DELIVERY METHODS FOR CARDIAC REHABILITATION:

AN INTEGRATIVE REVIEW

by

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ABSTRACT

Cardiovascular disease is a major cause of death in the United States. It is estimated that over 800,000 deaths were caused by cardiovascular disease in 2006. Mortality rates have decreased since 2000, but hospital discharges associated with a cardiovascular diagnosis remained relatively constant over that same time frame. Upon discharge cardiac rehabilitation is available for individuals with cardiovascular disease. Cardiac rehabilitation is a medically prescribed program designed to aid in recovery, improve a cardiac patients' function both physically and psychologically, and prevent further cardiac complication and progression of atherosclerotic processes. However, geographic distribution of cardiac rehabilitation programs can be a barrier for program attendance. In rural areas like Montana, there could be many miles between a patient's home and a cardiac rehabilitation program. The mean geographic density for cardiac rehabilitation programs in the United States is 1 program per 1282 square miles of land area. These statistics indicate the serious potential of poor access for patients recovering from cardiac interventions in various parts of the United States. Alternative delivery methods for cardiac rehabilitation may be a solution for overcoming the geographic distribution barrier. The purpose of this integrative review was to evaluate the effectiveness of various delivery methods for cardiac rehabilitation programs on thirteen specific variables of interest related to patient outcomes. Databases were searched for empirical literature from January 2000 to August 2011, and all study design types were included in the search for literature. One reviewer selected the 49 studies used in the review, and extracted data using a standardized form. Exercise capacity and quality of life were two variables of interest found to be improved by every delivery method. A variety of delivery methods for cardiac rehabilitation were found to be as effective as center- based cardiac rehabilitation, and in most studies were significantly more effective than usual care or a control group.

CHAPTER 1 - INTRODUCTION

Background

The direct cost of cardiovascular disease (CVD) was estimated to be $324.1 billion in 2010, of which $189.4 billion specifically related to coronary heart disease (CHD) (Lloyd-Jones et al., 2010). CVD is a major cause of death in the United States (U.S.). It is estimated that over 800,000 deaths were caused by CVD in 2006, and just over 600,000 of those deaths were more specifically related to CHD (Lloyd-Jones et al., 2010). In 2006 an estimated 6.2 million hospital discharges had CVD diagnosis (Lloyd-Jones et al., 2010). Mortality rates have decreased since 2000, but hospital discharges associated with a CVD diagnosis remained relatively constant over that same time frame (Lloyd-Jones et al., 2010). Patients appear to be surviving CVD events to be discharged.

Upon discharge cardiac rehabilitation (CR) is available for individuals with CHD. CR is a medically prescribed program designed to aid in recovery, improve a cardiac patients' function both physically and psychologically, and prevent further cardiac complication and progression of atherosclerotic processes (American Association of Cardiovascular and Pulmonary Rehabilitation [AACVPR], 2011). CR programs typically include education and counseling on cardiac risk factors, exercise, telemetry heart monitoring, psychosocial assessment, and evaluation of patient outcomes.

The benefits of CR on cardiac patients have been well documented in the literature (Taylor, Brown, et al., 2004; Taylor, Dalal, et al., 2010; Southard, B., Southard, D., & Nuckolls, 2003). CR helps cardiac patients return to regular activities after

suffering from CHD complications like myocardial infarction, open heart surgery, or cardiac catheterization intervention. However, geographic distribution of CR programs can be a barrier for center or hospital-based program attendance (Curnier, Savage, & Ades, 2005). In rural areas like Montana, there could be many miles between a patient's home and a CR program. In 2005, Curnier, Savage, and Ades published an article documenting the mean geographic density for CR programs across the U.S. Montana was ranked third in the nation for the least number of inhabitants per CR program, with 32,221 state inhabitants per 1 of the available 28 programs (Curnier et al., 2005). Montana was ranked 45th in the U.S. for land area per program, with an average geographical density of 1 program per 5,198 square miles of land area (Curnier et al., 2005). The mean geographic density for CR programs in the U.S. is 1 program per 1282 square miles of land area (Curnier et al., 2005). These statistics indicate the serious potential of poor access for patients recovering from cardiac interventions in Montana. The findings of at least one study done in Montana support these statistics. Echeverri (2007), reported statistically significant findings that distance and access were barriers to participation in CR for CVD patients in Montana.

Alternative delivery methods for CR may be a solution for overcoming the geographic distribution barrier, and many alternatives have been successful in improving patient outcomes. Southard, Southard, and Nuckolls (2003) found evidence that internet-based CR improved cardiac patient outcomes. In a 2004 systematic review, Taylor, Brown, et al. confirmed exercise-based rehabilitation decreased mortality and morbidity for patients. Additionally, home and center based cardiac rehabilitation was found to be

equally effective in improving cardiac patient outcomes (Taylor, Dalal, et al., 2010). However, literature is not easily found comparing effectiveness of one type of CR program delivery method against that of other delivery methods. In depth comparison of these alternative delivery methods could help facilities and providers identify feasible ways to meet the needs of their patients who would benefit from CR but have poor access.

Objective

The purpose of this literature review was to evaluate the research available on existing delivery methods for CR programs and compare effectiveness between varieties of delivery methods, using an integrative review process.

Integrative Review

An integrative review is a literature review method that incorporates a variety of research into the same review. It is designed for the simultaneous review of experimental, observational, qualitative, quantitative, empirical and theoretical literature together, or in any combination as appropriate based on the purpose of the review. This type of review provides for a broad understanding of a particular concept or connection between numerous variables (Whittemore & Knafl, 2005). Integrative reviews have a wide range of purposes and can in many ways be more useful than a systematic or meta-analysis review. Systematic and meta-analysis review methods are designed to summarize primary study evidence specific to one clinical problem or question. This is

somewhat limiting to the usefulness of these study designs, as only one aspect has been studied (Whittemore & Knafl, 2005). Integrative reviews are very broad in scope with a purpose to provide much more comprehensive understanding.

Conceptual Framework

For this project Whittemore and Knafl's 2005 revised integrative review method was used as the framework for the analysis process. This review method incorporates detailed and systematic processes to increase analytic rigor (Whittemore & Knafl, 2005). Clear identification of the purpose and variables of interest compose the problem identification stage of the review method. This helps differentiate relevant and irrelevant information during data extraction (Whittemore & Knafl, 2005). Fully defined literature searching strategies help protect against incomplete or biased searches that could produce inaccurate results (Whittemore & Knafl, 2005). Data evaluation for quality is very complex in an integrative review, and is ideally used more in reviews that have a much narrower sampling frame with similar research designs. When used in an integrative review, evaluation for quality needs to be specific to the type of literature being analyzed (Whittemore & Knafl, 2005). In the data analysis stage reviews are organized, coded, and summarized using a systematic method that is explicitly identified before the review process is begun. Conclusions in integrative reviews are presented in tables or diagrams with clear details of the evidence supporting the findings (Whittemore & Knafl, 2005).

Variables of Interest

Delivery method for CR was operationally defined as the technique used by the CR program to provide activity, education, and supervision of patients during therapy. Effectiveness of each delivery method was determined by the method's positive effect on patient outcomes, related to specific variables. The integrative review process is a very useful framework for evaluating the relationship between many variables of interest.

The variables of interest for this integrative review are related to the CR program and included (a) program technique or system of presentation (delivery method), (b) material content, (c) duration, (d) patient adherence, and (e) measured patient outcomes. The patient outcomes of interest were variables chosen from the AACVPR Outcomes Committee outcome matrix. The AACVPR Outcomes Committee outcome matrix typically provides a framework for standardized patient outcomes assessment in CR programs (Sanderson, Sourthard, & Oldridge, 2004). For the purpose of this integrative review the matrix was a framework used to choose variables of interest for measuring effectiveness of the CR delivery method on patient outcomes. The assortment of patient outcomes from the matrix used in the integrative review are displayed in Table 1.

Table 1. Variables of Interest

Health	Clinical	Behavioral
Morbidity Mortality	Functional & Exercise Capacity	Improved knowledge base of self-care actions
Health-related quality of life	Lipid Management	Adherence to diet, exercise, and/or medication
Reoccurrence rates	Hypertension Management	Session attendance and program completion

Table 1 Continued

	Diabetes Management	Smoking Cessation
	Weight Management	

Adapted from: Sanderson, B.K., Southard, D., & Oldridge, N. (2004) Outcomes Evaluation in Cardiac Rehabilitation/Secondary Prevention Programs: Improving patient care and program effectiveness. *Journal of Cardiopulmonary Rehabilitation*, 24, 68-79.

The patient outcomes of functional and exercise capacity and health-related quality of life were two variable of interest where there was vast variance in what was included from the original literature source. In this integrative review, for functional and exercise capacity, the measurement variables from the literature included for this particular patient outcome were: (a) functional capacity or ability, (b) exercise capacity, (c) exercise tolerance, (d) graded exercise testing, (e) treadmill grade and speed, (f) distance walked, (g) rate of perceived exertion, and (h) amount of physical activity. The measurement variables used from the literature for the patient outcome of health-related quality of life included: (a) anxiety, (b) depression, (c) stress, (d) quality of life, (e) health related quality of life, (f) psychosocial well-being status, and (g) overall distress.

Summary

An integrative review design was used to compare the effectiveness of CR delivery. Effectiveness was based on improvement of patient outcomes related to a variety of variables chosen from a standardized matrix of variables published by AACVPR as being important in measuring effectiveness of CR. Upon completion of the review a comprehensive understanding of CR delivery methods and their respective effectiveness was reported.

CHAPTER 2 - LITERATURE REVIEW

Literature Search

Fully defined literature searching strategies help protect against incomplete or biased searches that could produce inaccurate results. Using the principle search strategies defined by Whittemore and Knafl's (2005) review method to reduce threats to the validity of the research, several research strategies were utilize for this project to compile the literature for review.

Librarians from Montana State University were consulted prior to beginning the literature search. The librarians guided literature collection by suggesting search terms and identifying pertinent databases to begin the search for literature. Computer generated searches in the electronic databases of Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, Med-line, and Medscape were used to seek literature from the time period January 2000 to August 2011. Articles older than 2000 were excluded from this review based on the assumption that newer publications would reflect current techniques in CR delivery methods. Search terms included (a) cardiac rehabilitation, and (b) delivery method. The search was limited by (a) the publication dates, (b) printed in the English language, (c) out-patient, and (d) human. Reference lists from included literature were used to obtain further studies relevant to the review. Only published literature was sought for this paper, and no attempt to seek unpublished literature was made. Only empirical literature types were included. Theoretical literature was excluded as the objective of the paper was to determine identified effectiveness of

delivery methods on patient outcomes. The inclusion and exclusion criteria used to determine relevant sample sources are displayed in Table 2.

Table 2. Inclusion and Exclusion Criteria

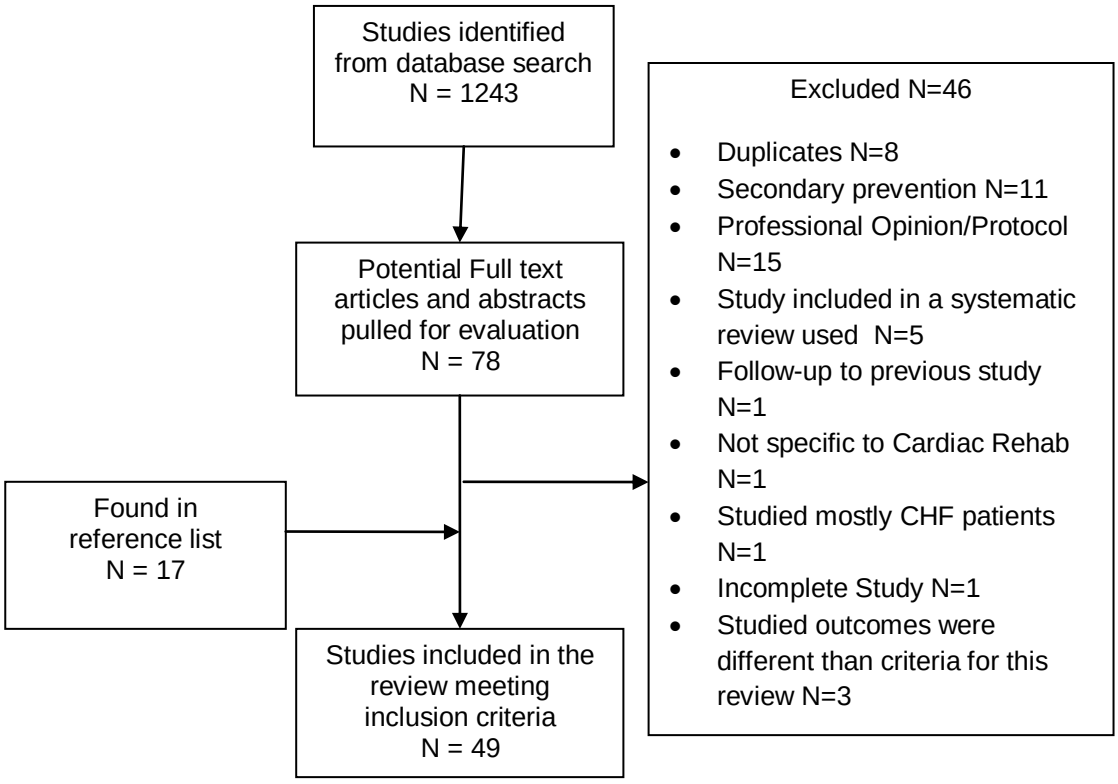
Inclusion	Exclusion
All published empirical literature	All non-empirical literature
Phase II Cardiac Rehabilitation program (period immediately post-hospital discharge)	All other phase of cardiac rehabilitation unless the majority of the data was pulled from a phase II program
Include information on patients with myocardial infarct, percutaneous transluminal coronary angioplasty and/or stent, or coronary artery bypass graft, medical treatment, stable angina (papers with a variety of cardiac conditions were included if the majority of the patients fit one of these diagnoses)	Studies including Congestive Heart Failure (CHF) patients, unless the majority of the patients included in the study had one of the listed inclusion diagnosis as a primary diagnosis and focus in the study, and CHF was a secondary diagnosis for the patient, or not the primary diagnosis for the majority of the study sample.
Delivery method for rehabilitation was identified	
Studies included at least one variable of interest for patient outcomes	
Study focused on patient outcomes in relation to delivery method	

Results of the Search

Electronic searches yielded a total of 1234 hits on potential studies for the review. After reviewing the titles and abstracts, 78 full text articles were retrieved for possible inclusion and 17 articles were found from the reference list of included studies. A total of 46 articles were excluded for various reasons (Figure 1). Overall 49 studies met the inclusion criteria and had enough information to evaluate the effectiveness of the

presented CR delivery method. All duplicate articles were removed prior to the final count.

Figure 1. Summary of Study Selection Process



Literature Evaluation

Abstracts were screened by the author to identify if they met the inclusion criteria. If an abstract was not available and the title indicated the article had the potential to meet inclusion criteria, the article was obtained and the abstract reviewed. The articles determined to be eligible for review are displayed in Table 3 along with the delivery method for quick reference.

Table 3. Integrative Review Articles and Delivery Method

Article by author	Delivery Method
Adams et al., 2007	Exercise based vs. traditional care vs. educational workshop
Ades et al., 2000	Electrocardiographic & voice transtelephonic monitoring
Aldana et al., 2006	Intensive lifestyle modification program vs. traditional CR
Bris et al., 2006	High vs. low training frequency
Carlson et al., 2000	Traditional vs. modified CR
Carlson et al., 2001	Traditional vs. modified CR
Chuang et al., 2006	Virtual reality during cardiac rehabilitation
Clark et al., 2011*	Heart Manual home based CR
Dalal et al., 2010*	Home vs. center based
Eder et al., 2010	Early center based rehab with supplemental exercise
Eshah et al., 2009*	Home and center based rehabilitation
Franklin et al., 2002	Exercise-based with risk factor reduction intervention
Furber et al., 2010	Pedometer based with telephone intervention vs. control
Giallauria et al., 2006	Home exercise with telemetry monitor vs. without vs. control
Harris et al., 2003	Nurse managed CR with telephonic interactions vs. CR
Heran et al., 2011*	Exercise based vs. usual care
Hevey et al., 2003	Ten week CR vs. four week CR
Higgins et al., 2001	Comprehensive home based vs. standard care with phone calls
Jiang et al., 2007	Nurse led home based CR vs. routine care
Jolliffe et al., 2009*	Exercise only & comprehensive CR vs. usual care
Jolly et al., 2006*	Home vs. center based CR
Jolly et al., 2009	Heart Manual at home vs. center based CR
Jones et al., 2009	Patient experience of Heart Manual vs. center CR
Kodis et al., 2001	Center based vs. home based CR
Kortke et al., 2006	Telemedicine home CR vs. hospital CR

Table 3 Continued

Kreikebaum et al., 2011	Psychosocial comprehensive vs. monitored exercise CR
LaPier et al., 2002	Alternative model of a mix center based and home based CR
Lee et al., 2004	Community based CR
Mandel et al., 2007	Music therapy with CR vs. CR alone
Marchionni et al., 2003	Home based vs. center based vs. control
Morrin et al., 2000	3 months of CR vs. 6 months of CR
Neubeck et al., 2009*	Tele-health & internet CR
Oerkild et al., 2011	Home based vs. center based
Oliveira et al., 2008	Home based vs. usual care
Pierson et al., 2001	Combined aerobic & resistance CR vs. aerobic CR only
Pluss et al., 2008	Expanded (multi-factorial) CR vs. hospital based CR
Reid et al., 2005	CR vs. distributed CR duration
Senuzun et al., 2006	Home/exercise based CR vs. control
Silberman et al., 2010	Intensive CR
Sledge et al., 2000	Intensive CR vs. usual care
Southard et al., 2003	Internet based vs. usual care
Stiles, 2008	Dance hall dancing
Taylor et al., 2004*	Exercise based CR vs. usual care
Taylor et al., 2010*	Home based vs. center based
Varnfield et al., 2011	Mobile phone applications & internet for CR vs. CR
Wu et al., 2006	Home based CR vs. traditional CR vs. control
Yates et al., 2007	Home based CR vs. traditional CR
Zutz et al., 2007	Internet based CR vs. control
Zwisler et al., 2008	Hospital based CR vs. usual care

Notes: * Literature Review

Assessment of Quality

In general, evaluation of the literature for quality included analysis of the methodology, validity, and integrity of each study. To keep in line with the Whittemore and Knafl (2005) framework, the appropriate quality criteria instruments were used specific to each literature type. Due to the variety of literature, the evaluation was guided by the *Users' Guides* for various studies provided in the book by DiCenso, Guyatt, and Ciliska (2005) titled *Evidence-Based Nursing: A Guide to Clinical Practice*. For example using these *Users' Guides*, the randomized control trial (RCT) quality assessment looked at six criteria, (a) rigor of the study design in relation to the research question of the study, (b) methods of randomization, (c) adequacy of allocation concealment, (d) proportion of patients lost to follow up, (e) blinding of outcome assessment, and (f) relevance to this project objective. Each study was assigned a rating for overall quality based on a 3-point scale (high, moderate or low). The studies were thus coded according to the appointed quality level, as recommended by Whittemore and Knafl's (2005) framework and displayed in Table 4. Quality of evidence is important when using literature to support practice change, and therefore was included in this integrative review process. However, no literature source was excluded from this review based on the quality evaluation. The purpose was to identify and report the quality of literature used in the integrative review.

