing the website to 8.4+/−1.4 afterwards (35% improvement), $p < 0.01$. Confidence in living a healthy life was 7.3+/−2.0 before viewing the website and this improved to 8.6+/−1.1 (18% improvement), $p < 0.01$ after interacting with the website. Participants reported a significant increase in their sense of control over their heart condition. This rose from 4.8+/−2.7 before viewing the website to 7.2+/−1.9 post website (50% improvement), $p < 0.01$.

The website had no impact on participants' level of concern. This remained the same both before and after viewing the website at 7.8+/−2.4 out of 10, p = NS.

Characteristic	Subjects N=67
Age	63 ± 11
Male n(%)	54 (81)
Internet Confidence	6 ± 4
Location: Inner City n(%)	25 (37)
Location: Outer City n(%)	17 (25)
Location: Rural n(%)	21 (31)
Location: Other n(%)	4 (6)
Diagnosis: CAD n(%)	53 (79)
Diagnosis: Valvular disease n(%)	29 (43)
Treatment: Coronary angiogram and stent n(%)	13(15)
Treatment: CABG n(%)	41(47)

Abbreviations: CAD, coronary artery disease; CABG, coronary artery bypass graft

Figure 5 Baseline characteristics of the study participants.
Abbreviations: CAD, coronary artery disease; CABG, coronary artery bypass graft

Question	Pre-website viewing N=67	Post-website viewing N=67	p Value
Illness knowledge	6 ± 2	8 ± 1	<0.01
Investigations knowledge	6 ± 2	9 ± 1	<0.01
Management knowledge	6 ± 2	9 ± 1	<0.01
Control of illness	5 ±3	7 ± 2	<0.01
Concern about illness	8 ± 2	8 ± 2	0.80
Long-term management knowledge	6 ± 3	8 ± 1	<0.01
Confidence in returning to activities of daily living	6 ± 3	8 ± 1	<0.01
Confidence in living healthy lifestyle	7 ± 2	9 ± 1	<0.01
Heart medication knowledge	5 ± 3	7 ± 2	<0.01

Figure 6 Questionnaire findings.
Abbreviations: ADLs, activities of daily living

Impact of Age

The impact of age on responses was only significant for the first question regarding understanding heart disease. Participants older than 65 years of age had a greater improvement in their understanding, with a mean difference of 2.5+/−1.5 in improving knowledge of their heart condition, compared to 1.8+/−2.0, for people under 65 years old, p = 0.04. Age did not have any impact on the results of other survey questions.