Table 4. Quality Rating of Literature

Articles by Author	High	Moderate	Low
Adams et al., 2007		x	
Ades et al., 2000			x
Aldana et al., 2006		x	
Bris et al., 2006			x
Carlson et al., 2000		x	
Carlson et al., 2001		x	
Chuang et al., 2006			x
Clark et al., 2011*		x	
Dalal et al., 2010*	x		
Eder et al., 2010		x	
Eshah et al., 2009*		x	
Franklin et al., 2002		x	
Furber et al., 2010		x	
Giallauria et al., 2006			x
Harris et al., 2003		x	
Heran et al., 2011*		x	
Hevey et al., 2003			x
Higgins et al., 2001			x
Jiang et al., 2007		x	
Jolliffe et al., 2009*		x	
Jolly et al., 2006*		x	
Jolly et al., 2009	x		
Jones et al., 2009		x	
Kodis et al., 2001		x	
Kortke et al., 2006			x
Kreikebaum et al., 2011			x
LaPier et al., 2002			x
Lee et al., 2004			x

Table 4 Continued	High	Moderate	Low
Mandel et al., 2007		x	
Marchionni et al., 2003		x	
Morrin et al., 2000		x	
Neubeck et al., 2009*	x		
Oerkild et al., 2011		x	
Oliveira et al., 2008		x	
Pierson et al., 2001			x
Pluss et al., 2008	x		
Reid et al., 2005	x		
Senuzun et al., 2006		x	
Silberman et al., 2010		x	
Sledge et al., 2000			x
Southard et al., 2003		x	
Stiles, 2008			x
Taylor et al., 2004*		x	
Taylor et al., 2010*	x		
Varnfield et al., 2011			x
Wu et al., 2006		x	
Yates et al., 2007			x
Zutz et al., 2007			x
Zwisler et al., 2008	x		

Notes: * Literature Review

CHAPTER 3 - METHODS

Data Analysis

The author extracted data from each literature source using a standard form. Components of the form included delivery method and the variables of interest for the review to ensure the extraction process led to the objective of the integrative review (Table 5). The extracted data form for each study included: (a) all the variables of interest for the study, (b) delivery method details, and (c) other specific information related to the primary source (see Appendix A for each study's extracted data).

Table 5. Data Included on the Data Extraction Form

- Delivery method
- Study Design
- Material/program content (duration, components)
- Outcomes Measured
- Statistically significant improvement of patient outcome(s) – specific
- Clinically significant improvement of patient outcome(s) – specific
- Quality
- Study Notes/Features (Assessment, gender/age, primary diagnosis)

Guided by the Whittemore and Knafl (2005) framework, a complete, unbiased, innovative synthesis of the evidence occurred when analyzing the data for this integrative review. The data extraction form was used as a constant comparison method for the included literature. The same data extraction format was used for each literature source allowing for complete, unbiased synthesis of evidence and was a critical part of data analysis process.

Data Reduction

Due to the nature of an integrative review the data analysis requires the primary sources of data be well organized (Whittemore & Knafl, 2005) and reduced to the data specific to the objectives of the review. In this review the primary studies were put into categories based on the general location of the delivery method and then sub grouped by specific delivery method. Throughout the data extraction process articles remained in their delivery based categories and delivery method subgroups, allowing for better comparison. The raw data from the initial sources were summarized, reduced, and compiled onto a spreadsheet organized by the delivery method. When the raw data from the data abstraction form were compiled onto the spreadsheet only the variables of interest specific to this integrative review were carried over and listed on the spreadsheet, in this way data was reduced. Under the assigned delivery method section of the spreadsheet the studies were listed first by study design, then by quality rating, and last by sample size.

Data Display

Variables of interest and significant findings were then graphed by delivery method to assist with visualization of the extracted data for each category (see Appendix B). Using this data reduction and display process an initial evaluation of study characteristics and relationships was made (Whittemore & Knafl, 2005).

Data Comparison

Data comparison began using the spreadsheets, extracted data forms, and a visual display using graphs to help identify patterns, themes, variations, etc. Homogeneity across studies was compared using the characteristics of each study within the delivery method category. Conceptual maps were created from the patterns and themes identified. Where appropriate the results from included studies were combined to give an overall idea of effectiveness of the delivery method. For example, if one study found an increase in peak heart rates and another study reported an increase in endurance for the six minute walking test, the concept map would indicate the delivery method had improvements in exercise tolerance. In this way the conceptual maps evolved. Evolution of the conceptual maps continued throughout the data comparison and conclusion drawing process. Continual revision of the conceptual maps was critical to allow for as much data as possible to be available for drawing conclusions. Eventually all of the individual maps were incorporated into one all inclusive concept map (see Appendix C).

Conclusions and potential relationships were verified using the extraction forms and the primary source for accuracy as needed. The process of visualization, theme identification, verification, and concept mapping provided clarity and support for interpretations of the data. As encouraged by Whittemore and Knafl (2005), conflicting evidence was addressed by looking at each primary source for verification and for potential confounding variables that may have caused discrepancies between the evidence. If the primary sources were of equal quality and study design, then

significance of effectiveness to patient outcomes in the study details were compared between the sources (Whittemore & Knafl, 2005).

Summary

Once the literature was compiled following specific inclusion/exclusion criteria, it was organized by delivery methods of CR. The included studies were then reviewed and data were abstracted using a standardized form. During data abstraction a quality assessment was completed and each study was appointed a quality level. Data was then reduce and displayed so the study findings could be compared.

CHAPTER 4 - RESULTS

Included Studies

The review process used an alpha level of $p<0.05$ for a variable to be reported as statistically significant. Variables identified as clinically significant for this review were determined by the author, based on the significance of effectiveness to patient outcomes within the context of the primary source (see Appendix B for graphs of statistically significant and clinically significant variables).

The forty-nine studies included in the review were divided into two global categories and then further separated into four sub-categories (Table 6). Twenty-seven studies made up the global home-based rehabilitation category and twenty-two studies constituted the global center-based rehabilitation category. There was a great deal of heterogeneity among the specifics of the delivery methods related to program presentation, material, and duration for both global categories.

Table 6. Global Categories and Sub-groups

Center-based	Home-based
Exercise based	Education, consult, or nurse led
Variance in frequency, intensity, & length	Tele-health
Comprehensive or modified	Pedometer based
Other	Home setting

Among the global home-based rehabilitation category, a total of nineteen studies were sub-grouped in the home setting (Taylor et al., 2010; Dalal, Zawada, Jolly,

Moxham, & Taylor, 2010; Eshah & Bond, 2009; Jolly, Taylor, Lip, & Stevens, 2006; Clark, Kelly, & Deighan, 2011; Jolly, et al., 2009; Oerkild, et al., 2011; Marchionni, et al., 2003; Jiang, Sit, & Wong, 2007; Senuzun, Fadiloglu, Burke, & Payzin, 2006; Wu, Lin, Chen, & Tsai, 2006; Higgins, Hayes, & McKenna, 2001; Kodis, et al., 2001; Oliveira, Ribeiro, & Gomes, 2008; Ades, et al., 2000; Yates, et al., 2007; Giallauria, et al., 2006; Kortke, et al., 2006; Jones, Greenfield, & Jolly, 2009). The effectiveness of the home setting as the delivery method for CR was studied in these literature sources. Three studies evaluated educational workshops, consultation, or nurse led non-center based programs used as the delivery method (Harris, et al., 2003; Adams, et al., 2007; & Aldana, et al., 2006). Four studies evaluated a variety of tele-health methods as the delivery method (Neubeck, et al., 2009; Southard, et al, 2003; Zutz, Ignaszewski, Bates, & Lear, 2007; Varnfield, et al., 2011), and one study evaluated pedometer use (Furber, Butler, Phongsavan, Mark, & Bauman, 2010).

For the delivery method categorized as home setting, sample sizes varied from 26 (a qualitative study) to 4743 (aggregate numbers for systematic review). There were mostly male participants, average age in the 60s, and a variety of cardiac events were the primary diagnosis. Of the nineteen studies, seven were randomized controlled trials (RCT), six were cohort studies, five were systematic or integrative reviews, and one was a qualitative review. Ten of the thirteen variables of interest for the integrative review were addressed by these nineteen studies and included: (a) exercise, (b) cholesterol, (c) blood pressure, (d) weight, (e) smoking cessation, (f) mortality, (g) quality of life, (h) reoccurrence rates, (i) improved knowledge, and (j) adherence. The home setting as a

delivery method for CR showed significant improvement and superiority for improving eight of the ten variables: (a) exercise, (b) cholesterol, (c) blood pressure, (d) weight, (e) smoking cessation, (f) quality of life (g) reoccurrence rates, and (h) improved knowledge. One study showed non-statistically significant, but clinically significant evidence of improvement in adherence (Dalal, et al., 2010). One systematic review of CR in the home setting reported two of the studies included found that CR in the home setting increased mortality non-significantly. However, upon review of the primary source it was indicated these two trials were predominantly psychological interventions studies (Jolly, et al., 2006). Kodis et al. (2001) found that the center based program had a higher peak V02 (peak oxygen uptake) level over the home setting. Yet overall the home setting had significantly higher within group exercise capacity from baseline. One study of the home setting versus on-site CR, reported a significant increase in weight for the home setting participants (Ades et al., 2000). Further review of the primary literature source found that dietary counseling was likely a confounding variable as this was available to the on-site CR participants. Jolly et al. (2009) reported a lower systolic blood pressure (SBP) in the center group over the home setting found during an interaction test comparing post-myocardial infarct participants with post-revascularization patients. However, overall their RCT study results indicate that there was no significant difference in SBP between the center and the home setting participants.

Three studies reviewed educational, consult, or nurse led programs and had sample sizes ranging from 84 to 342 (all cohort studies), subject age ranging from 58 to 68 years, consisted of 50 to 82% male participants, and covered a variety of cardiac

events. Three variables of interest for this review were included in these studies. Educational workshop, consult, or nurse led programs as a delivery method for CR resulted in significant improvement and superiority for improving three variables: (a) adherence, (b) cholesterol, and (c) quality of life (Adams et al., 2007; Aldana et al., 2006; & Harris et al., 2003).

Four studies reviewed tele-health as a delivery method for CR. These studies together had sample sizes ranging from 15 (a RCT) to 3145 (aggregate numbers for systematic review), an average patient age of about 60 years, consisted of 74 to 100% male participants, and covered post-myocardial infarct, post-revascularization, and coronary artery disease as the primary diagnosis. Two studies were internet based RCTs, one study was a mobile phone – internet combination based RCT, and one study was a systematic review of a telephone & internet based program. Nine variables of interest for this review were included in these studies. Tele-health as a delivery method for CR showed significant improvement in seven variables: (a) blood pressure, (b) body mass index, (c) cholesterol, (e) exercise tolerance, (f) quality of life, (g) reoccurrence rates, and (h) smoking cessation. One study included a clinically significant outcome of adherence (Varnfield et al., 2011). Overall eight of the nine variables of interest for this review were positive improvements providing evidence for tele-health as an effective delivery method of CR.

Pedometer based home program as the delivery method was researched in one study. This was a RCT with a sample size of 222, average patient age of 65.5 years, had unidentified patient genders, and a variety of cardiac events as the primary diagnosis.

This study included two variables of interest for this review and both were found to be statistically significant outcomes of improvement. They included: (a) exercise, and (b) quality of life (Furber, et al. 2010).

Of the twenty-two studies in the global center-based rehabilitation category, eight studies reviewed varieties of CR that had different frequency, intensity, and length of program as the delivery method under study (Reid et al., 2005; Eder, et al., 2010; Hevey, et al., 2003; Bris, Ledermann, Topin, Messner-Pellenc, & Le Gallais, 2006; Lee, Naimark, Porter, & Ready, 2004; Sledge, Ragsdale, Tabb, & Jarmukli, 2000; Silberman, et al., 2010; Morrin, Black, & Reid, 2000). Six studies had a comprehensive or modified variety as the delivery method of study (Pluss, Karlsson, Wallen, Billing, & Held, 2008; Carlson, Johnson, Franklin, & VanderLaan, 2000; Carlson, Norman, et al., 2001; Pierson, et al., 2001; Kreikebaum, Guarneri, Talavera, Madanat, & Smith, 2011; LaPier, Cleary, Steadman, & Alesander, 2002). Five studies were exercise based programs of delivery (Heran, et al., 2011; Taylor, Brown, et al., 2004; Jollife, et al., 2009; Zwisler, et al., 2008; Franklin, et al., 2002). Three studies were classified as other center-based programs and consisted of music therapy (Mandel, Hanser, Secic & Davis, 2007), virtual reality (Chuang, Sung, Chang, & Wang, 2006), and community dance hall CR (Stiles, 2008) as the delivery methods.

The eight studies reviewing variations in frequency, intensity, and length of CR as a delivery method, had sample sizes ranging from 4 (a cohort) to 2971 (a correlation study), an average patient age of about 58 years, consisted of mostly male participants, and covered varied cardiac events as the primary diagnosis. Two studies were intensity

based studies, one correlation study and one cohort. Five studies had variations in length of study, three RCT studies, one cohort study, and one correlation study. One study researched intensity and was a cohort study. Twelve variables of interest for this review were included in these studies. Variations in frequency, intensity, and length as a delivery method for CR showed significant improvement in eight variables: (a) blood pressure, (b) body mass index, (c) cholesterol, (e) exercise tolerance, (f) quality of life, (g) adherence, (h) diabetes, and (i) program completion. One high quality RCT with 392 participants found no statistically significant outcomes, but shared three outcomes as clinically significant outcomes of improvement: (a) cholesterol, (b) exercise, and (c) quality of life (Reid et al., 2005).

Six studies reviewed a comprehensive or modified CR delivery method. In these studies sample sizes ranged from 1 (case study) to 224 (RCT), average age of about 60 years, 47 to 100% male participants, and a variety of cardiac events as the primary diagnosis. Four studies were modified CR and included three RCT and one case study. One RCT study consisted of an expanded CR program and another was considered to be holistic and was a cohort study. Eight variables of interest for this review were included in the studies for review. Four variables were found in the studies to be statistically significant improvements and included: (a) body mass index, (b) cholesterol, (c) exercise, and (d) quality of life. Three variables were found in the various studies to be clinically significant improvements and included: (a) adherence, (b) smoking cessation, and (c) improved knowledge. In one study expanded CR was found to have a non-significant increase in SBP for both the intervention group as well as the comparison group which

was a hospital based CR program (Pluss, et al., 2008). Carlson et al. (2001) found that social support for both modified CR and its comparison, traditional CR, was decreased significantly during the 6 months of the study.

Five studies reviewed exercise based CR as a delivery method. In these studies sample sizes ranged from 117 (correlation study) to 10,794 (aggregate numbers for systematic review), average participant ages were in the mid 60s, mostly men participants, and a variety of cardiac events were the primary diagnosis. These studies included three systematic reviews, one RCT, and one correlation study. Nine variables of interest for this review were included in these studies. Eight of them were found to be statistically significant improvements and included: (a) blood pressure, (b) cholesterol, (c) exercise, (d) improved knowledge, (e) mortality, (f) quality of life, (g) reoccurrence, and (h) smoking cessation. Four variables were repeated as clinically significant outcomes for the various studies and those included: (a) blood pressure, (b) quality of life, (c) mortality, and (d) smoking cessation.

The last three studies of various center-based programs included were all RCT and included musical therapy, virtual reality, and dance hall as the CR delivery methods. These studies had samples sizes ranging from 15 (RCT) to 560 (correlation study), average patient ages between 55 to 65 years, all male participants in one study with unidentified gender mix in the others, and had a variety of cardiac events as the primary diagnosis. These studies included four variables of interest for this review, and found three of them to be statistically significant improvements. These three variables included: (a) blood pressure, (b) exercise, and (c) quality of life.

Most included studies consisted of mostly male participants. Four studies had either equal female participants or contained more female then male participants (Eder et al., 2010; Eshah & Bond, 2009; Silberman et al., 2010; & Yates et al., 2007). Of these four studies two studies were variations of length or intensity as the delivery method and two were studies of home based programs as the delivery method. All four studies report that although some variables of interest were found to be statistically significant for within group comparisons, there were no significant differences in the effectiveness of one delivery method over another. This is congruent with the evidence found in this review from studies with a majority of male participants.

Quality of Included Studies

The majority of studies evaluated were given a moderate quality rating by the author. The quality of a study can be important when using the results to support practice change. There were a variety of reasons that led to the quality rating for each included study. For this reason, the author's rationale for studies rated moderate and low in quality are listed in Table 7.

Table 7. Rationale for Moderate to Low Quality Ratings

Study	Quality rating rational
Adams et al., 2007	Moderate – The study is observational, non-randomized. Thus lower on the hierarchy of evidence, but group demographics do not differ and study has good methodology. Good description of assessment tools & techniques, data analysis were common, outcome assessment appropriate & complete.

Table 7 Continued

Ades et al., 2000	Low – No randomization, no blinding, groups were small numbers, programs varied enough that on occasion it was difficult to determine whether improvements were due to the program or components of the program.
Aldana et al., 2006	Moderate – No randomization, self selection of program to enter, self-report questionnaires for outcome assessment, yet the study used good data analysis techniques and were consistent with assessment among groups, that improves quality strength.
Bris et al., 2006	Low – Extremely small sample size, blinding and randomization process was not addressed, differences in patient pathologies was noted.
Carlson et al., 2000	Moderate – Small number of participants, randomization not detailed, otherwise good methodology & data collection.
Carlson et al., 2001	Moderate – Randomization process & outcome assessment blinding was not detailed, authors note some concern about the questionnaires being accurate in self-efficacy. However for study design methodology is good.
Chuang et al., 2006	Low – Extremely small sample size, lottery group placement, loss to follow up was likely a factor.
Clark et al., 2011*	Moderate - RCT included are strong quality studies, but the comparison studies had poor methodology & low numbers so if studies are used separately there is potential for bias & confounding variables.
Eder et al, 2010	Moderate – This is a RCT, with good descriptions & instruments of evaluation assessments. However, patients were volunteers, randomization method was not defined, blinding was not addressed, & intervention application was vague.
Eshah et al., 2009*	Moderate - The studies reviewed did not include RCT. However, this review provided good detail about components of the studies & outcomes studied.

Table 7 Continued

Franklin et al., 2002	Moderate - Non-experimental design & sample size is relatively small. Outcome assessment was systematic; measuring the same components each time, results were thorough, & results were meaningful.
Furber et al., 2010	Moderate – Good sample size. The study is strong in all areas, but it uses self-reported questionnaires as the measurement tool in all variables, and this is a weaker measure than say a 6 min. walk test or exercise tolerance testing as indicators.
Giallauria et al., 2006	Low- Randomization is not discussed, it appears group allocation was based on availability of exercise equipment and participant desire, results data was difficult to understand; it was unclear what p-values were for what data in some cases.
Harris et al., 2003	Moderate - Retrospective study design & longitudinal nature weaken the study some, however there was blinding of assessment collection and comparisons between participants and non participants for the year of the population along with between group comparisons.
Heran et al., 2011*	Moderate – The study is high quality in itself, but the available evidence used for the study has a great risk for bias.
Hevey et al., 2003	Low – Small sample size, randomization process is not specified, blinding of assessment is not specified, loss to follow up is not specified.
Higgins et al., 2001	Low – Randomization not defined in article, most assessments were self-reported, 20+ patients were lost to follow up, relatively small sample.
Jiang et al., 2007	Moderate - Randomized, computer-generated, blinding to assignment & outcome assessor was blinded, some risk for bias in the self reported collection of outcomes with use of questionnaires for behavior outcomes.

Table 7 Continued

Jolliffe et al., 2009*	Moderate – The quality of studies used in the review was reported to be poor by the author related to poor description of randomization and blinding, and loss to follow up. However the review itself was of high quality methodology.
Jolly et al., 2006*	Moderate – The quality of studies used in the review were reported to be poor by the author related to poor description of randomization and blinding, and loss to follow up. However the review itself was of high quality methodology.
Jones et al., 2009	Moderate – Small sample size, study type is low on quality hierarchy, some risk for response bias, yet focus groups had standardized questions, and were assessed in their original groups good methodology for study type.
Kodis et al., 2001	Moderate – Large sample size, differing times of lipid assessment are noted, retrospective observational study design.
Kortke et al., 2006	Low – Pilot study with no randomization & the groups had different time duration of the study.
Kreikebaum et al., 2011	Low - Extremely small sample size, and no randomization. The groups had significant differences as well, and loss to follow-up was significant.
LaPier et al., 2002	Low - Case study design is difficult to make any inference or draw conclusions. Sample size of only 1.
Lee et al., 2004	Low – Small sample size, potential for bias is great related to differences in programs, weak design on hierarchy of evidence.
Mandel et al., 2007	Moderate - Randomization occurred, blinding not addressed in literature, data analysis & tools for measuring outcomes are well studied, yet questionnaires were utilized which are not objective.
Marchionni et al., 2003	Moderate - Randomized not detailed, outcome assessment was blinded, loss to follow up was not significant, significant baseline differences create potential for bias & limited inference.

Table 7 Continued

Morrin et al., 2000	Moderate - Observational longitudinal study, good methodology, complete outcome assessment, yet no control group.
Oerkild et al., 2011	Moderate – Small sample size. Randomized & computer generated patient allocation. Small sample size & no blinding but both were acknowledged by the author. Outcome assessment was systematic.
Oliveira et al., 2008	Moderate – A control, with use of statistical software and common data analysis technique. Small sample size, no randomization, blinding not identified, & weak source of physical activity assessment weaken the study.
Pierson et al., 2001	Low - Small number of participants, randomization process not detailed, outcome assessors were blinded, difference between groups in session length of exercise.
Senuzun et al., 2006	Moderate – Randomization details were not available, blinding was not addressed in the article, and small sample size. However, assessment tools are good and assessment was equal between groups, and this was a controlled trial.
Silberman et al., 2010	Moderate: Non-experimental, risk for bias in recruitment, and follow up assessment. However, good methodology and large sample size.
Sledge et al., 2000	Low – Observational study with a small number of participants, non-randomized group placement, questionnaire mailing to usual care individuals producing only 65% return rate – bias created in return and in loss to follow-up.
Southard et al., 2003	Moderate - Moderate sample size. Stratified Then computer randomization. Loss to follow up was not significant. Outcome assessment systematic. Blinded entry assessment, but no blinded outcome assessment.
Stiles, 2008	Low – This is a nice sample size, but there were no details related to the methodology, patient demographics, or outcomes assessments.

Table 7 Continued

Taylor et al., 2004*	Moderate – Large sample size, with no significant publication bias & good methodology for review. Trials used poor methodology. Only 8 studies were from 2000 or later.
Varnfield et al., 2011	Low - These are preliminary results of a RCT, where few details available about RCT to determine quality.
Wu et al., 2006	Moderate – Small sample size & loss to follow up not addressed; randomization done via drawing lots; outcome assessment blinded, group assessed identical.
Yates et al., 2007	Low – Small sample size, and the risk for bias was very high. No randomization, outcomes assessment was by self-report questionnaire & self-measurements.
Zutz et al., 2007	Low – Extremely small sample size and there was a loss to follow up as well. Randomization was present; measurement tools of quality were used.

Notes: * Literature Reviews

Summation of Evidence

The top three variables of interest for this review most impacted significantly by the home setting as a delivery method were, in order of most impacted: (a) exercise, (b) quality of life, and (c) cholesterol. The home setting was found to be more effective than all the other delivery methods in improving these three variables of interest. Center based CR with variations in length, start date, and intensity as a delivery method was the next delivery method to significantly impact these same three variables in the same order of impact, yet to a lesser degree.

The evidence could also be looked at starting with the variable of interest and the top delivery methods that show statistically significant data for improvement. For

example, for smoking cessation the top three delivery methods that studied smoking cessation and reported statistically significant improvement were as follows, in order of most effective delivery method: (a) home setting, (b) exercise based, and (c) tele-health.

The general effectiveness of a CR delivery method in this review was assessed based on the positive improvement the method had on one or more of the variables of interest. Overall, the results of this review produced evidence that a variety of CR delivery methods are effective in producing positive patient outcomes for the variables of interest for this review. However, certain delivery methods were found to be more successful in improving specific variables.

CHAPTER 5 - DISCUSSION

General Discussion

A thorough review of empirical evidence was undertaken to examine in what way, if any, various delivery methods for CR impact patient outcomes. The majority of the studies used in this review were of moderate quality causing some limitation to study findings. Yet no significantly different or clinically superior delivery method for CR was identified in this integrative review. In general, every delivery method of CR reviewed in the studies had evidence of effectiveness, positively impacting one or more of the variables of interest for this review.

The home-based CR statistically significant evidence included seven variables of interest for this review that were improved with a variety of home-based CR delivery methods. Of the twenty-seven studies included in this review that had a home-based delivery of CR, there was consistency in that blood pressure, body mass index, cholesterol, exercise tolerance, quality of life, reoccurrence rates, and smoking cessation were improved regardless of the specific home-based delivery method. Of the twenty-two center-based CR delivery method studies included in this review, there was statistically significant evidence that exercise tolerance and quality of life were consistently improved regardless of the specific center-based delivery of CR. Overall, looking at all the studies combined, the variables of interest found to be most impacted by these two global headings comprehensively are (a) exercise tolerance, and (b) quality of

life. The variety of delivery methods reviewed provides evidence that these two variables are improved regardless of the delivery method.

This review found that home-based CR had more variables of interest (n=7) with statistically significant evidence of improvement. While the center-based appears to have only a couple (n=2), it is important to remember that these variables can be improved, but just not statistically significantly improved. To explain look at this example:

> From baseline to 12 months within the home-based group there was statistical improvement of total cholesterol. Similar changes were also noted for the center-based group just not statistically significant (Jolly et al., 2009).

Understanding that this review is not solving a research problem, but compiling data on delivery methods and comparing them, there is some trending towards the home-based cardiac rehabilitation as being superior in effectiveness as a delivery method. However, the majority of the studies reviewed discussed similar improvements in center-based CR when direct comparisons were made between the two delivery types. This is consistent with numerous studies that have found that when the two delivery methods are compared one against the other, they are found to have similar findings and often are not statistically different (Ades et al., 2000; Carlson & Johnson et al., 2000; Carlson & Norman et al., 2001; Dalal et al., 2010).

This review also included evidence that when female participants are of equal percentage or greater to male participants in a study, the results on effectiveness of the delivery method are not changed. So, although this integrative review included mostly male participants, the evidence suggests that results would be little changed had female participants been of equal or greater percentages to males in the studies reviewed.

Study Limitations

This review focused on empirical data, but future study could include review of opinion papers, and theoretical literature to broaden the understanding and potential for different delivery methods for CR. Also the use of only published literature creates a potential bias by missing the entire spectrum of gray literature that may be available.

Due to the volume of studies included in this review and the time limits on review completion it was not possible to contact original authors for clarification. Therefore questions related to methods of concealment allocation, the number of participants lost to follow up, or whether outcome assessors were blinded to group allocation were not answered and the study was ranked accordingly on the quality rating scale.

This review was limited by the heterogeneity of the delivery methods. Even within the categories and subgroups of each delivery method there was a tremendous amout of heterogeneity related to program content, evaluation tools, and the variables being evaluated. Because of this difference, it was difficult to determine if delivery method, content, or evaluation tools produced the effectiveness results. Had there been more similarity a better comparison of effectiveness on specific variables may have been possible.

Another potential for limiting the inference of this review is the fact that more studies evaluated quality of life and exercise than any of the other variables of interest. Potentially this could have been why those were the two variables that globally were improved regardless of the CR delivery method.

The last two identified limitations in themselves also add to the strength of this review. Regardless of the vast heterogeneity of each delivery method it is evident that CR presented in a variety of forms is effective at decreasing cardiac risk and improving patient outcomes.

Implications

Implications for Practice

Based on the studies available for this review, CR in a variety of delivery methods is effective in physiological and psychological management of middle aged men with a variety of cardiovascular events. The ability to generalize the effectiveness of a variety of delivery methods for women is limited somewhat by this review, but should not limit recruitment efforts by healthcare providers to encourage women to attend a CR program, as four studies in the review showed little to no difference in results when women are the majority gender in a study. Suggesting women would benefit just as much from CR attendance.

The focus of this review was on delivery methods in general, but potentially could be used to further focus on delivery methods most appropriate for rural areas. Home-based and center-based CR delivery methods were virtually equal in effectiveness. As such there may be a potential for impacting CR participation in rural areas by initiating home-based CR. Home-based CR may provide better CR access having the potential to impact more patients in rural areas where a center-based CR is not immediately available.

This review might also be helpful as a conceptual framework for CR program development. The evidence from this review shown in the graphs in Appendix B depicts specific delivery methods having greater effectiveness on certain variables. This evidence could be used to match up the delivery method with the most evidence of effectiveness for a variable. For example, in the event a specific variable or group of variables was identified in a cardiac patient population, the evidence from this review could be used as a framework for development of a CR program to meet the needs of this specific patient population. CR programs could be developed based on the specific needs and variables of interest for the patient population in certain regions or areas. In this way the conclusions from this review could be used as a conceptual framework for CR program development. multifaceted

Implications for Research

The limitations and components of the studies included in this review provide needs for future research. These 49 studies were limited on inclusion of females, older age participants, and patients with congestive heart failure. To allow for more confident generalization further studies need to be completed on these patient populations. There is also a need for studying different delivery methods of cardiac rehabilitation that measure several, but the same variables of interest. In this way there would be more homogeneity among studies allowing for more meaningful conclusions. Utilization and cost effectiveness of various CR delivery methods was not evaluated in this review. Both would be a good variable to consider when deciding between delivery methods, and are another implication for future research.

Implication for Integrative Review Writers

As the future of healthcare continues to embrace evidence-based practice initiatives, literature reviews like the integrative review will be important to address the complex topics and issues of the healthcare system. The idea that the integrative review includes both qualitative and quantitative studies is important. The qualitative research is important to incorporate the holistic concepts that include things like human behavior and preference. An author utilizing a systematic and rigorous integrative review process can produce a new holistic conceptualization of the issue/topic, rather than simply compiling more evidence to support past research. Both are important for the advancement of healthcare; however a well done integrative review should synthesize new knowledge on the topic.

Conceptualization of the topic should start early in the processes of writing an integrative review. Identify a point of view or hypothesis, or follow a model or framework. This will help focus the data abstraction and information gathering during review of the literature, as well as organize the review article. Keeping notes of unusual findings, omissions, inaccuracies, or potential themes as they are identified helps lay the foundation for the analysis of data. This allows for that holistic conceptualization of the issue/topic. Maintain curiosity and continue to seek validation throughout the entire integrative review process, this is the foundation of knowledge synthesis.

Conclusion

Using an integrative review process the author reviewed information on a well studied topic from several literature types to determine effectiveness of CR delivery methods. Although none of the delivery methods for CR studied every variable of interest for this integrative review, there are clear signs as to the effectiveness of a variety of delivery methods to decrease future risk, improve exercise tolerance, and to improve the quality of live for patients with a variety of cardiac related conditions. In addition to addressing the purpose of the review, the author used the structure of the integrative review process to synthesize a new framework for CR program development. The approach of this conceptual framework guides CR program development by initially identifying variables of interest specific to a patient population and then choosing the delivery method most effective in improving patient outcomes related to those variables.

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APPENDICES

APPENDIX A:

EXTRACTED DATA AND STUDY SPECIFICS

Study Name	Adams 2007
Delivery Method	Exercise-based, traditional care, & educational workshop
Study Design	Cohort Study
Material & Program Content	• N = 217 traditional care n=114 CR n= 78 educational workshop n= 25 • Educational workshop: 8 hour workshop taught by a team of healthcare professionals. Patients receive a workbook that reviews cardiovascular disease, medications, exercise, nutrition, and stress management.
What was measured	• Anxiety & Depression (Brief symptom Inventory, Beck Depression Inventory) • Functional ability (Katz index) • Weight, height, BMI (calibrated scales) • BP (manual, seated) • HR (60 second palpation) • Cholesterol (Plasma Lipid)
Statistically Significant improvement	• In the subset of patients with initial HDL levels less than 40, there were statistical differences between cardiac rehab & traditional care with HDLs increasing in cardiac rehab.
Non-stat significant but clinically significant	• No differences between groups for depression, anxiety, or global index, but all groups decreased from baseline. • No significant differences in physiological variables emerged.
Quality	Moderate – The study is observational, non-randomized & thus lower on the hierarchy of evidence, but group demographics do not differ and has good methodology. Good description of assessment tools & techniques, data analysis were common, outcome assessment appropriate & complete.
Study Notes/Features	• Assessment: Baseline, 3, 6, 9, & 12 month • Majority males (77%) • No statistically significant demographic or physiological differences between groups, group size was not similar. • Primary diagnosis: Various cardiac events. 47% were Stent patients. • Loss to follow-up: Not indicated • Adherence: Not measured
Miscellaneous Notes	•

Study Name	Ades 2000
Delivery Method	Home setting on-line transtelephonic electrocardiographic & voice monitoring vs. on-site CR
Study Design	Controlled trial – not randomized
Material & Program Content	• N= 133 home n=83 center n=50 • Both: progressive individualized monitored exercise, nursing support & were in direct telephone/person contact with the nurse during exercise & preventative education. • Home: 3 months transtelephonic monitoring, conference call with the other patients during exercise. • On site: Dietary counseling also provided. • Exercise Target Heart Rate: 65% - 85%
What was measured	• Quality of life (health status questionnaire) • Exercise capacity (graded exercise test with expired gas analysis)
Statistically Significant improvement	• Home group increased weight while onsite decreased weight with significant between group differences. • Both groups had statistically significant improvements from baseline on Peak VO2 , but did not have significant differences between the groups. • Both showed significant improvement in quality of life and hemodynamic data (HR/SBP), but no significant difference between groups.
Non-stat significant but clinically significant	•
Quality	Low – No randomization, no blinding, groups were small numbers, programs varied enough that on occasion it was difficult to determine whether improvements were due to the program or components of the program.
Study Notes/Features	• Assessment: Baseline & after program 3 month • Majority Males (76-90% within group) • Average age 56-58 years old • No baseline demographic or study variable differences between groups. However, female patients had significantly higher BMI and lower peak VO2 than male patients at baseline. • Primary diagnosis: Various cardiac events. Only the highest risk patients were excluded from both programs. • Loss to follow-up: Similar for both groups, not significant. • Adherence: Not noted.
Miscellaneous Notes	• On-site had dietary counseling that may have benefited them leading to the decrease in weight.

Study Name	Aldana 2006
Delivery Method	Intensive lifestyle modification program vs. cardiac rehab & control
Study Design	Cohort Study
Material & Program Content	• N = 84 n=28 in each group • Modification (Ornish): 10% fat vegetarian diet, exercise, group support, & stress management. • Traditional CR: Supervised exercise & education classes – three 1-hr sessions per week. • Control: Standard care (normal visits with medical provider)
What was measured	• Quality Of Life (SF-36) • Depression (Center for Epidemiological Studies Depression Inventory [CES-D]) • Stress (State-Trait anxiety inventory) • Hostility (Cook-Medley Hostility Scale) • Social support (Preferred Support Profile)
Statistically Significant improvement	• Ornish showed significant improvement over time in every psychosocial variable & every SF-36 component except physical function which was only marginally increased. (Within group comparison) • Ornish had significantly lower stress than both CR & control.
Non-stat significant but clinically significant	• Ornish group showed greater improvement over control in depression, mental health, vitality, & social functioning, and better than CR, but not significantly.
Quality	Moderate – No randomization, self selection of program to enter, self-report questionnaires for outcome assessment, yet the study used good data analysis techniques and were consistent with assessment among groups, that improves quality strength.
Study Notes/Features	• Assessment: Baseline, 3 months, 6 months • 95% white; 82% male; 58.2 average age • No significant demographic differences between groups. However, Ornish & CR groups had significantly lower baseline scores than control related to social function & higher scores for depression & stress. • Primary diagnosis: Various cardiac events. • Loss to follow-up: Not indicated. • Adherence: No significant differences between groups.
Miscellaneous Notes	•

Study Name	Bris 2006
Delivery Method	High vs. low training frequency in cardiac rehab
Study Design	Experimental
Material & Program Content	• N = 4 • Low = 20 sessions of supervised cardiac rehab, three non-consecutive days per week for 7 weeks • High = 20 sessions of supervised cardiac rehab, five consecutive days per week for 4 weeks. • Exercise Target Heart Rate: 70% heart rate reserves
What was measured	• Exercise tolerance (6 minute walk test) • Graded exercise test (electromagnetic cycle ergometer) • Training quantity • Compliance (proportion of scheduled sessions attended)
Statistically Significant improvement	• No statistically different results were reported
Non-stat significant but clinically significant	• High & low training frequency induced similar increases in exercise tolerance. • Increased exercise tolerance persisted twice as long in the High group as it did in the low.
Quality	Low – Extremely small sample size, blinding and randomization process was not addressed, differences in patient pathologies was noted.
Study Notes/Features	• Assessment: Training period – daily 6 min. walk test & pre/post training period did a graded exercise test; observation 3 times on non-consecutive days per week & graded exercise test at end of observation. • All male patients • Age ranged from 45 – 53 year of age • There were significant differences in pathologies among the four patients included. • Primary diagnosis: 1 CABG & 1 PTCA included in each group. • Loss to follow-up: None
Miscellaneous Notes	• There was 100% compliance with all patients.

Study Name	Carlson 2000
Delivery Method	Traditional vs. modified CR
Study Design	RCT
Material & Program Content	• N = 80 Traditional n=42 Modified n=38 • Both: First 4 weeks were identical – 3 exercise sessions per week, ECG monitoring, patient education (individual counseling, group classes, and videos), & nutrition

	education series. • Traditional: Continued the same regimen as initial 4 weeks, and then at 12 weeks encouraged to move into a phase III CR program. • Modified: ECG monitoring ended & personal heart rate monitors were used for on & off site exercise, and on-site exercise sessions were progressively decreased. Educational counseling continued & emphasized overcoming barriers. • Exercise target heart rate: 60 – 85%
What was measured	• Exercise adherence (session attendance & home workouts) • Exercise tolerance (graded treadmill) • Maximal oxygen consumption (Metabolic cart) • Ventilatory threshold (v-slope method), • Cholesterol (blood samples) • BMI (Calibrated meter & scale) • HR (from 12-lead ECG) • Blood pressure
Statistically Significant improvement	• Both groups significantly improved in 4 of 7 physiologic variables (wt, BMI, functional capacity, resting heart rate) and all 5 lipid variables with the exception of HDL in the traditional group. • Adherence: Significantly more patients from the modified group had exercise adherence.
Non-stat significant but clinically significant	• A favorable trend for the modified program was observed in total exercise adherence, aerobic capacity, no significant difference found.
Quality	Moderate – Small number of participants, randomization not detailed, otherwise good methodology & data collection.
Study Notes/Features	• Assessment: Baseline, & 6 months post • Majority men • Average age is 59 years old • Only significant difference between groups was a higher resting SBP in traditional group. • Primary diagnosis: Various cardiac events – low to moderate risk • Loss to follow-up: not significant
Miscellaneous Notes	•

Study Name	Carlson 2001
Delivery Method	Traditional vs. modified CR
Study Design	RCT
Material & Program	• N= 80 Traditional n=42; Modified n=38

Content	• Traditional: 3 x per week, for 3 months, education, 4-6 months patients were encouraged to attend phase III CR. • Modified: first 4 weeks same as traditional, then weaned from supervised exercise over 6 months, education on health behavior processes; weekly heart health forum/support meeting • Exercise Target Heart Rate Range: 60 – 85%
What was measured	• Exercise adherence • Psychosocial measures (outcomes expectancy for exercise, peer- and social support related to exercise) • Self-efficacy for exercise related to continuous ECG monitoring. • Self-efficacy for exercise frequency, intensity, & duration
Statistically Significant improvement	• Modified CR group reported statistically significant higher rates of independent exercise, higher levels of self-efficacy while exercising without the ECG over the traditional, and progressed significantly from baseline each time point within group. • Traditional CR improved in self-efficacy while exercising from baseline to 1.5 months, but then stayed the same. • The self-efficacy for exercise frequency decreased significantly from baseline to 6 months in both groups. • Both groups decreased significantly in social support measures during the 6 month study. • The only significant predictor was self-efficacy for exercise frequency.
Non-stat significant but clinically significant	•
Quality	Moderate – Randomization process & outcome assessment blinding was not detailed, authors note some concern about the questionnaires being accurate in self-efficacy. However for study design methodology is good.
Study Notes/Features	• Assessment: baseline 1.5months, 3 months, & 6 months • Ages 35-75 years • Males 80-84% in both groups • No significant differences demographically & psychosocially between groups. • Primary diagnosis: Various cardiac events. • Loss to follow-up: Not indicated • Adherence: Modified CR had higher rates of independent exercise.
Miscellaneous Notes	•