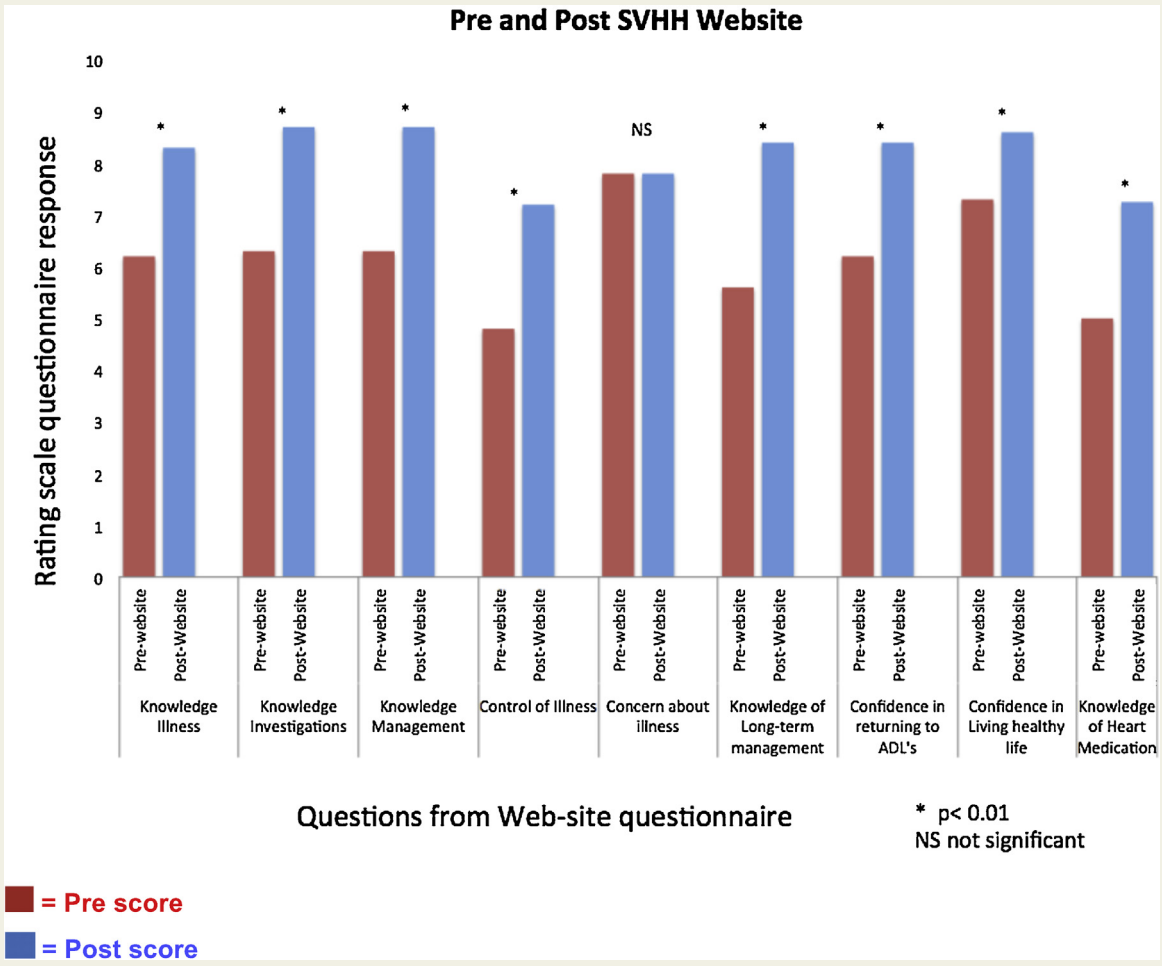

Figure 7 Results: Rating of questionnaire response before (red) and after (blue) scores viewing the website.

Impact of Residence

Primary place of residence had no impact on reported outcomes. People living rurally demonstrated similar improvements to those living in the city for all nine questions.

Discussion

Generalisability

The results of this pilot study demonstrate that utilisation of this purpose built cardiac rehabilitation website improved patients' self-reported knowledge of their heart condition and management, and confidence to return to activities of daily living. Self-reported improvements were observed irrespective of age and primary place of residence. Whilst older subjects had the lowest confidence using the internet, they demonstrated the greatest self-reported improvement in knowledge. This pilot data supports that an online education tool could be a beneficial adjunct to cardiac rehabilitation, particularly for elderly patients and rural dwellers who have the lowest rates of attendance to traditional cardiac rehabilitation programs.

There was a significant improvement in eight out of the nine questions on the Heart Health survey after viewing the website. The greatest improvements were seen in the amount of control participants felt they had over their heart condition and how well they understood their long-term management; both had a 50% improvement in self-rated scores. Whilst understanding improved, self-rated concern did not change. Our pilot data suggest that the SVHHH website may have improved participants' knowledge of their heart condition including pathophysiology of their illness, cardiac investigations, medications, procedures and long-term management, with the hope that it will positively influence their lifestyle choices and health care compliance. Although we only measured the impact of the website on knowledge and confidence, as part of overall education within cardiac rehabilitation, we would anticipate education via the internet would help facilitate improved morbidity, mortality and reduced hospital admissions, as seen with typical CR programs.

Interpretation

Due to its wide availability, internet resources have the capacity to educate and empower a broad population. The leading causes for low attendance at CR have been identified as insufficient facilities, work commitments, lack of transport and failure of clinicians to refer [13]. As such, the need for alternatives to traditional CR has become apparent to meet the needs of all Australians with cardiovascular disease including the most disadvantaged. The addition of an online education tool to the existing CR format is in alliance with the Australian Cardiovascular Health and Rehabilitation Association recommendation to expand the traditional model of CR to make it more accessible to the Australian population [14]. Previous studies have shown that web-based interventions are effective at improving knowledge, lifestyle choices, risk factor profile and decreasing hospitalisations [15–17]. A recently published systematic review found that telehealth interventions have similar outcomes to centre-based supervised CR [18]. The SVHHH website was launched in February 2016. Between February 2016 and April 2017 the website has been viewed 78,133 times, from all over the globe, with the top five countries viewing the website as Australia, USA, India, UK and Canada. This website was designed for patients and families linked to St Vincent's Hospital in Sydney, though the general content had gained broader international interest, likely outlining the lack of suitable online material worldwide.