Study Name	Chuang 2006
Delivery Method	Virtual reality (VR) – "country walk" for cardiac rehabilitation
Study Design	RCT
Material & Program Content	• N = 15 after loss to follow up • Both groups – Identical program other than the VR component of treadmill exercise. • Program: Exercise 2 x per week for 3 months, max of 32 sessions; session length around 30 min. depending on subject's condition. • Group 1 = No VR • Group 2 = VR provided during rehab sessions; 3D wraparound screen setting (not head-mounted) with graphic user interface permits speed alteration & incline adjustment of the treadmill in conjunction with scenery changes. • Exercise Target Heart Rate: 85% heart rate max
What was measured	• HR max & VO2peak (Treadmill graded exercise test) • Treadmill grade & speed (From Treadmill)
Statistically Significant improvement	• VR group had significantly fewer sessions required to achieve each target CR goal over the non-VR group. • VR group significantly fast in achieving VO2 peak goals than non-VR • VR group achieved significantly greater high speed than subjects in non-VR group.
Non-stat significant but clinically significant	•
Quality	Low – Extremely small sample size, lottery group placement, loss to follow up was likely a factor.
Study Notes/Features	• Assessment: Baseline & when met goal of 85% HR max • Men only, average age was 64 years • No statistically significant demographic differences between groups. • Primary diagnosis: All post CABG patients. • Loss to follow-up: Likely significant given low sample size.
Miscellaneous Notes	•

Study Name	Clark 2011 – Systematic Review of the Heart Manual
Delivery Method	Heart Manual – home based program
Study Design	Systematic Review
Material & Program Content	• N = 1151 ○ RCT of home based vs hospital based = 2 studies N=755

	○ Comparison studies = 6 studies N= 396; studies were between heart manual and a control group. • Home: Self-help manual based on the cognitive behavioral therapy techniques. Provided in a structured program information, advice, encouragement, empowerment to help modify risk factors, Face to face & telephone contact. • Manual Included: dietary, exercise, & lifestyle change advice, false belief education, information on diagnosis, HD and drug treatment, and a relaxation compact disc.
What was measured	• Anxiety - Depression • quality of life - Illness perception • Smoking - Physical activity • Diet - Cholesterol • Blood pressure - BMI • Provider visits - Clinical events • Efficacy in older patients - Cost *** Tools varied by study
Statistically Significant improvement	• None found in RCTs on any measured outcome, except cost was lower for home based CR. • Comparison studies showed statistically significant improvements between groups with HM being better for anxiety, confidence in recover, perceived physical progress, smoking cessation, quality of life, and depression.
Non-stat significant but clinically significant	• Comparison studies showed improvements between groups for self perceived health status higher in HM group, and greater knowledge of benefits to exercise in HM group. • Of the 8 studies in this review 6 indicated the Heart manual was as effective as hospital based CR; yet this evidence is unclear due to the methodological issues of these studies.
Quality	Moderate - RCT included are strong quality studies, but the comparison studies had poor methodology & low numbers so if studies are used separately there is potential for bias & confounding variables.
Study Notes/Features	• Assessments: Varied by study • Adult patients, all studies had 66% or higher males, most studies were 76 years or younger. • Primary diagnosis: Coronary artery disease of varying stages
Miscellaneous Notes	• The 2 RCTs indicated no significant differences between the heart manual & hospital based CR

Study Name	Dalal 2010
Delivery Method	Home based versus center based
Study Design	Systematic Review
Material & Program Content	• N=1875 • 8 studies compared comprehensive programs (exercise plus education or psychological management or both) • 4 studies exercise only
What was measured	• Mortality, morbidity • Exercise capacity • Modifiable risk factors (smoking, lipid concentrations, BP) • Health related quality of life (6 instruments used to study this) • Adverse events • Health service use or costs • Cost effectiveness • Adherence *** Tools varied between studies
Statistically Significant improvement	• No statistically significant differences occurred between the home and center groups.
Non-stat significant but clinically significant	• Exercise capacity for home based programs may be better at 24 months follow up (not statistically significant) • Center based programs may have improved diastolic blood pressure & HDL levels over home in 12 week follow up.
Quality	High
Study Notes/Features	• Assessment: Most studies reported outcomes up to 12 months; 3 reported up to 24 months. • Gender/Age: Not reported for each study • Primary diagnosis: Acute Myocardial infarction & revascularization.
Miscellaneous Notes	• Evidence suggested better adherence to the home based program • Programs differed considerably in duration, frequency, and session length.

Study Name	Eder 2010
Delivery Method	Early Supplementary exercise in addition to exercise only cardiac rehab – starting at 2-3 weeks post op rather than the usual 4-8 weeks post op.
Study Design	RCT
Material & Program Content	• N = 60 control n=19; intervention cycle n=22; intervention walking n=19

	• All patients: standard 4-week exercise only CR program • Intervention groups: In addition to the standard CR had additional exercise sessions of initially 12 minutes with a 2 min. increase each week. • Control: Only the standard 4-week exercise program that all patients received. • Exercise Target Heart Rate: Started at 50% max was up from there
What was measured	• Cardiopulmonary Exercise testing with peak VO2 • Peak VO2, max heart rates, max power output, max blood lactate, max blood pressure, max Borg rating, cardio respiratory markers • 6 minute walk test • Quality of life (The MacNew questionnaire)
Statistically Significant improvement	• Walking group perceived significantly higher exertion during exercise. • At 4 weeks both intervention groups improved significantly in all measures from baseline. • At 4 weeks peak, max power output, & max breathing differed significantly between the intervention groups & control, but not VO2 max. • All patients had significant improvement in 6 MWT from baseline at 4 weeks, & significant differences between the intervention groups and control, but not between the two intervention groups. • Quality of life revealed significant improvements from baseline, & were significantly higher for global score only in the intervention group
Non-stat significant but clinically significant	• No significant differences between intervention groups (suggesting that standard exercise is likely sufficient to improve quality of life).
Quality	Moderate – This is a RCT, with good descriptions & instruments of evaluation assessments. However, patients were volunteers, randomization method was not defined, blinding was not addressed, & intervention application was vague.
Study Notes/Features	• Assessment: Baseline then after 4 week program. • Male to female ratio nearly equal – not significantly different • Age 65 years or older • Primary Diagnosis: Post open heart surgery & over 60% of patients had diabetes • 94% adherence among all patients.
Miscellaneous Notes	• All patients significantly improved in cardio-respiratory

	testing, 6 Minute walk testing, and quality of life scores from baseline.

Study Name	Eshah 2009
Delivery Method	Home & center based CR
Study Design	Integrative Review
Material & Program Content	• N= varied from 18 to 1812 • 13 articles (2 home based & 11 center based)
What was measured	• If nurses were providing CR • Ages and gender of participants • What proportion were male and female • Length of current CR programs • Intervention types • Physical and psychological effects from CR (exercise capacity, lipid profiles, BMI, BP, anxiety, & depression) *** Tools varied by study
Statistically Significant improvement	• Exercise only, strength training only, or both together in a program showed significant improvement in exercise capacity. • All except two studies found significant improvement in exercise capacity & tolerance. • 8 studies found significant improvement in quality of life (SF-36) in rehab groups over controls.
Non-stat significant but clinically significant	• Both home and center based showed improvement in quality of life and increased exercise tolerance. • 2 studies found less depression in CR vs. controls
Quality	Moderate – The studies reviewed did not include RCT. However, this review provided good detail about components of the studies & outcomes studied.
Study Notes/Features	• Assessment: Varied from 2 weeks to 3 years • Mean Ages 55-82 years • Males ranged from 49 – 87%; Females ranged from 13 – 100%. • Primary Diagnosis: Cardiovascular disease or cardiac related procedure • Adherence: Rates varied greatly from study to study.
Miscellaneous Notes	• Several of the studies indicate that women and elderly have favorable results when attending cardiac rehab.

Study Name	Franklin 2002
Delivery Method	Exercise-based CR with risk factor reduction intervention
Study Design	Correlation Study; Observational, non-experimental
Material & Program Content	• N= 117 • Exercise: Three 45 to 60 min. sessions per week for 6 – 8 weeks. • Risk reduction plan: Patient education provided during sessions using written materials, audio CDs on nutrition, physical activity, exercise, stress, prevention, & health promotion. Group education and 1:1 counseling also occurred. Patients were provided individual goals & an action plan based on national guidelines at the beginning of the program that guided their progress. • Exercise Target Heart Rate: 75 – 80% Max
What was measured	• Height & weight • BP • Fasting lipid (serum) • Glucose (serum) • HR • Rate of perceived exertion • Smoking
Statistically Significant improvement	• Exercise significantly reduced heart rate, SBP, DBP, total cholesterol, LDL & ratings of perceived exertion.
Non-stat significant but clinically significant	• Overall health ratings were improved
Quality	Moderate - Non-experimental design & sample size is relatively small. Outcome assessment was systematic; measuring the same components each time, results were thorough, & results were meaningful.
Study Notes/Features	• Assessment: Pre program & post-program • Average age 66.5 years • 68% men, 96% white • Primary Diagnosis: Various cardiac events • Loss to follow-up: Not indicated
Miscellaneous Notes	• Patients in the study with the worst coronary risk factor profiles at baseline demonstrated the greatest improvements.

Study Name	Furber 2010
Delivery Method	Pedometer based with telephone intervention
Study Design	RCT
Material & Program Content	• N = 222 • Intervention: exercise brochures, pedometer, step calendar for self-monitoring & telephone support with goal setting & behavior reinforcement at week 1, 3, 6, 12, & 18 weeks. • Control group: Exercise brochures, but no other supply or follow up
What was measured	• Physical activity (Active Australia self report questionnaire) • Psychosocial status (Self-efficacy for exercise scale; self report questionnaire)
Statistically Significant improvement	• Baseline to 6 weeks within intervention group – improvement in self-reported physical activity • Intervention group improved over the control group for total physical activity minutes at 6 week & 6 month, total physical activity sessions at 6 week, & 6 month, walking minutes at 6 week & 6 month, and walking sessions at 6 week & 6 month • Significant improvements in self-efficacy, outcome expectancies, and cognitive & behavioral self-management strategy use within the intervention group at 6 weeks, with the increase in self-efficacy & outcome expectancies remaining significant at 6 months • Significant decrease in psychological distress within the control group at 6 weeks & 6 months. • Significant improvement in intervention group over control group at 6 weeks for outcome expectancies & cognitive self-management strategy use.
Non-stat significant but clinically significant	•
Quality	Moderate – Good sample size. The study is strong in all areas, but it uses self-reported questionnaires as the measurement tool in all variables and this is a weaker measure than say a 6 min. walk or exercise tolerance test as indicators.
Study Notes/Features	• Assessment: 6 weeks & 6 months • Mean age about 65.5 years old • No significant differences between socio-demographic & clinical characteristics of groups. • Primary diagnosis: Variety of cardiac events • Loss to follow-up: Response rate overall was 93-94.9%

Miscellaneous Notes	• These participants had not taken part in a cardiac rehabilitation program prior to the home program, another study where pedometers were used post CR program showed no improvement from the control.

Study Name	Giallauria 2006
Delivery Method	Tele-cardiology
Study Design	Cohort; Observational control study
Material & Program Content	• N = 45 all three groups n=15 • Control: standard in-hospital 8 week program with 3/week exercise, monitored • Home with Telemetry: 8 week home based CR with tele-cardiology monitoring • Home without telemetry: 8 weeks home based without ECG monitoring • Exercise Target Heart Rate: 75% max
What was measured	• Exercise test • Anxiety (State Anxiety test - STAI-Y1 & Trait scale of anxiety inventory - STAI-Y2) • Depression (Beck Depression Inventory - BDI) • QOL (Medical Outcomes Study 36-item Short-Form Health Survey - MOS/SF-36)
Statistically Significant improvement	• Home w/ telemetry & control CR group had improved functional capacity from pre to post CR. • Home with telemetry significantly improved STAI-Y1 & BDI scores from pre to post assessment.
Non-stat significant but clinically significant	• Tele-cardiology improved compliance, functional capacity & psychology profile compared to home based without telemetry.
Quality	Low- Randomization is not discussed, it appears group allocation was based on availability of exercise equipment and participant desire, results data was difficult to understand; it was unclear what p-values were for what data in some cases.
Study Notes/Features	• Assessment: baseline and 2months. • 100% male, average at 57.3 years • Groups similar in demographic and clinical presentation. • Primary Diagnosis: Post Myocardial Infarct • Loss to follow-up: Not significant
Miscellaneous Notes	•

Study Name	Harris 2003
Delivery Method	Nurse care management w/ telephonic interactions vs. traditional hospital-based CR
Study Design	Cohort, nonrandomized, retrospective descriptive
Material & Program Content	• N= 342 1997 group n=184 1998 group n = 158 • 1997: Traditional CR • 1998: Nurse-managed CR; this included a cardiac assessment with risks & needs assessment and also an exercise component that could be traditional CR, community based supervised exercise, or home based exercise with supervision via the phone.
What was measured	• Lipids (serum) • Participation
Statistically Significant improvement	• The nurse managed CR was associated with a doubling in the patient participation.
Non-stat significant but clinically significant	• Both groups had similar effectiveness at lipid management
Quality	Moderate - Retrospective study design & longitudinal nature weaken the study some, however there was blinding of assessment collection and comparisons between participants and non participants for the year of the population along with between group comparisons.
Study Notes/Features	• Lipid assessment: 360 days prior, 180 days post, 360 days post. • Mostly men participants – just over 50% • Average age about 68 years • Most demographics & clinical characteristics were insignificant. However, 1998 population was significantly different in miles from hospital (lived farther), were less likely to have diagnosis of MI, & had a higher CR participation rate. • Primary diagnosis: Various cardiac events • Loss to follow-up: Not significant
Miscellaneous Notes	•

Study Name	Heran 2011
Delivery Method	Exercise based CR vs usual care
Study Design	Systematic Review

Material & Program Content	• N = 10,794 patients
	• 47 studies
	  ○ 29 studies = comprehensive programs (exercise plus education, psychological management, or both.
	  ○ 17 studies = exercise only
	  ○ 1 study = randomized patients to a comprehensive program, exercise only or usual care
	• Most programs included brief center-based intervention.
	• Nearly all home based programs were based on walking.
	• Both intervention & control patients received usual care (medication, education & advice about diet & exercise).
	• Control patients did not receive formal exercise training.

What was measured	• Mortality in 30 studies (n=8971) • Cardiovascular mortality in 19 studies (n=6583) • Morbidity many studies • Hospitalizations • Health related quality of life • Cost *** Tools varied by study
Statistically Significant improvement	• Total mortality & cardiovascular mortality decreased with exercise CR over 12 months, no significant difference up to 12 months • Readmissions decreased with exercise CR up to 12 months follow up, no significant difference over 12 months. • 7 of 10 trials found improved quality of life with exercise CR over control.
Non-stat significant but clinically significant	• Most trials demonstrated an improvement in baseline quality of life following exercise based CR, but there was also often reported within group improvement for the control group.
Quality	Moderate - The study is high quality in itself, but the available evidence used for the study has a great risk for bias.
Study Notes/Features	• Assessment: Varied by study • Low number of women participants, mean age was 56 years, upper age limit of 65 in most studies. • Primary Diagnosis: Various cardiac events; Heart failure was excluded • Loss to follow up ranged from 21-48% in 12 trials; only

	70% achieved a follow up of 80% or more.
Miscellaneous Notes	• No difference in mortality effect by exercise "dose" a based on the overall duration, intensity, frequency, and length of exercise sessions. • Insufficient data to definitely conclude improvement in QOL due to only 10 trials using validated tools.

Study Name	Hevey 2003
Delivery Method	Ten weeks of CR vs. four weeks of CR
Study Design	RCT
Material & Program Content	• N = 60 • Both: same 50 min. session conducted by trained coordinators in center based setting. • Standard: 10 week 30 session multi-factorial CR • 4 week 20 session multi-factorial CR • Exercise Target Heart Rate: 60 – 80%
What was measured	• Exercise testing (Bruce protocol) • Quality of Life (SF-36) • Anxiety & Depression (Hospital Anxiety & Depression Scale) • Adherence (Number of attended sessions) • Hospital re-admission rates (hospital records) • Lifestyle changes (self-report) • Smoking
Statistically Significant improvement	• Attendance rate was significantly higher in the 4 week group. • Both groups had significant improvements in exercise capacity, exercise duration, pain, energy, emotional and social well being, and decrease in heart rate for equal workload. • The 10 week group had significantly higher ratings of depression over 4 week group.
Non-stat significant but clinically significant	•
Quality	Low – Small sample size, randomization process is not specified, blinding of assessment is not specified, loss to follow up is not specified.
Study Notes/Features	• Assessment: baseline, post, & 6 months follow-up • Mostly male; average age about 61 years • No significant demographic or clinical differences between groups. • Primary Diagnosis: Various cardiac events

	• Loss to follow-up: Not indicated
Miscellaneous Notes	•

Study Name	Higgins 2001
Delivery Method	Comprehensive home-based vs. standard care with phone follow-up
Study Design	RCT
erial & Program tent	• N= 105 • Control: Standard care with 3 monthly post discharge CHD information focused telephone follow up calls • Intervention: individualized, comprehensive, home-based, cardiac rehabilitation, three educational home visits within 2 months post PCI, and 3 monthly telephone calls.
What was measured	• Cholesterol (serum) • BMI • Smoking history/status (self-report) • Exercise habits (Self-report) • Psychological well-being (psychosocial adjustment to illness scale - PAIS-SR) • Functional capacity (Canadian cardiovascular society functional classification for angina - CCS & Specific activity questionnaire – SAQ) • Work resumption (# of days before returning to work)
Statistically Significant improvement	• Baseline to 1st assessment intervention group had significant improvement in cholesterol, but not significantly different from control group. • Baseline to 1st assessment intervention group had significant improvement in exercise participation rate, significantly better than control group. • Both groups had significant linear trends of improvement in BMI & PAIS-SR total scores over time. • Both groups had significant within group improvement in both functional capacity screenings. • The intervention group had significantly shorter return to work time post discharge.
Non-stat significant but clinically significant	• Control group did not have significantly different changes in cholesterol from baseline.
Quality	Low – Randomization not defined in article, most assessments were self-reported, 20+ patients were lost to follow up, relatively small sample.
Study Notes/Features	• Assessment: baseline; 10 weeks post cath; 51 weeks post cath

	• All participants had been employed within previous 12 months • No significant differences in demographics or clinical characteristics of groups. • Primary Diagnosis: First time PCI patients
Miscellaneous Notes	• Alpha was set at 0.02 for statistical significance • Limited portion of participants had cholesterols drawn

Study Name	Jiang 2007
Delivery Method	Nurse led home –based cardiac rehab vs. routine care
Study Design	RCT
Material & Program Content	• N = 167 • Rehab: 12 week; hospital based patient/family education, home CR supervised, coached and supported by cardiac nurse, daily behavior goals for walking, smoking cessation, diet and medication adherence, and goal setting for physiological risk factors, daily log, home visits and telephone calls provided. • Routine care: undefined
What was measured	• Walking performance (Jenkins Activity Checklist for Walking) • Diet (3 day diet record) • Medication adherence (self-report) • Smoking cessation (self-report) • Lipids (serum) • BP (sitting) • Weight (scale)
Statistically Significant improvement	• At 3 & 6 months the intervention group demonstrated significantly greater increase in mean scores of walking & diet adherence, at 3 months significant group difference in medication adherence occurrence. • At 3 & 6 months significant greater reduction in TG, TC, & LDL occurred in intervention group. • At 3 months less increase in SBP/DBP for the intervention group.
Non-stat significant but clinically significant	•
Quality	Moderate - Randomized, computer-generated, blinding to assignment & outcome assessor was blinded, some risk for bias in the self reported collection of outcomes with use of questionnaires for behavior outcomes.
Study Notes/Features	• Assessment: baseline, 3 & 6 months

	• 69-74% male participants, average age about 62 years • No significant difference between group demographics or clinical characteristics. • Primary diagnosis: Angina pectoris or Myocardial Infarction • Loss to follow-up: 26 participants dropped out at various times, the control group having lost 8 more than the intervention group.
Miscellaneous Notes	•

Study Name	Jollife 2009
Delivery Method	Exercise based cardiac rehab
Study Design	Systematic Review
Material & Program Content	• N=8440 exercise only n=2845 comprehensive n=5595 • 51 Studies were included • Exercise only: exercise training & usual care vs. usual care alone • Comprehensive CR: exercise training in addition to psychosocial and/or educational interventions vs. usual care alone
What was measured	• Mortality • Morbidity (recurrence of non-fatal Myocardial Infarct) • Health related quality of life (Tools varied by study) • Smoking • BP • Lipids (serum)
Statistically Significant improvement	• There was a significant net reduction in total cholesterol, triglycerides, & LDL in the comprehensive CR group over UC, but not the exercise only group. • DBP was significantly reduced in the comprehensive CR (however very little data was collected on BP).
Non-stat significant but clinically significant	• Exercise only & comprehensive CR reduced total cardiac mortality compared to UC. • Comprehensive CR showed favorable but non-significant effects on smoking cessation (small number of trials reported). • QOL assessment instruments varied greatly – it was not possible to combine data, but most studies showed small changes overall, two studies showed substantial, but non-significant differences between exercise only and comprehensive. • Both had no effect on the recurrence of non-fatal MI
Quality	Moderate – The quality of studies used in the review was

	reported to be poor by the author related to poor description of randomization and blinding, and loss to follow up. However the review itself was of high quality methodology.
Study Notes/Features	• Assessment: Follow-up greater than 6 months all studies • Mostly male, average 54.5 roughly • Primary diagnosis: Various cardiac events; low risk • Loss to follow-up: Varied by study
Miscellaneous Notes	• Exercise based CR is effective in reducing cardiac death, it is not clear whether exercise only or a comprehensive cardiac rehabilitation intervention is more beneficial.