Limitations of online CR programs include availability of internet access and motivation to utilise the resource. Our model has been designed to complement rather than replace the already existing CR model. By providing patients with access to an electronic tablet whilst they are in hospital, we are not only providing equal access to all patients, we are also taking advantage of a time period where people do not have the usual time constraints of daily life. Our model has been created to educate and empower patients during their hospital admission, whilst simultaneously encouraging them to attend local centre-based CR.

Web based information regarding health is prolific. As many as 30% of people rely on the internet to learn about their health condition [19]. Although the internet is readily accessible and available, it is difficult for the user to determine which information is correct and reliable. Patients, therefore, need access to information that is endorsed by their health professionals: evidence-based, reliable, accurate and up to date, which, we propose, can be achieved via hospital-based websites. We also propose that these web based learning tools could be rapidly expanded to create individualised plans for patients. An individualised platform would highlight the relevant information of specific heart diseases and guide patients through their disease management plans, including medications, diet, exercise and follow-up. With readily available technology, it is conceivable that such an individual approach could also allow for monitoring of basic parameters, including heart rate, blood pressure, smoking status, alcohol intake and exercise. Algorithms could be generated to provide feedback on these parameters with links to the appropriate online tutorials and helpful hints when targets are not met.

Limitations

We acknowledge several limitations to this pilot study, including a small sample size, no blinding and no control group. The study only observed the impact of age and place of residence on outcomes. We recognise that there may be other extraneous variables which would alter the outcomes. End user perceptions were not assessed. Additionally, the questionnaire relied on self-reporting and data was collected by a single, relatively short point measurement, 30 minutes after viewing the website with no longer term follow-up. Using a more objective assessment, such as the 'Beliefs about Medicine Questionnaire', may have resulted in a smaller improvement in the outcomes. The study may be compromised by a risk of validity given that the timing between the pre-test and post-test timing is only 30 minutes. Although use of the website showed clear improvement in patients' knowledge and confidence, further research is essential to investigate whether there are long-term benefits particularly in clinical outcomes, CR attendance rates and hospital readmission rates. This will be the focus of a larger study.

Conclusion

Despite evidence to support the efficacy of traditional centre-based supervised cardiac rehabilitation, attendance rates remain poor. To address this, the Australian Cardiovascular Health and Rehabilitation Association is recommending alternatives to meet the needs of people who do not have access to, or cannot attend, a local CR program. The purpose of the SVHHH website was to educate patients about their heart condition at the time of diagnosis in hospital, a time when they are available to interact with a web-based program. Through delivery of web-based heart health education this pilot study has shown improvements in health care understanding and confidence, which will hopefully translate to better outcomes, including increased completion rates at CR, adherence to medication and selection of better lifestyle choices to reduce overall mortality and morbidity from heart disease. A larger appropriately powered study would allow us to determine if similar online resources translated to long-term change in health behaviour. We anticipate that online health resources will become an important adjunct to cardiac rehabilitation and suggest further research to assess the impact of online education on patient outcomes.

Conflict of Interest

None of the authors have any conflict of interest to declare.

Funding

The website was funded by the ''Supporters In the Resuscitation of Emergency Department Needs'' (SIRENS) Group at St Vincent's Hospital.

Other Information

Registration

All study participants provided informed consent to participate in the study, which was approved by the Local Research Ethics Committee (reference number HREC/16/SVH/172).

Acknowledgements

The website was funded by the SIRENS Group at St Vincent's Hospital and created by a local working group including Jeffrey Candiloro, David Faktor and Heather Schoenheimer. We would like to acknowledge Wendy Upcott, Kathryn Tonini, Madeline Attrill and Terry Bartlett for their assistance with data collection, and Elise Crothers for her assistance with writing and technical editing of the manuscript. We would also like to thank our colleagues from St Vincent' s Public and Private Hospitals working in the Day Procedure Centre, Coronary Care Units and Cardiothoracic Units for their assistance with this project.