Study Name	Jolly 2006
Delivery Method	Home based cardiac rehab vs. center based
Study Design	Systematic Review

Material & Program Content	• N = 4743
	• 21 total trials included
	  • 18 Home vs. control (N=3925)
	  ○ comprehensive home n=1612
	  ○ predominantly psychological/educational home n=1966
	  ○ exercise only n=347
	  • 6 Home vs. group/center (N= 818)

What was measured	• All cause mortality • Cardiac mortality • Exercise capacity (Tools varied per study) • Smoking behavior • Blood lipid levels • BP • Health related quality of life (Tools varied per study) • Health service utilizations
Statistically Significant improvement	• SBP & risk of being a smoker showed significantly greater fall in home based vs. control. • Two trials reported a significant reduction in readmission rates in the home based group at 6 weeks & 6 months vs. control. • Some significant improvement in favor of home based vs. control was reported for 1 of 3 domains in QOL domains. • When post-MI is compared with usual care, the change in exercise capacity is significantly better in the home group vs. control. • Two studies reported significantly greater improvement in some QOL domains & in perception of social support for the home group vs. center.

Non-stat significant but clinically significant	• Exercise capacity, total cholesterol & Anxiety & depression scores all showed non-sign. Changes favorable to the home group vs. control. • No significant differences were found in exercise capacity, SBP, & total cholesterol for home vs. center, but did slightly favor center.
Quality	Moderate – The quality of studies used in the review was reported to be poor by the author related to poor description of randomization and blinding, and loss to follow up. However the review itself was of high quality methodology.
Study Notes/Features	• Assessment: Varied by study, minimum was end of program • Mostly men, ages varied per study usually less than 75 years of age • Primary diagnosis: Variety of cardiac events •
Miscellaneous Notes	•

Study Name	Jolly 2009
Delivery Method	Heart Manual vs. center based
Study Design	RCT
Material & Program Content	• N= 475 • Center: exercise, relaxation, education, & lifestyle counseling. Programs varied between the 4 facilities offering center based CR. • Home: Heart manual, 3 home visits (10days, 6 weeks, & 12 weeks), telephone contact at 3 weeks. • Exercise Target Heart Rate: 65-75% of max
What was measured	• Cholesterol (serum) • Blood pressure • Distance walked (Incremental shuttle walking test – ISWT) • Psychological morbidity (Hospital Anxiety & Depression Scale - HADS) • Smoking cessation (Urinary nicotine metabolites) • Diet (Food frequency questionnaire) • Physical activity (Exercise component of Health Behaviors Profile) • Health care utilization • Cardiac symptoms (angina & shortness of breath) • BMI • Health related quality of life (Euroqol EQ5D) • Death & cardiac events • Employment status

Statistically Significant improvement	• No significant differences noted for primary outcomes • Participants in the home group reported more chest pain on movement • Participants in the home group had significant improvement in their mean HADS anxiety score, total cholesterol & HDL, & smoking cessation from baseline to 12 months. • SBP & DBP increased significantly in the home based group from baseline to 12-month follow up. • Home based participants reported significantly more participants doing at least 3 episodes of at least 15-min. exercise in previous 7 days at 6 weeks. • Participants in the home based reported significantly higher exercise score than center based at 9 weeks.
Non-stat significant but clinically significant	• Similar changes were seen in the center based program from baseline to 12months as in home only not significant.
Quality	High
Study Notes/Features	• Assessment: baseline (both clinical & questionnaire); 6 week, 9 week, 12 weeks (questionnaire data); 6 months & 12 months (clinical). • 76-77% male, average age 61 years • No significant differences for group demographics or clinical characteristics at baseline. • Primary diagnosis: MI, PTCA, CABG patients not high risk • Loss to follow-up: Not significant
Miscellaneous Notes	•

Study Name	Jones 2009
Delivery Method	Heart Manual vs. center based
Study Design	Qualitative Focus group discussion analysis - 5 focus groups, 1.5hours long - Analysis of transcripts to ID themes & categories
Material & Program Content	• N = 26 center n=16 home n=10 • Home: Heart manual 6 week program with relaxation & information tapes, home visits, & telephone follow up at 12 weeks. • Center: 4 different hospitals each run a little different, but essentially circuit training & all had education components – 3 hospitals had group therapy and one had individual therapy sessions.
What was measured	• Patient experience (benefits & problems of each delivery

	method) • Reason for participating in CR • Program preference • Views on the different components of their program • Continuing to exercise since completing CR
Statistically Significant improvement	• Both groups satisfied with the program they received and both suggested the alternative program would not be as good. • Both groups had loss of confidence following the cardiac event, continued to exercise and make lifestyle changes, improved knowledge and understanding of heart disease, and benefited from CR • Home exercisers liked the control they felt over their own lifestyle changes, & the benefits of 1:1 nurse contact. • Center based patients particularly benefited from meeting with others & the social support and staff support.
Non-stat significant but clinically significant	• Center based groups had more camaraderie than home groups during focus group. • Both groups had specific topics that differed, but the center program has much more variation in delivery that it seemed patient occasionally missed opportunities because of miscommunication or lack of availability.
Quality	Moderate – Small sample size, study type is low on quality hierarchy, some risk for response bias, yet focus groups had standardized questions, and were assessed in their original groups; good methodology for study type.
Study Notes/Features	• Assessment: Once post CR • Majority male; Mean age roughly 63 years; mostly white • No significant difference in demographics & clinical characteristics of groups. • Primary diagnosis: Myocardial infarction or revascularization
Miscellaneous Notes	• Both CR delivery methods improve patient's well being and should be recommended to patients.

Study Name	Kodis 2001
Delivery Method	Center based vs. home based
Study Design	Retrospective cohort
Material & Program Content	• N = 1,042 Center n=713 Home n = 329 • Center: personalized exercise prescription & supervised group exercise twice weekly. Patients had access to other series such as group education lectures, dietary counseling, smoking cessation programs, stress management groups, or

	individual psychological intervention. • Home: personalized exercise prescription & detailed guidelines for home exercise. • Exercise Target Heart Rate: 40 – 70% of max
What was measured	• Exercise capacity (cycle exercise testing with oxygen uptake) • Lipid profiles (serum) • Gender differences in outcomes
Statistically Significant improvement	• Both within group comparisons had significant improvement in exercise capacity. • At end of training supervised patients had significantly higher peak V02 levels & peak workload values over unsupervised. • At 6 months supervised group had significantly lower total cholesterol & LDL compared to unsupervised group. • Supervised group had significant improvement within group of LDL & HDL. • Home-based significant improvement in HDL within group. • Men performed significantly better than women for all measures of exercise capacity, but no differences between females of one group from the other. • Women in both groups demonstrated improved HDL, significant differences between the genders in HDL & total cholesterol were present at baseline and 6 months.
Non-stat significant but clinically significant	•
Quality	Moderate – Large sample size, differing times of lipid assessment are noted, retrospective observational study design.
Study Notes/Features	• Assessment: varied baselines; post & all follow- up done 6 months after exercise intervention • 85-90% male, average age 61 years • No significant baseline group demographic or clinical characteristics. • Primary diagnosis: Bypass patients only • Loss to follow-up: Supervised group had larger loss
Miscellaneous Notes	•

Study Name	Kortke 2006
Delivery Method	Telemedicine ambulatory rehabilitation vs. hospital rehabilitation
Study Design	Pilot study – Cohort
Material & Program Content	• N = 170 hospital n=70 telemedicine n=100 • Hospital: 3 week standardized training program, dietary instruction & supervision, sociomedical evaluation & instruction in prevention, group therapy. • Telemedicine: 3 months using telemedicine supervision, individualized training program, personnel led instruction (dietary, sociomedical, anticoagulation, & prevention, cardio complications and their symptoms), sessions were 30 min. 3 x per week, in the home with special equipment from study.
What was measured	• Physical capacity (ECG & Spiroergometry) • BMI/Body weight • Heart rate • QOL (SF-36) • Cost
Statistically Significant improvement	•
Non-stat significant but clinically significant	• No significant difference with BMI, physical capacity, heart rate, QOL, between groups at 6 or 12 months.
Quality	Low – Pilot study with no randomization & the groups had different time duration of the study.
Study Notes/Features	• Assessment for training program at baseline & 3 weeks for both groups. Then 6 & 9 weeks for tele-med group. Both groups were examined for parameters at 6 & 12 months after surgery. • 90-95.7% males, average age roughly 56 years • No significant demographic or clinical group differences. • Primary diagnosis: Cardiac surgery all participants • Loss to follow-up: Not significant
Miscellaneous Notes	•

Study Name	Kreikebaum 2011
Delivery Method	Holistic CR (as defined below) vs. monitored exercise CR
Study Design	Cohort – Pilot study Quasi-experimental – between subject repeated measure design (mostly a between group experiment as the control group didn't have same outcome assessment as the intervention group
Material & Program Content	• N = 150 Holistic n=87 Monitored exercise n=63 • Holistic CR program: Monitored with exercise, cooking classes, educational lectures, group support, stress management classes, music therapy & spirituality classes. • Monitored exercise: Monitored exercise 3x a week supervised by an exercise physiologist.
What was measured	• Overall mental & physical health status (SF-36) • Hostility (Cook-Medley Hostility Scale) • Depression (Beck Depression Inventory Second Edition) • Social support (Interpersonal Support Evaluation List) • Stress (Perceived Stress Scale) • Satisfaction with Life (Satisfaction with Life Scale) • Spirituality (Spiritual Involvement & Beliefs Scale) • Cholesterol Levels (Lipid panels)
Statistically Significant improvement	• Significant improvements within the holistic group for depression, satisfaction with life, stress, spirituality, and all 4 cholesterols
Non-stat significant but clinically significant	• Holistic CR did reduce hostility and increase social support, but not statistically significantly. • No Significant differences between groups noted.
Quality	Low - Extremely small sample size, and no randomization. The groups had significant differences as well, and loss to follow-up was significant.
Study Notes/Features	• Assessment: baseline and program completion • 47-70% male; average age roughly 66.7 years • Groups differed significantly by gender, but not age. • Primary diagnosis: Participants had an order to have CR • Loss to follow-up: 150 completed baseline but only 94 completed the exit assessment. This is significant.
Miscellaneous Notes	•

Study Name	LaPier 2002
Delivery Method	Alternate model of mixed center & home based CR
Study Design	Case study
Material & Program Content	• N = 1 • 4 weeks center based, exercise 3 times a week; then 8 weeks once a week at center supplemented with home exercise & education program.
What was measured	• Exercise capacity (6 min walk test) • Physical Activity (Duck activity Status Index) • RAND 36 item health survey • Dietary Fat intake • Diet Habit Survey
Statistically Significant improvement	• Statistical calculations were not made for the outcomes
Non-stat significant but clinically significant	• Patient was able to meet his first short term goal (to exercise 20 min nonstop 3.0 METs) & long term goals (to exercise nonstop for 40 min. at 4.0 METs). • Patient decreased percent body fat by 2%. • Demonstrated learning about proper exercising and dietary habits. • Patient demonstrated improved exercise tolerance.
Quality	Low - Case study design is difficult to make any inference or draw conclusions. Sample size of only 1.
Study Notes/Features	• Assessment: Pre-program & post-program • 52 year old man • Primary diagnosis: Status post MI & stent • Loss to follow-up: N/A
Miscellaneous Notes	•

Study Name	Lee 2004
Delivery Method	Long term community cardiac rehab
Study Design	Retrospective Cohort observational
Material & Program Content	• N= 82 Middle aged n=42 Elderly (over 65 years) n=40 • 3x a week for 1 month, then programs varied in type, duration, and intensity continued for 2 years.
What was measured	• Exercise capacity (Exercise stress testing on treadmill) • Lipid profile (serum) • BP • BMI & waist-to-hip ratio • Smoking • Risk factors for heart disease

Statistically Significant improvement	• Both groups had within group significant improvement in exercise capacity, exercise stress test duration, HDL & cholesterol ratio after 1 year, while serum triglycerides improved in both after 2 years. • Middle-aged men had significantly greater improvement over the elderly group in exercise capacity & HDL levels in first year, but not in second. • Improvements in total cholesterol after 2 years, & LDL levels after both years were significant for elderly group only.
Non-stat significant but clinically significant	•
Quality	Low – Small sample size, potential for bias is great related to differences in programs, weak design on hierarchy of evidence.
Study Notes/Features	• Assessment: Baseline (joining CR), 1 & 2 year follow up. • 100% male • No statistical differences between elderly and middle-aged group except age was different & exercise capacity was significantly higher in the middle-aged group. • Primary diagnosis: Varied cardiac events • Loss to follow-up: Not specific, noted to be difficult to assess due to retrospective nature.
Miscellaneous Notes	•

Study Name	Mandel 2007
Delivery Method	Cardiac Rehab with music therapy or cardiac rehab only
Study Design	RCT
Material & Program Content	• N= 68 music n=35 Control n=33 • Music therapy: musical experiences, counseling, and music assisted relaxation & imagery; One 1.5hr session every other week during regular CR. • Regular CR: 1 hour exercise, 3 times a week, 1 hour weekly education lecture.
What was measured	• Blood Pressure • Anxiety (State-Trait Anxiety Inventory) • Depression (Center for Epidemiologic Studies depression scale) • Overall distress (Brief symptom Inventory • QOL (SF-36) • Compliance/attendance • Music therapy assessment
Statistically	• Music therapy had significant decrease in SBP from control

Significant improvement	• Initially no significant differences in psychological measures, but at 4 months music therapy had sign. Lower anxiety over control. • Music had significantly greater QOL scores both general health & social functioning over control at 4 months. • Each music therapy session showed improvements that were significant from pre & post session anxiety & stress scales for each attendee.
Non-stat significant but clinically significant	• In general all QOL, anxiety, overall distress were noted to be different between groups
Quality	Moderate - Randomization occurred, blinding not addressed in literature, data analysis & tools for measuring outcomes are well studied, yet questionnaires were utilized which are not objective.
Study Notes/Features	• Assessment: baseline, & 1, 4, 10 months • 30 – 80 years of age – median age 64 & 65 for groups • Demographics were similar • Primary diagnosis: Varied cardiac events • Loss to follow-up: 35% - statistically significant
Miscellaneous Notes	• Loss to follow up could have had potential for not seeing statistically significant differences between groups as there were limitations in statistical power resulting from this.

Study Name	Marchionni 2003
Delivery Method	Center-based vs. home-based vs. no CR
Study Design	RCT
Material & Program Content	• N = 270 • 3 age groups (n=90 each): 45-65 = middle-age; 66-75 = old; >75 = very old [age & gender stratified] • Hospital: 40 sessions total; exercise, stretching, risk factor coaching, and offered a monthly support group option. • Home: 4-8 supervised sessions; risk factor counseling & offered a monthly support group option, then did home exercise entering data into a log book, with physical therapist home visits every other week. • No CR: 1 structured education session on risk factor management and referred back to primary provider. • Exercise Target Heart Rate: 70-85% max
What was measured	• Exercise tolerance (cycle ergometer) • Health related quality of life (Sickness Impact Profile – SIP) • Fatal & non-fatal events

	• Cost
Statistically Significant improvement	• Significant greater treatment effect of both CR groups in middle & old patients, but no in very old. • Exercise tolerance had significantly improved in very old patients in both interventions at 2 months. • In middle-aged & old patients HRQL improved significantly over the entire study regardless of the intervention & control. • Very old patients had significantly improvement in HRQL with both interventions, but not control. • Home CR had significantly fewer medical visits than both the hospital & control patients.
Non-stat significant but clinically significant	• Exercise tolerance improved in both CR groups, but not control. No significant difference between groups.
Quality	Moderate - Randomized not detailed, outcome assessment was blinded, loss to follow up was not significant, significant baseline differences create potential for bias & limited inference.
Study Notes/Features	• Assessment: Baseline, post, 6 months & 12 months • Age 46-86 (average ages 57,70,80 in groups) • Significant baseline differences between groups included: age, weight, BMI, marital status, education, smoking, hyperlipidemia, low pre-MI exercise, & stroke. • Primary diagnosis: Post MI patients • Loss to follow-up: Not significant
Miscellaneous Notes	•

Study Name	Morrin 2000
Delivery Method	3 months CR vs. 6 months CR
Study Design	Correlation Study; Observational time-series study
Material & Program Content	• N = 126 • Cardiac Rehab: Two 3-hour sessions of educational workshops (nutrition & cardiac risk factors), twice weekly supervised exercise sessions, encouraged to do a home program 2-5 times a week, physician assessment at 4-8 weeks for lipid management or other issues. Stress management, smoking cessation and individual counseling was available for patients as appropriate, and patients were given a personalized copy of the profile with tips for improvement. • Exercise Target Heart Rate: 50%-75% max
What was measured	• Lipid profile – (fasting plasma samples)

	• Blood pressure (resting blood pressure) • Body Mass Index (BMI) • Physical activity level (self-report questionnaire) • Smoking status (self-report) • Health related quality of live (HRQoL) – SF-36
Statistically Significant improvement	• There were significant improvement in BP, Physical activity, Physical components of SF-36, HDL at 3 months • There were significant changes between 3 to 6 months for TC, LDL, mental component of SF-36, but no other improvement on previously mentioned risk factors in this time frame. • Overall, there was significant improvement in all risk factors and HRQoL except BMI baseline to 6 months.
Non-stat significant but clinically significant	•
Quality	Moderate - Observational longitudinal study, good methodology, complete outcome assessment, yet no control group.
Study Notes/Features	• Assessment: Baseline, 3 month, 6 month • 74% were male; mean age was 60.6 • Primary diagnosis: All cardiac included • Loss to follow-up: None as only patient completing all full 6 months, and all 3 assessments were included.
Miscellaneous Notes	• Improvements in physical activity level were observed largely in the first 3 months as assessed by weekly energy expenditure. • Improvements in mental health reached significance over the second half of the program.

Study Name	Neubeck 2009
Delivery Method	Tele-Health: more than 50% of patient contact being delivered via above telephone or internet
Study Design	Systematic Review

Material & Program Content	• N= 3145
	• 11 studies total
	  ○ 9 telephone studies
	  ○ 2 internet studies
	• 2 studies had discussion groups; progress graphs; online rewards
	• 6 studies had supplemental written material
	• Contact varied from 40 min. to 9 hours
	• Mixed participants some attending center based CR prior to

	study
Outcomes Measured	• All cause mortality (11 trials, n=3145) • Cholesterol: total (8 trials, n=2501), LDL (4 trials, n=1062), HDL (7 trials, n=1962), & triglycerides (4 trials, n=1400) • Systolic Blood pressure (7 trials, n=1728) • BMI (5 trials, n=1443) • Smoking status (7 trials, n=2563) • Physical activity (7 trials, n=1737) • Psychosocial state (5 trials) • Nutritional status (4 trials)
Statistically Significant improvement	• Improved Total cholesterol, LDL, HDL • Improved SBP • Improved Smoking cessation • 5 trials reported significantly better levels of physical activity in the telehealth intervention group at follow up. • 5 trials reported significantly improved scores for psychosocial state from baseline, but not between control and intervention group.
Non-stat significant but clinically significant	• BMI trended lower in 5 trials; heterogeneity was moderate (71%) with one trial having significantly higher BMI throughout even at baseline • Telehealth had non-significant lowering of all-cause mortality compared with controls
Quality	High
Study Notes/Features	• Assessment: Varied among studies • 74% male; mean age of 61 • Primary diagnosis: post MI patients, some revascularization • Large variance in tele-health interventions
Miscellaneous Notes	• Favorable effects seen in physical activity, QOL, & cost • Telephone – based interventions have the greatest weight of evidence for secondary prevention of CHD. • Internet interventions studies were small in subjects & difficult to draw conclusions from

Study Name	Oerkild 2011
Delivery Method	Home based vs. center based
Study Design	RCT
Material & Program Content	• N= 75 • Home: Baseline data at center, exercise component at home, 2 home visits for program development, telephone

	call between visits, dietary counseling & smoking cessation were offered. • Center: 6 week intensive program, 1 hr twice per week, encouraged to exercise at home as well, & offered 6 education lectures (2 dietary, 3 cooking classes, 1 smoking cessation).
What was measured	• Exercise capacity (VO2 & 6 min. walk test) • Sit to stand test • Self reported level of activity • Blood pressure • Cholesterol (TC, HDL, & LDL) • BMI • Waist to hip ratio • Smoking status • Health related quality of life (SF-12 & Hospital Anxiety & Depression scale)
Statistically Significant improvement	• 3 months: 6 min. walk test was significantly improved for center group, no other outcomes had significant differences. • 12 months: Significant decline in 6 min. walk test and VO2 in both center & home groups, but no difference between the groups.
Non-stat significant but clinically significant	•
Quality	Moderate – Small sample size. Randomized & computer generated patient allocation. Small sample size & no blinding but both were acknowledged by the author. Outcome assessment was systematic.
Study Notes/Features	• Assessment: baseline, 3, 6, 12 months. • Mostly men, average age 74 years. • No significant demographic or clinical differences between groups. • Primary Diagnosis: Various cardiac events • Loss to follow-up: Not indicated
Miscellaneous Notes	• Home based CR is as effective as center based CR, but not superior to it. • Significant decline at 12 months potentially related to age of participant.

Study Name	Oliveira 2008
Delivery Method	Home-based vs. usual out-patient follow-up care
Study Design	Cohort
Material & Program Content	• N = 30 • Intervention: education & counseling on the benefits of physical activity, management strategies for CAD, physical activity, procedures to monitor exertion, delivered via 2 group sessions on site at the hospital, telephonic contact, educational flyers, and home visits. • Control: Ordinary hospital care and follow up.
What was measured	• Physical activity level (ActGraph accelerometer – worn by the patient during all waking hours of the assessment time)
Statistically Significant improvement	• Intervention group had significantly more low & moderate intensity physical activity in the beginning over the control. • Daily physical activity index increased significantly during the intervention period.
Non-stat significant but clinically significant	• The control group had no changes in daily physical activity index.
Quality	Moderate – A control, with use of statistical software and common data analysis technique. However, a small sample size, no randomization, blinding was not identified, & a weak source of physical activity assessment weaken the study.
Study Notes/Features	• Assessment: Baseline, 1, 6, & 12 weeks • All males, average age 67-70 years • Low & moderate intensity levels were higher at baseline in the intervention group, but no other demographic or clinical differences were noted. • Primary diagnosis: First myocardial infarct
Miscellaneous Notes	• Education and counseling on the benefits of physical activity, helped improve physical activity.

Study Name	Pierson 2001
Delivery Method	Combined resistance and aerobic training vs. aerobic alone
Study Design	Randomized
Material & Program Content	• N=36; AE n=17 AE&R n=19 • After loss to follow-up N=20; 10 in both groups • Aerobic training (AE): 30 min. aerobic exercise alone, 3x per week for 6 months. • Combined aerobic and resistance (AE+R): Aerobic training along with two sets of resistance exercises on 7 different machines post aerobic training adding 20 minutes more exercise time.

	• Exercise Target Heart Rate: 65% to 80% of max
What was measured	• Strength assessment (two-repetition maximal performance) • Body Composition (total body scans densitometer, height & weight for BMI) • Exercise Tolerance (Graded treadmill test with VO2 peak oxygen) • Submaximal exercise efficiency (10-min constant load walk on treadmill) • Adherence
Statistically Significant improvement	• Strength gains for AE+R group were greater than AE group on 6 of 7 resistance machines. • VO2 peak increased after training for within group assessment, no between group differences. • Resting and sub maximal exercise heart rates and rate-pressure product - lower after training in the AE&R group. • Percent body fat was reduced for AE+R after training. • Significant increase in total lean mass and significant decrease in percentage body fat for AE+R group • AE+R group increased in arm & trunk lean mass while the AE group had significant increase in trunk lean mass.
Non-stat significant but clinically significant	• 80% adherence rate, no significant differences between groups
Quality	Low - Small number of participants, randomization process not detailed, outcome assessors were blinded, difference between groups in session length of exercise.
Study Notes/Features	• Assessment: Baseline & 6 months at program completion • Male 78%, average age was 58.7-61.0 for the groups. • No baseline differences between groups except in VO2 peak values that were significantly higher at baseline for AE+R. • Primary Diagnosis: documented coronary artery disease • Loss to follow-up: large amount - not significant between groups.
Miscellaneous Notes	•

Study Name	Pluss 2008
Delivery Method	Expanded CR (multifactorial interventions) vs. usual hospital care CR
Study Design	RCT
Material & Program Content	• N = 224 • Control: Physical training, counseling, heart school information sessions, two out-patient clinic meetings with a

	nurse, social worker counseling, smoking cessation. • Intervention: All the activities of the control group in addition to stress management program, Patient hotel (5 day stay with cardiologist counseling session & physical training), cooking sessions & dietary counseling.
What was measured	• Exercise testing (bicycle ergometer - EKG w/ exercise & 10 min post exercise – BP – heart rate) • Labs: C-reactive protein, fibrinogen, cholesterol, glucose & HgbA1c, WBC, platelet counts. (serum) • Smoking • BMI • BP
Statistically Significant improvement	• No statistically significant differences were found. •
Non-stat significant but clinically significant	• Total cholesterol, LDL, fibrinogen, & C-reactive protein improved similarly in both groups. • Exercise duration, heart rate recovery, max exercise tolerance improved in both groups but no significant difference between. • Systolic BP increased similarly in the two groups. • Active smoking decreased in both groups.
Quality	High - Randomized, concealed, ethics reviewed, insignificant loss to follow up, there was some limitations related to variable assessment noted by author.
Study Notes/Features	• Assessment: Baseline, 3 months, & 1 year • Under the age of 75 – average age for both groups 63 years • 85-88% men • No significant demographic differences between groups, yet control group had less lipid lowering medication. • Primary diagnosis: Acute myocardial infarct or coronary artery bypass graft patients • Loss to follow-up: Insignificant for statistical analysis, but higher loss to control group noted.
Miscellaneous Notes	•

Study Name	Reid 2005
Delivery Method	Standard CR duration vs. distributed CR duration
Study Design	RCT
Material & Program Content	• N=392 Standard n=196 Distributed n=196 • Standard: 33 sessions for 13.5 weeks (twice weekly), case management visit at 2 weeks & 8 weeks, telephone contact at week 4, physician visit at week 7.

	• Distributed: 33 sessions for 12 months (1 x per week for 14 weeks, once every 2 weeks for 14 weeks, and once every 4 weeks for 24 weeks), case management visit at 2 weeks & 26 weeks, telephone contact at week 8, physician visit at week 7.
What was measured	• Cardio-respiratory fitness (treadmill exercise stress test) • Daily physical activity (7 day physical activity recall) • Coronary risk factors (BP, BMI, cholesterol, smoking status) • Heart disease Health Related Quality of Life (MacNew Instrument) • Generic Health Related Quality of Life (SF-36) • Depressive symptoms (Center for Epidemiological Studies depression scale (CES-D) • Cholesterol (serum) • Fatal and non-fatal events • Cost
Statistically Significant improvement	• No statistically significant between group differences at 12 or 24 months.
Non-stat significant but clinically significant	• Both groups had improvements over time in cardio-respiratory fitness, daily physical activity, LDL, generic & heart disease HRQL, & depressive symptoms. • Over time blood pressure and BMI values worsened.
Quality	High - Stratified randomization based on gender, concealed treatment allocation, blinding on data collection when possible, strong tools of measurement, good methodology.
Study Notes/Features	• Assessment: baseline, 3, 12, & 24 months • No significant differences in demographics or clinical data between groups. • Mostly men (84-85% of each group), average age 58 years • Primary diagnosis: Various cardiac events • Sample size met 80% power for detection of differences
Miscellaneous Notes	• Participants accepting to be entered in study were found to be statistically different than those refusing participation. Participants were younger & less likely to be smokers

Study Name	Senuzun 2006
Delivery Method	Home based cardiac exercise program vs. control
Study Design	RCT
Material & Program Content	• N= 60 • Home: Education sessions with written & audiovisual education methods; 40-60 min. session 3/week, phone

	contact every 2 weeks, exercise diary, feedback, reinforcement, progress review, follow up
What was measured	• Exercise tolerance (exercise testing – Bruce Protocol) • Lipid levels (serum) • BP • BMI • Self-efficacy (Cardiac Exercise Self Efficacy Index)
Statistically Significant improvement	• At the end of 12 weeks there were significant improvements in exercise capacity, exercise duration, total cholesterol, TG, HDL, LDL, BMI, BP, & self-efficacy in home group over control.
Non-stat significant but clinically significant	•
Quality	Moderate – Randomization details were not available, blinding was not addressed in the article, and small sample size. However, assessment tools are good and assessment was equal between groups, and this was a controlled trial.
Study Notes/Features	• Assessment: baseline & 12 weeks • Over 90% Men, average age about 53 years • No significant demographic or clinical differences existed between groups. • Primary diagnosis: Myocardial infarction & stent patients • Loss to follow-up: Not identified
Miscellaneous Notes	•

Study Name	Silberman 2010
Delivery Method	Intensive Cardiac Rehab
Study Design	Correlation Study; Nonexperimental - prospective
Material & Program Content	• N = 2971 • Content: healthy diet, moderate physical activity, psychosocial group support, and stress management; 8 hr orientation, 4 hour sessions twice a week for 12 weeks
What was measured	• Cholesterol (serum) • Dietary cholesterol & fat intake (3 day diet recall) • BMI • BP • Hgb A1c (serum; if diabetic at baseline) • Exercise (self-reported min/week) • Functional Capacity (treadmill; METs) • Hostility (Modified version of Cook-Medley Hostility Scale) • Depression (Center for Epidemiology Studies-Depression

	scale)
Statistically Significant improvement	• 12 weeks from baseline & 1 year from baseline: significant differences for improvement from baseline in all except HDL. • Between 12 weeks to 1 year: significant improvement in HDL, BMI, functional capacity and hostility; and significant recidivism in Total cholesterol, LDL, BP, HgbA1c, exercise min/week.
Non-stat significant but clinically significant	•
Quality	Moderate: Non-experimental, risk for bias in recruitment, and follow up assessment. However, good methodology and large sample size.
Study Notes/Features	• Assessment: baseline, 12weeks, 1 year • 52 % female; average age about 58.5 years • No significant demographic or clinical differences between groups. • Primary diagnosis: coronary heart disease or significant risk factors for coronary heart disease • Loss to follow-up: 10% at 12 weeks, over 50% at 1 year • Adherence: roughly 90%
Miscellaneous Notes	•

Study Name	Sledge 2000
Delivery Method	Intensive CR vs. Usual Care
Study Design	Cohort; observational
Material & Program Content	• N=87 Intensive n=45 Usual n=42 • Intensive CR: 8 week program, monitored exercise 3 x a week, inter-disciplinary education (16 30-minute classes), encouraged to do home exercise, and participated in relaxation exercises once per week. • Usual care: Routine outpatient clinic services. Scheduled visits with provider, 1 hour individual education on risk factors, follow-up visits scheduled at 3 & 9 months.
What was measured	• Quality of life (SF-36)
Statistically Significant improvement	• Patients in CR had significant improvements in all areas of quality of life assessment. • Vitality was significantly worse at post test in usual care.
Non-stat significant but clinically significant	• No improvement at all occurred in the usual care group related to quality of life, and actually had one area of significant decreased function.
Quality	Low – Observational study with a small number of

	participants, non-randomized group placement, questionnaire mailing to usual care individuals producing only 65% return rate – bias created in return and in loss to follow-up.
Study Notes/Features	• Assessment: Baseline & post program or 8 weeks • 99% male, only 1 female was included she was included in the cardiac rehab group. • Mean age was 64.83 in CR & 63.5 usual care • No significant differences in age, cardiac event, or baseline psychological function. There were significant differences in distance from event/procedure with usual care group having been farther from this date. • Primary diagnosis: Various cardiac events
Miscellaneous Notes	• Improvements appear to be more pronounced in patients with greater levels of distress initially when they participate in cardiac rehabilitation.

Study Name	Southard 2003
Delivery Method	Internet based CR
Study Design	RCT
Material & Program Content	• N = 104 Internet n=53 Usual n=51 • Intervention: 6 month program, log onto a site at least once a week for 30 min., e-mail communication with case managers, completing education modules, access to a registered dietician via e-mail, entering data into progress notes, offered an on-line discussion group, a list of other participants' e-mails, and links to related sites on the internet. • Usual care: Not specified.
What was measured	• BP • Lipid levels (serum) • Quality of Life (Dartmouth COOP) • Depression (Beck Depression Inventory) • Functional Status (Duke Activity Status Index) • Dietary habits (MEDFICTS) • Cardiovascular events • Smoking • Cost
Statistically Significant improvement	• Fewer cardiovascular events occurred among the intervention patients. • More weight loss occurred in the intervention group over the usual care group. • Pre-post comparisons of weight and BMI were significant better for intervention over usual care groups.

Non-stat significant but clinically significant	•
Quality	Moderate - Moderate sample size. Stratified based on minority status, acute illness, and participation in CR. Then computer randomization. Loss to follow up was not significant. Outcome assessment systematic. Blinded entry assessment, but no blinded outcome assessment.
Study Notes/Features	• Assessment: Baseline & post • Predominantly white, males, average age 62 year • No significant demographic or clinical differences between groups at baseline. • Primary diagnosis: Cardiovascular disease
Miscellaneous Notes	• Based on Likert scale survey the subjects were "very satisfied" with the program on average.

Study Name	Stiles 2008
Delivery Method	Dance routine as CR
Study Design	Correlation Study - Observational study
Material & Program Content	• N = 560 • Intervention: patients taught dance routines & performed these while wearing monitors that transmitted readings to physical therapist. Different tempos were used for different target levels of intensity; four groups with four different tempos based on cardiovascular risk. Four weeks of twice weekly training sessions.
What was measured	• Exercise tolerance • BP • HR
Statistically Significant improvement	• Mean heart rate during maximal exercise increased significantly.
Non-stat significant but clinically significant	• Increase in mean exercise tolerance after first 4 weeks. •
Quality	Low – This is a nice sample size, but there were no details related to the methodology, patient demographics, or outcomes assessments.
Study Notes/Features	• Assessment: Baseline, 4 weeks, over two years • Majority were in the 40s, 50s, & 60s for age. Range was 4 – 80s • No discussion of group gender or demographics. • Primary Diagnosis: Patients with ischemic or valve disease,

	chronic heart failure, or congenital heart disease. 70% considered high risk. • Loss to follow-up: Not indicated.
Miscellaneous Notes	•

Study Name	Taylor 2004
Delivery Method	Exercise-based CR vs. usual care
Study Design	Systematic Review

Material & Program Content	• N=8940
	• 48 trials
	  ○ 19 studies were exercise only; average 3.7 sessions of 53 minutes per week
	  ○ 30 studies were comprehensive cardiac rehab; some combination of risk factor education/modification, and psychological intervention.

What was measured	• Mortality/Morbidity • Cholesterol • BP • Smoking • Health Related Quality of Life • Recurrent Myocardial Infarct or revascularization needs ** Tools varied by study
Statistically Significant improvement	• CR was associated with significantly reduced mortality, total cholesterol, triglycerides, SBP, & smoking. •
Non-stat significant but clinically significant	• No difference in mortality effect between exercise-only & comprehensive cardiac rehabilitation.
Quality	Moderate – Large sample size, with no significant publication bias & good methodology for review. Trials used were rated as being of poor methodology quality due to poor reporting on methods of the trials. Only 8 studies were from 2000 or later.
Study Notes/Features	• Assessment: Median duration of programs - 3 months, and follow up at 15 months. • On average women accounted for only 20% of the patients recruited in the studies. • Primary diagnosis: Myocardial infarct alone (67%), post-revascularization or both make up the remainder.
Miscellaneous Notes	•

Study Name	Taylor 2010
Delivery Method	Home based vs. center based

	Defined as: structured program with clear objectives for the participants including monitoring, follow up visits, letters or telephone calls from staff, or at least self-monitoring diaries.
Study Design	Systematic Review

Material & Program Content	• N = 1938
	• 14 comparison studies
	  ○ 12 trials comparing home to a center based CR program
	  ○ 2 studies had three comparison arms that were analyzed separately making 14 total comparisons
	• Center: Typically performed supervised cycle & treadmill exercise routines.
	• Home: Based on walking with intermittent nurse or exercise specialist telephone support. The Heart Manual model was the exposure of the majority of home patients.

What was measured	• Exercise capacity • BP • Lipids (serum) • Smoking • Health related quality of life • All-cause mortality • Cardiac events ** Tools varied by study
Statistically Significant improvement	• None identified when the most outlying study was no longer included.
Non-stat significant but clinically significant	• DBP & HDL-cholesterol had the best chance of improvement although the results once excluding the most outlining study were no longer statistically significant • Evidence of a decrease in TC, LDL, & TG & increase in HDL at follow up in both groups. • There was evidence of improvements in the health related quality of live at follow up for both groups.
Quality	High
Study Notes/Features	• Assessment: Studies with outcome up to 24 months; most had up to 12 months only. • Mainly male with a mean age of 52-69 years of age • Primary diagnosis: Myocardial infarct & revascularization. Excluded unstable CHD patients & heart failure & cardiac resynchronization therapy or defibrillators. • Adherence: Weak evidence to suggest that home based interventions were associated with a higher level.
Miscellaneous Notes	• Home & hospital based interventions are similar in the

	benefits.