References

[1] World Health Organization. [updated September 2016; cited 2016 September]. Available from: http://www.who.int/mediacentre/factsheets/fs317/en/.
[2] Australian Institute of Health and Welfare. Cardiovascular disease 2014. Available from: http://www.aihw.gov.au/cardiovascular-disease/.
[3] Briffa TG, Kinsman L, Maiorana AJ, Zecchin R, Redfern J, Davidson PM, et al. An integrated and coordinated approach to preventing recurrent coronary heart disease events in Australia. Med J Aust 2009;190(12):683.
[4] Clark RA, Conway A, Poulsen V, Keech W, Tirimacco R, Tideman P. Alternative models of cardiac rehabilitation: a systematic review. Eur J Prev Cardiol 2015;22(1):35–74.
[5] Organization WH. Rehabilitation after cardiovascular diseases, with special emphasis on developing countries: report of a WHO expert committee [meeting held in Geneva from 21 to 18 October 1991]. 1993.
[6] Chew DP, Scott IA, Cullen L, French JK, Briffa TG, Tideman PA, et al. National Heart Foundation of Australia and Cardiac Society of Australia and New Zealand: Australian clinical guidelines for the management of acute coronary syndromes 2016. Med J Aust 2016;205(3):128–33.
[7] Bittner V. Cardiac rehabilitation: call to action for healthcare providers. Circulation 2012;126(6):671.
[8] Bashi N, Windsor C, Douglas C. Evaluating a web-based self-management intervention in heart failure patients: a pilot study. JMIR Res Protoc 2016;5(2).
[9] Varnfield M, Karunanithi M, Lee C-K, Honeyman E, Arnold D, Ding H, et al. Smartphone-based home care model improved use of cardiac rehabilitation in postmyocardial infarction patients: results from a randomised controlled trial. Heart (British Cardiac Society) 2014;100(22):1770–9.
[10] Mukoro F. Summary of the evidence on performance of the Patient Activation Measure (PAM). NHS Kidney Care 2012;1–22.
[11] Broadbent E, Petrie KJ, Main J, Weinman J. The brief illness perception questionnaire. J Psychosom Res 2006;60(6):631–7.
[12] Prey JE, Qian M, Restaino S, Hibbard J, Bakken S, Schnall R, et al. Reliability and validity of the patient activation measure in hospitalized patients. Patient Educ Couns 2016;99(12):2026–33.
[13] Worcester MU, Murphy BM, Mee VK, Roberts SB, Goble AJ. Cardiac rehabilitation programmes: predictors of non-attendance and drop-out. Eur J Cardiovasc Prev Rehabil 2004;11(4):328–35.
[14] Woodruffe S, Neubeck L, Clark RA, Gray K, Ferry C, Finan J, et al. Australian Cardiovascular Health and Rehabilitation Association (ACRA) core components of cardiovascular disease secondary prevention and cardiac rehabilitation 2014. Heart Lung Circ 2015;24(5):430–41.
[15] Neville LM, O'Hara B, Milat A. Computer-tailored physical activity behavior change interventions targeting adults: a systematic review. Int J Behav Nutr Phys Act 2009;6(1):30.
[16] Song M, Choe M, Kim KS, Yi MS, Lee I, Kim J, et al. An evaluation of web-based education as an alternative to group lectures for diabetes self-management. Nurs Health Sci 2009;11(3):277–84.
[17] Widmer RJ, Allison TG, Lerman LO, Lerman A. Digital health intervention as an adjunct to cardiac rehabilitation reduces cardiovascular risk factors and rehospitalizations. J Cardiovasc Transl Res 2015;8(5):283–92.
[18] Huang K, Liu W, He D, Huang B, Xiao D, Peng Y, et al. Telehealth interventions versus center-based cardiac rehabilitation of coronary artery disease: a systematic review and meta-analysis. Eur J Prev Cardiol 2015;22(8):959–71.
[19] Wong C, Harrison C, Britt H, Henderson J. Patient use of the internet for health information. Aust Fam Phys 2014;43(12):875.