Study Name	Varnfield 2011
Delivery Method	Information & communication technology (mobile phone & internet) assisted home cardiac rehab vs. traditional CR
Study Design	Preliminary results of a RCT
Material & Program Content	• N = preliminary results for 87 (160 is goal of overall RCT) • Technology: Mobile phone applications in disease management, smoking cessation, relaxation and education material applications. Internet for self-management & progress review. Other content includes: education, mentoring, goal setting, personal feedback, and counseling over a 6 week period, with weekly telephone feedback. • Traditional: Not defined.
What was measured	• Usability & adherence (questionnaire)
Statistically Significant improvement	•
Non-stat significant but clinically significant	• Step counter and phone applications were used daily • 91.5% usage rate for the mobile phone wellness diary; • 97% use of automatic steps logged via the step counter. • 91% of participants report phone consults with mentor motivate them to meet goals. • Internet applications were used 36% of the time
Quality	Low - These are preliminary results of a RCT, few details were available about the RCT to determine quality.
Study Notes/Features	• Assessment: Initial & 6 week assessment • Technology group – mean age 59 years, control not defined. • Primary diagnosis: Post myocardial infarct
Miscellaneous Notes	•

Study Name	Wu 2006
Delivery Method	Cardiac Rehab vs. home exercise
Study Design	RCT
Material & Program Content	• N = 54 Each group n=18 • CR : 30 – 60 min. exercise 3x a week, 36 sessions at 60-85% peak heart rate from baseline • Home = Encouraged to do 30 – 60 min. exercise at least 3 x a week, 60 – 85% peak heart rate from baseline, keep record book of exercise, phone follow up every 2 weeks by nurse. • Control = Normal activity of daily living no coaching

What was measured	• Exercise Stress Test (with a cycle ergometer) • Resting Heart rate • Heart rate recovery (Reduction of HR from immediately post peak exercise to HR 1 min. after)
Statistically Significant improvement	• Cardiac Rehab had significant improvement in resting heart rates over control group. • Cardiac rehab had statistically significant difference in heart rate recovery over control group. • All three groups had significantly increased heart rate recovery compared with their baseline data.
Non-stat significant but clinically significant	• Home exercise group did not have significant differences from those of control, yet its statistical improvements were comparable with those of cardiac rehab at follow-up testing.
Quality	Moderate – Small sample size & loss to follow up not addressed; randomization was done via drawing lots; outcome assessment was blinded, group assessment was identical.
Study Notes/Features	• Assessment: baseline & 12 weeks • 100% Male, average age about 62 years old • No statistical significance noted among group demographics or clinical characteristics. • Primary diagnosis: Post coronary artery bypass graft patients without acute myocardial infarction.
Miscellaneous Notes	•

Study Name	Yates 2007
Delivery Method	Home CR vs. traditional CR
Study Design	Cohort
Material & Program Content	• N = 62 • Traditional: 24 sessions, 3 times a week, over 8 weeks. Exercise per AACVPR recommendations, educational sessions (benefits of exercise, cooking, & medications). • Home: Two pt education/counseling sessions (self-monitor of health habits, setting goals, relapse management, risk factor modification, medications, dietary counseling), one telephone call, target exercise 30 min. 5 or more times a week.
What was measured	• BMI • Cardiac Risk Factors: BP, aerobic exercise, cholesterol, amount of fat in diet, frequency of anger & frustration (Arizona Heart Institute & Foundation Heart Test for Men and Women – a questionnaire) • Smoking (self-report)

Statistically Significant improvement	• None reported
Non-stat significant but clinically significant	• Home CR was as effective as traditional in achieving BMI & waist circumference outcomes at 2 & 4 months. • Similar improvement in BP, aerobic exercise, cholesterol level, amount of fat in diet, found in both groups. • Home group was not found to be as effective as traditional in relation to frequency of anger. • Proportions of smokers didn't change much for either group.
Quality	Low – Small sample size, and the risk for bias was very high. No randomization, outcomes assessment was by self-report questionnaire & self-measurements.
Study Notes/Features	• Assessment: baseline, 2, & 4 months. • Average age 63 years • Men & women were equally represented • No significant differences between group demographics, some clinical characteristics differed between groups. • Primary diagnosis: Various cardiac events • Loss to follow-up: less than 20% & equal among groups.
Miscellaneous Notes	• Results indicate that home is at least as effective as traditional center based rehabilitation.

Study Name	Zutz 2007
Delivery Method	Internet CR vs. control
Study Design	RCT – Pilot study
Material & Program Content	• N = 15; Intervention n=8 Control n=7 • Internet delivery: On-line intake form, 3 one-on-one chat sessions with nurse/exercise physiologist/dietitian, education slide presentations, & monthly group chats. • Control: No contact was made, usual routine for patient.
What was measured	• Cholesterol (Serum) • BP • BMI • Waist circumference • Exercise capacity (Treadmill stress test – Bruce protocol) • Weekly physical activity (Questionnaire) • Self efficacy (Likert scoring)
Statistically Significant improvement	• The intervention group significantly improved HDL, TG, exercise capacity, weekly physical activity, & self efficacy.
Non-stat significant	• The intervention group improved their exercise stress test

but clinically significant	time over control as well. • Participant appreciation of the program was positive.
Quality	Low – Extremely small sample size and there was a loss to follow up as well. Randomization was present; measurement tools of quality were used.
Study Notes/Features	• Assessment: Baseline & 12 weeks • 100% men; average age roughly 58 years • No significant differences in baseline factors between groups. However, more control group participants presented with prior revascularization & other clinically relevant differences between the groups were present. • Primary diagnosis: Not clearly identified
Miscellaneous Notes	•

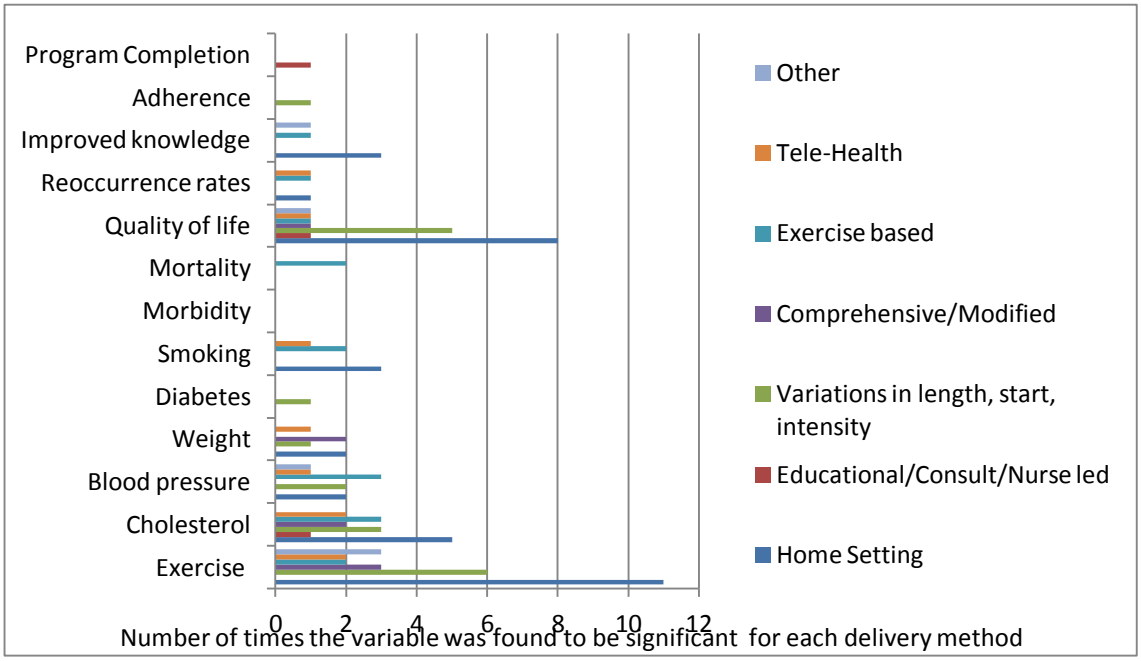
Study Name	Zwisler 2008
Delivery Method	Hospital based vs. usual care
Study Design	RCT
Material & Program Content	• N = 770 • Hospital: standardized cardiac rehab by multidisciplinary team. 6 week intensive program with patient education, 12 exercise training sessions, dietary counseling, smoking cessation, psychosocial support, risk factor management, and clinical assessment. • Usual care: Follow up with primary physician with usual medical treatment as deemed necessary by the provider.
What was measured	• Overall mortality • Readmission (MI or Acute first-time readmission due to heart disease other than MI) • Quality of life (SF-36 & HADS)
Statistically Significant improvement	• Significantly more intervention patients than UC patients received exercise training, smoking cessation, dietary guidance, and consultation with a social worker at the hospital, and attended community physical exercise activities. • Intervention group had significantly lower modifiable risk factors above treatment target (smoking, physical activity, and dietary habits).
Non-stat significant but clinically significant	• No significantly difference with SF-36 and HADS • Intervention group had shorter length of stay during readmissions. • Intervention group had fewer SBP above target, fewer physically inactive, & had fewer heart unhealthy dietary habits.

Quality	High
Study Notes/Features	• Assessment: Baseline, 3, 6, and 12 months • 63% men; median age 65 years • No significant differences noted at baseline between groups. • Primary diagnosis: Ischemic heart disease (58%), high risk for ischemic heart disease (30%), CHF (12%). • Loss to follow-up: This did occur, but was not statistically significant.
Miscellaneous Notes	•

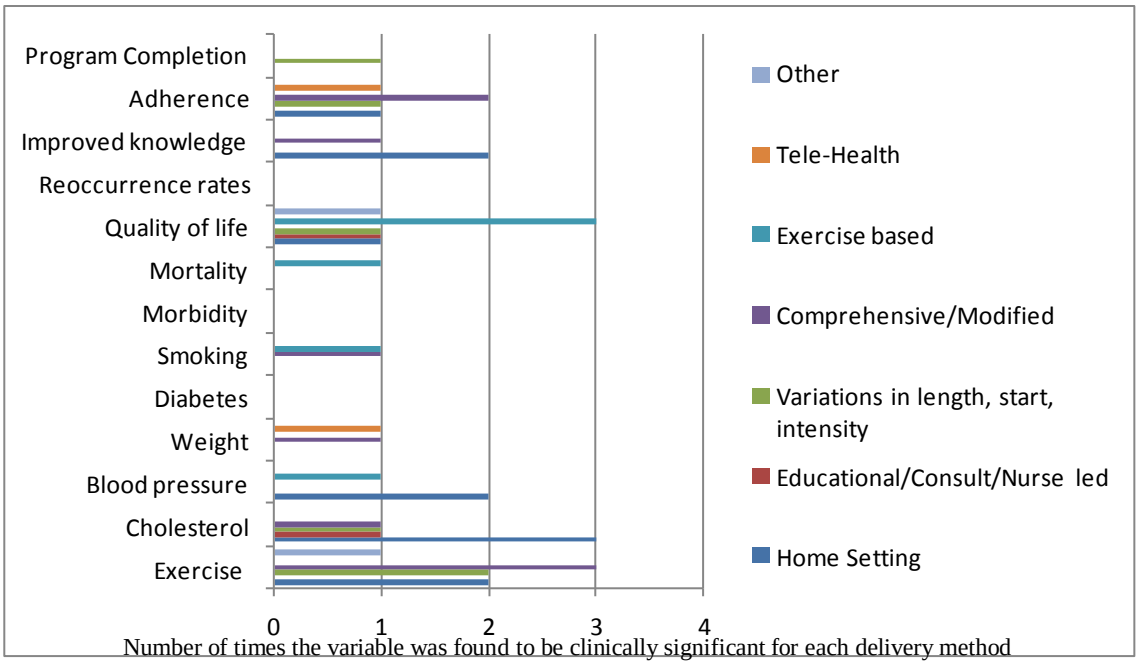
APPENDIX B:

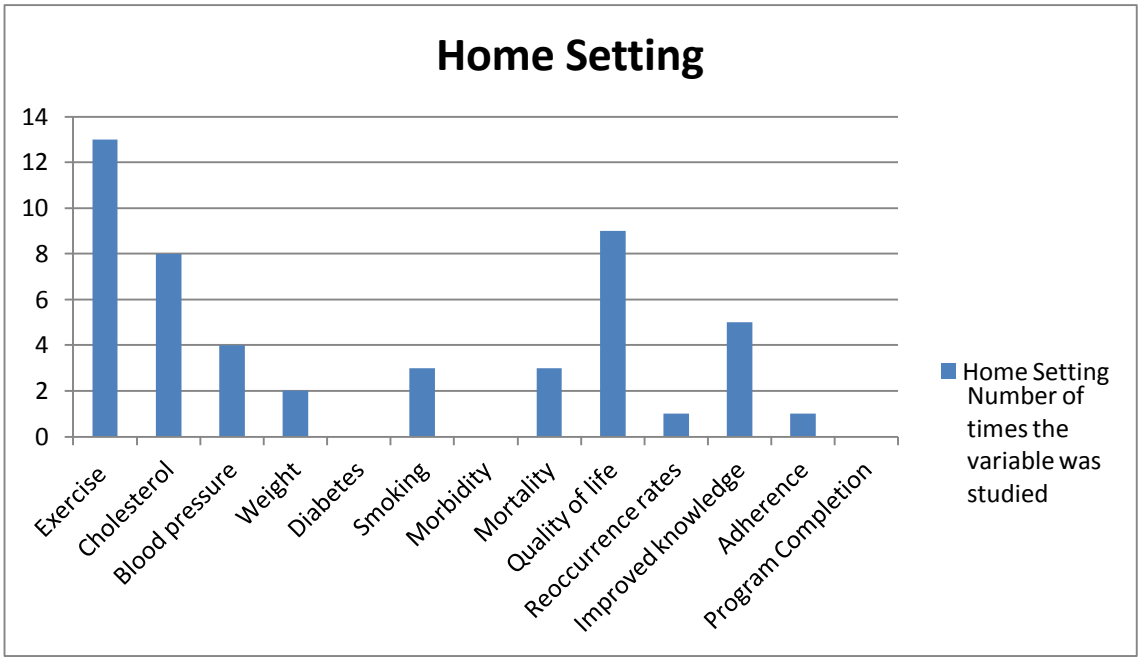
GRAPHS OF EVIDENCE

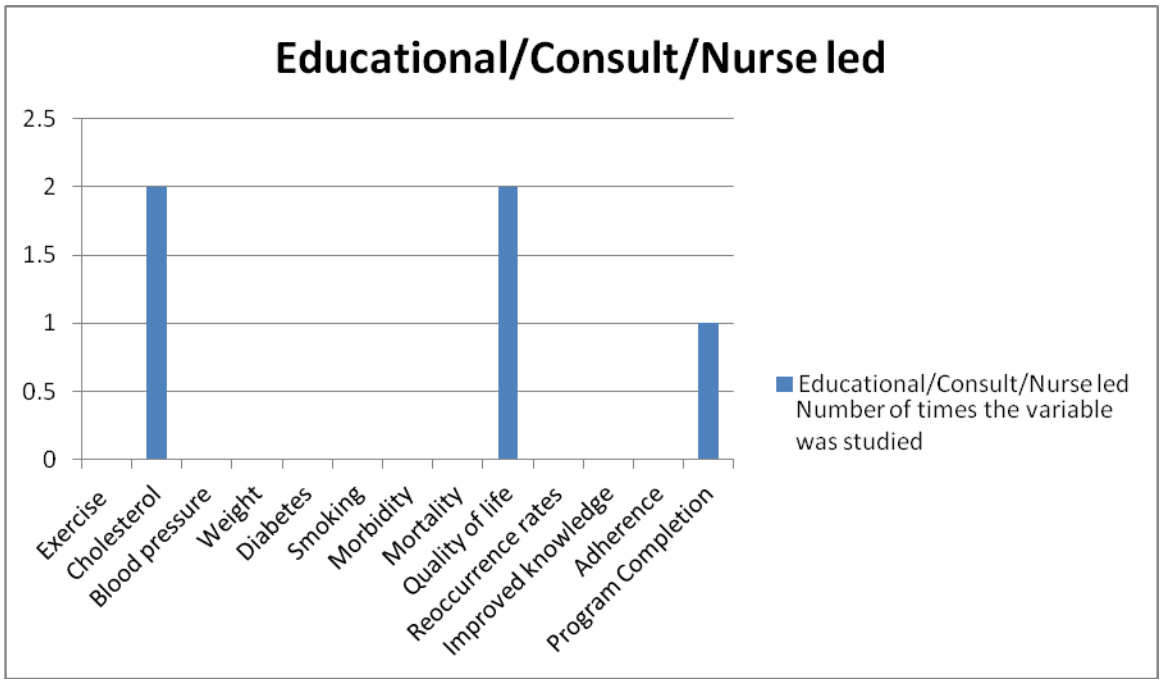
Statistically Significant Evidence

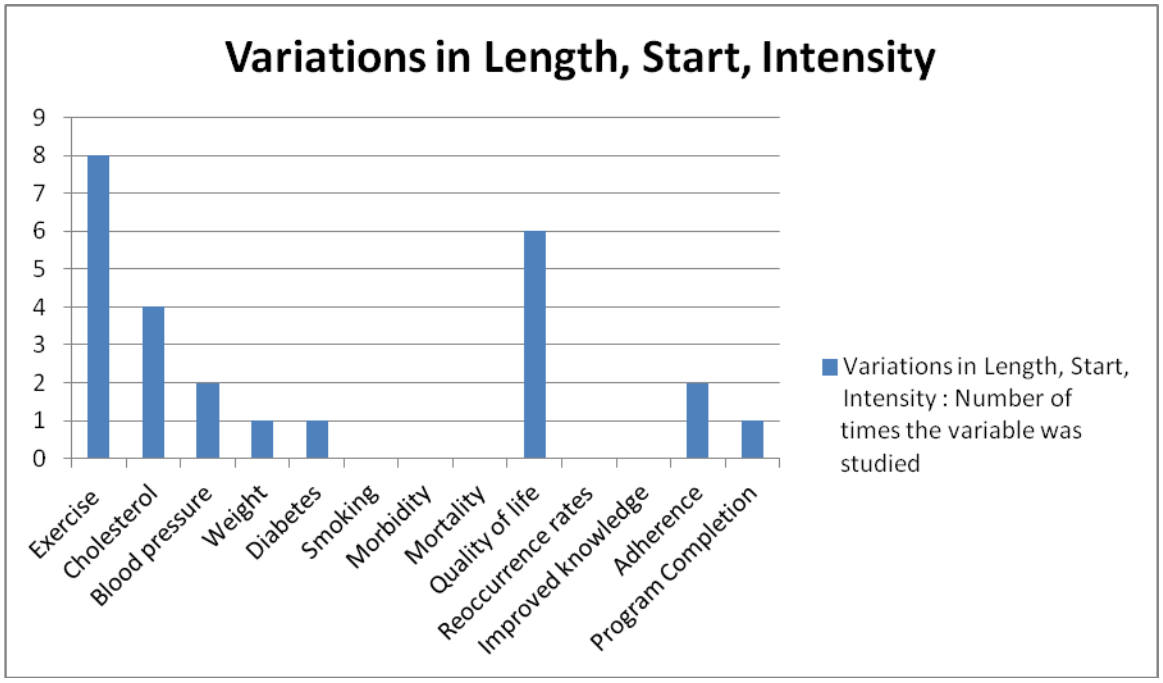


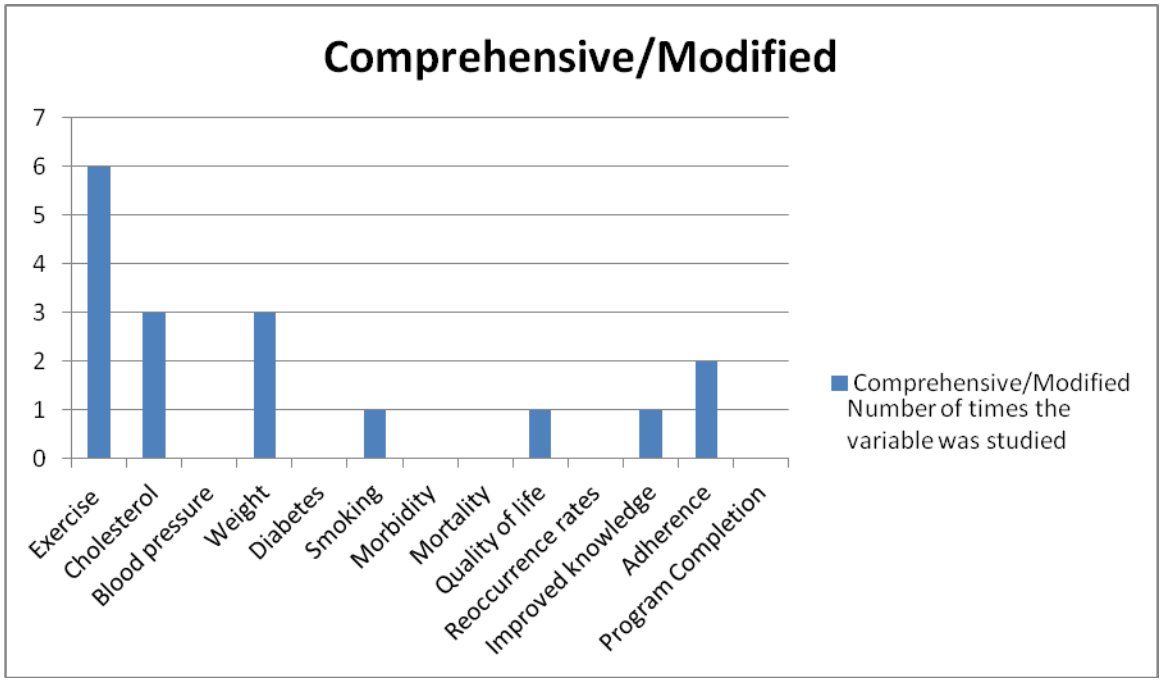
Clinically Significant Evidence

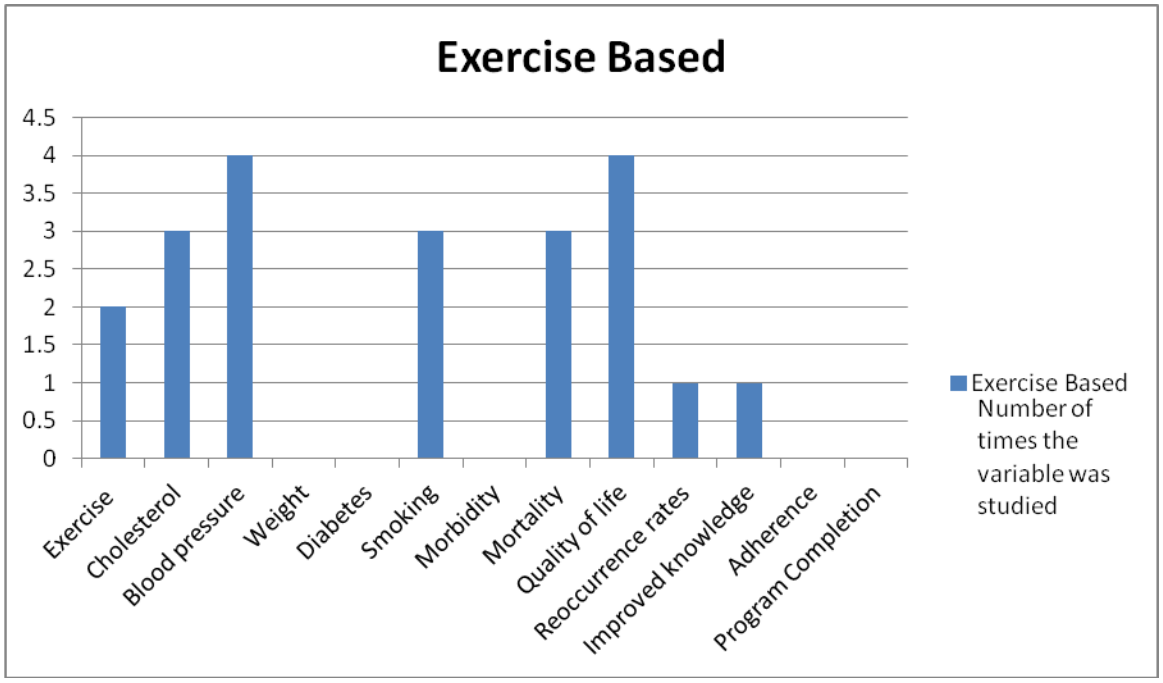


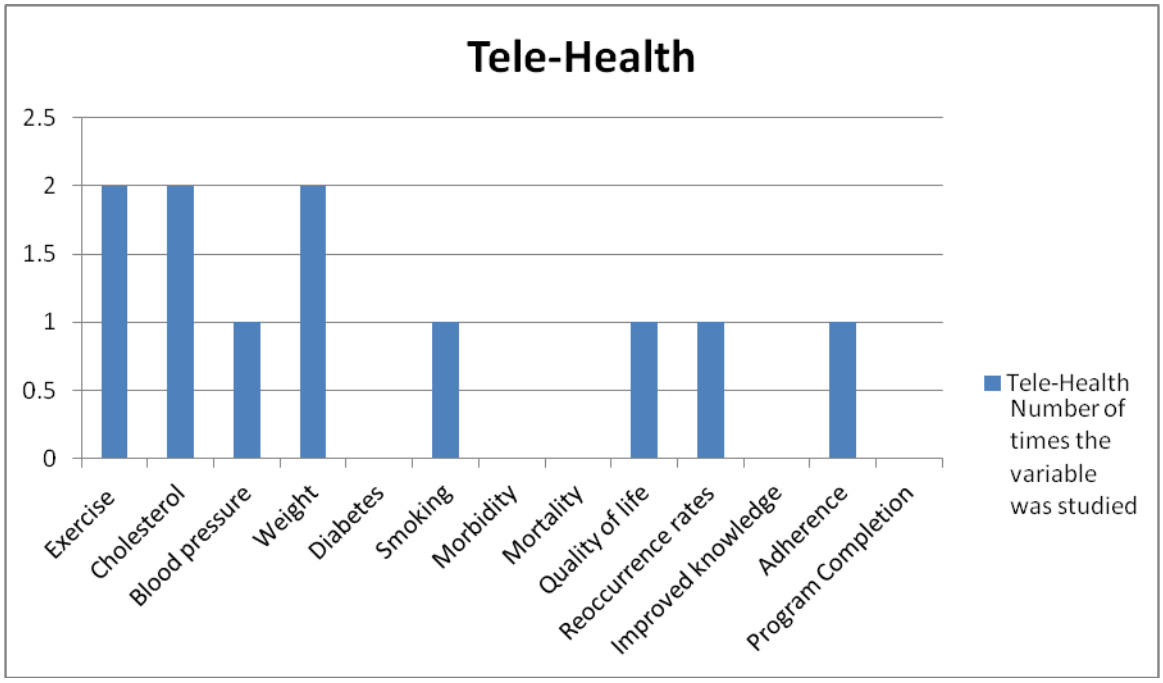

Home Setting
14
12
10
8
6
4
2
0
Exercise
Cholesterol
Blood pressure
Weight
Diabetes
Smoking
Morbidity
Mortality
Quality of life
Reoccurrence rates
Improved knowledge
Adherence
Program Completion
Home Setting
Number of times the variable was studied

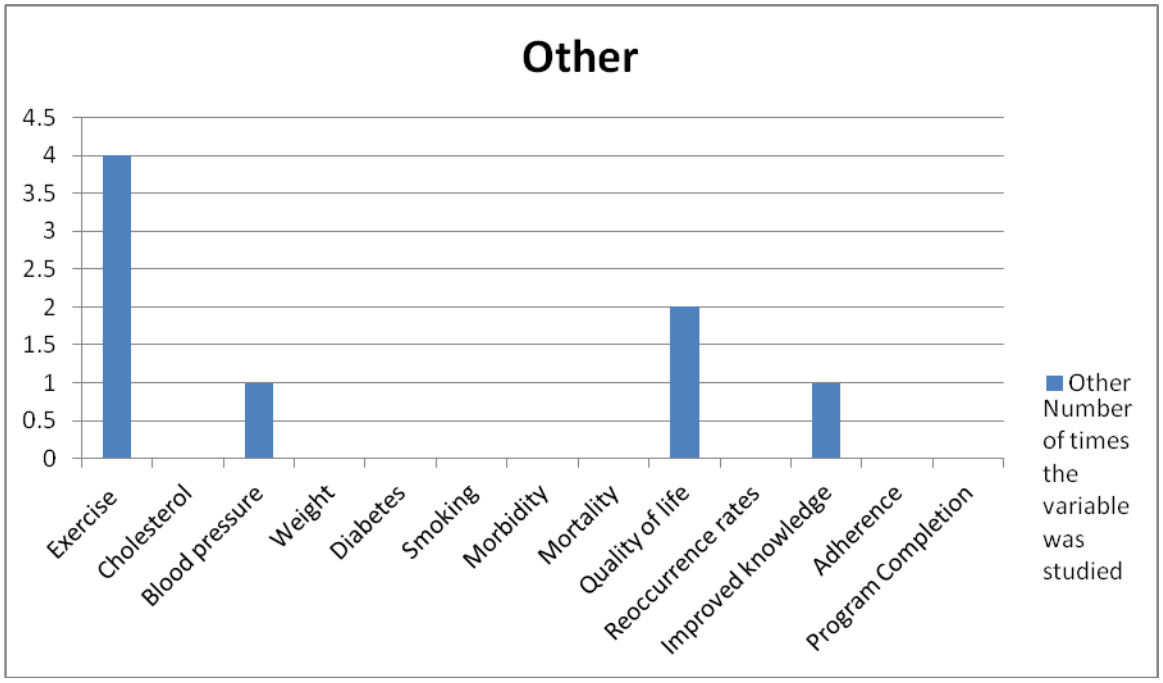

Educational/Consult/Nurse led
2.5
2
1.5
1
0.5
0
Exercise
Cholesterol
Blood pressure
Weight
Diabetes
Smoking
Morbidity
Mortality
Quality of life
Reoccurrence rates
Improved knowledge
Adherence
Program Completion
Educational/Consult/Nurse led
Number of times the variable was studied


Variations in Length, Start, Intensity
9
8
7
6
5
4
3
2
1
0
Exercise
Cholesterol
Blood pressure
Weight
Diabetes
Smoking
Morbidity
Mortality
Quality of life
Reoccurrence rates
Improved knowledge
Adherence
Program Completion
Variations in Length, Start, Intensity : Number of times the variable was studied


Comprehensive/Modified
7
6
5
4
3
2
1
0
Exercise
Cholesterol
Blood pressure
Weight
Diabetes
Smoking
Morbidity
Mortality
Quality of life
Reoccurrence rates
Improved knowledge
Adherence
Program Completion
Comprehensive/Modified Number of times the variable was studied

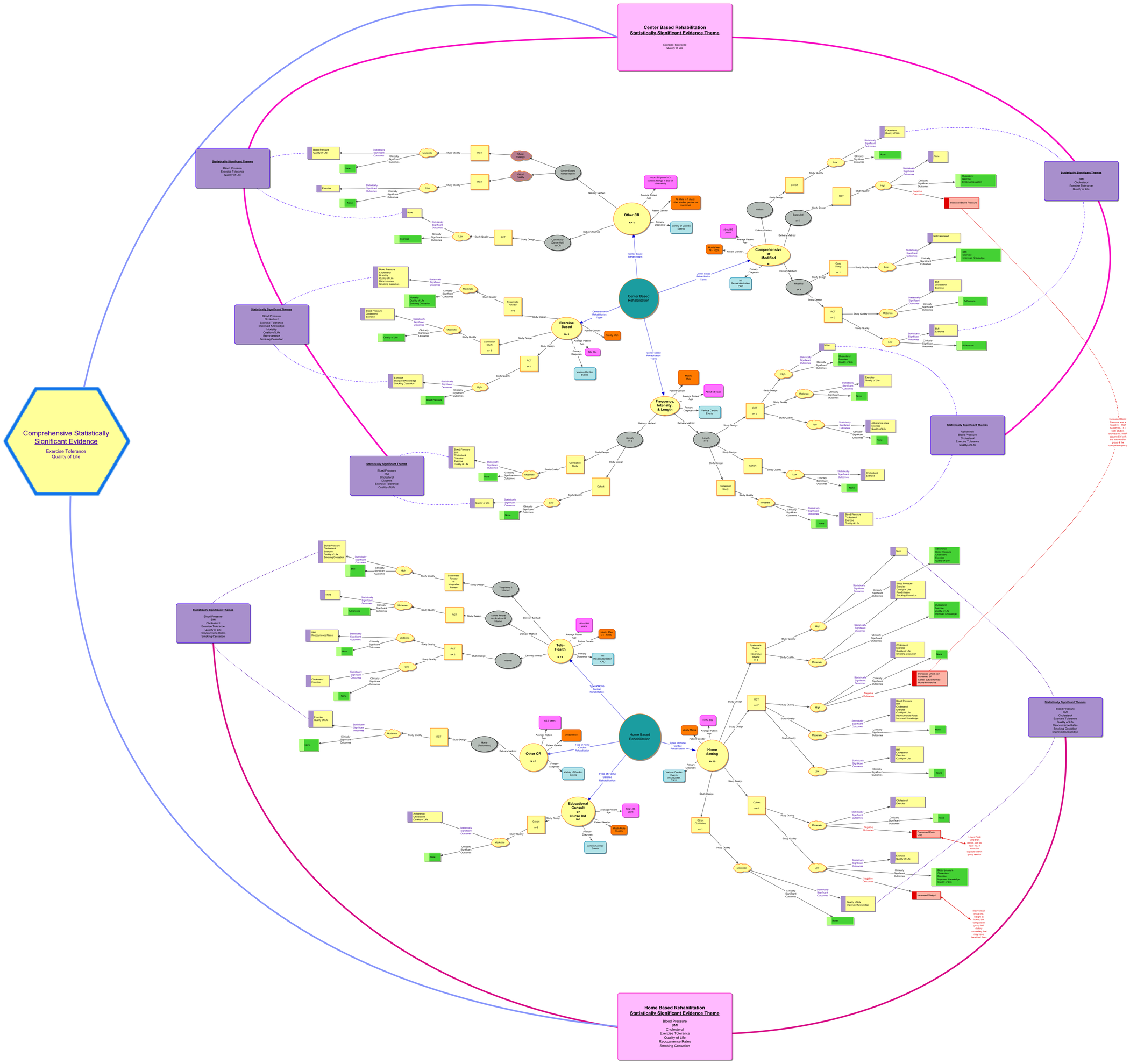

Exercise Based
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Exercise
Cholesterol
Blood pressure
Weight
Diabetes
Smoking
Morbidity
Mortality
Quality of life
Reoccurrence rates
Improved knowledge
Adherence
Program Completion
Exercise Based Number of times the variable was studied


Tele-Health
2.5
2
1.5
1
0.5
0
Exercise
Cholesterol
Blood pressure
Weight
Diabetes
Smoking
Morbidity
Mortality
Quality of life
Reoccurrence rates
Improved knowledge
Adherence
Program Completion
Tele-Health Number of times the variable was studied


Other
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Exercise
Cholesterol
Blood pressure
Weight
Diabetes
Smoking
Morbidity
Mortality
Quality of life
Reoccurrence rates
Improved knowledge
Adherence
Program Completion
Other
Number of times the variable was studied

APPENDIX C:

CONCEPT MAP


Comprehensive Statistically Significant Evidence
Exercise Tolerance
Quality of Life
Center Based Rehabilitation
Statistically Significant Evidence Theme
Exercise Tolerance
Quality of Life
Statistically Significant Themes
Blood Pressure
Exercise Tolerance
Quality of Life
Blood Pressure
Quality of Life
Statistically Significant Outcomes
Clinically Significant Outcomes
Moderate
Study Quality
RCT
Music Therapy
Center-Based Rehabilitation
None
Exercise
Statistically Significant Outcomes
Clinically Significant Outcomes
Low
Study Quality
RCT
Virtual Reality
Center-Based Rehabilitation
None
None
Statistically Significant Outcomes
Clinically Significant Outcomes
Low
Study Quality
RCT
Study Design
Community (Dance Hall) as CR
Delivery Method
Other CR
N = 4
Average Patient Age
About 65 years in 3 studies; Range in 50s for other study
Patient Gender
All Male in 1 study; other studies gender not mentioned
Primary Diagnosis
Variety of Cardiac Events
Center-based Rehabilitation
Center Based Rehabilitation
Center-based Rehabilitation Types
Comprehensive or Modified
n= 5
Average Patient Age
About 60 years
Patient Gender
Mostly Male 74 - 100%
Primary Diagnosis
MI Revascularization CAD
Delivery Method
Holistic
Study Design
Cohort
Study Quality
Low
Statistically Significant Outcomes
Cholesterol Quality of Life
Clinically Significant Outcomes
None
Expanded
n= 1
Study Design
RCT
Study Quality
High
Statistically Significant Outcomes
None
Clinically Significant Outcomes
Negative Outcomes
Cholesterol Exercise Smoking Cessation
Increased Blood Pressure
Modified
n= 4
Study Design
Case Study
n= 1
Study Quality
Low
Statistically Significant Outcomes
Not Calculated
Clinically Significant Outcomes
BMI Exercise Improved Knowledge
RCT
n= 3
Study Quality
Moderate
Statistically Significant Outcomes
BMI Cholesterol Exercise
Clinically Significant Outcomes
Adherence
Low
Statistically Significant Outcomes
BMI Exercise
Clinically Significant Outcomes
Adherence
Increased Blood Pressure was a negative - High Risk Outcome for both studies showed Inc. in BP occurred in both the intervention and the comparison group
Statistically Significant Themes
BMI
Cholesterol
Exercise Tolerance
Quality of Life
Statistically Significant Themes
Blood Pressure
BMI
Cholesterol
Exercise Tolerance
Quality of Life
Reoccurrence Rates
Smoking Cessation
Blood Pressure
Cholesterol
Mortality
Quality of Life
Reoccurrence
Smoking Cessation
Statistically Significant Outcomes
Clinically Significant Outcomes
Moderate
Study Quality
Systematic Review
n=3
Study Design
Mortality
Quality of Life
Smoking Cessation
Blood Pressure
Cholesterol
Exercise
Statistically Significant Outcomes
Clinically Significant Outcomes
Moderate
Study Quality
Correlation Study
n= 1
Study Design
Quality of Life
Center-based Rehabilitation Types
Exercise Based
N= 5
Patient Gender
Mostly Men
Average Patient Age
Mid 60s
Primary Diagnosis
Various Cardiac Events
RCT
n= 1
Study Design
Study Quality
Exercise
Improved Knowledge
Smoking Cessation
Statistically Significant Outcomes
Clinically Significant Outcomes
High
Blood Pressure
Center Based Rehabilitation
Frequency, Intensity, & Length
Patient Gender
Mostly Male
Average Patient Age
About 58 years
Primary Diagnosis
Various Cardiac Events
Delivery Method
Intensity
n= 2
Study Design
Correlation Study
Study Design
Cohort
Blood Pressure
BMI
Cholesterol
Exercise
Quality of Life
Statistically Significant Outcomes
Clinically Significant Outcomes
Moderate
Study Quality
None
Quality of Life
Statistically Significant Outcomes
Clinically Significant Outcomes
Low
Study Quality
None
Length
n= 5
Study Design
Cohort
n= 3
Study Design
RCT
Study Quality
High
Statistically Significant Outcomes
None
Clinically Significant Outcomes
Cholesterol Exercise Quality of Life
Moderate
Statistically Significant Outcomes
Exercise Quality of Life
Clinically Significant Outcomes
None
Low
Statistically Significant Outcomes
Adherence Exercise Quality of Life
Clinically Significant Outcomes
None
Cohort
Study Quality
Low
Statistically Significant Outcomes
Cholesterol Exercise
Clinically Significant Outcomes
None
Correlation Study
Study Quality
Moderate
Statistically Significant Outcomes
Blood Pressure Cholesterol Exercise Quality of Life
Clinically Significant Outcomes
None
Statistically Significant Themes
Adherence
Blood Pressure
Cholesterol
Exercise Tolerance
Quality of Life
Statistically Significant Themes
Blood Pressure
BMI
Cholesterol
Exercise Tolerance
Quality of Life
Reoccurrence Rates
Smoking Cessation
Blood Pressure
Cholesterol
Exercise
Quality of Life
Improved Knowledge
Statistically Significant Outcomes
Clinically Significant Outcomes
High
Study Quality
BMI
Systematic Review or Integrative Review
Study Design
Telephone & Internet
Delivery Method
None
Statistically Significant Outcomes
Clinically Significant Outcomes
Moderate
Study Quality
Adherence
RCT
Study Design
Mobile Phone Applications & Internet
Delivery Method
BMI Reoccurrence Rates
Statistically Significant Outcomes
Clinically Significant Outcomes
Moderate
Study Quality
None
RCT
n= 2
Study Design
Internet
Delivery Method
Cholesterol Exercise
Statistically Significant Outcomes
Clinically Significant Outcomes
Low
Study Quality
None
Tele-Health
N = 4
Average Patient Age
About 60 years
Patient Gender
Mostly Men 74 - 100%
Primary Diagnosis
MI Revascularization CAD
Type of Home Cardiac Rehabilitation
Exercise Quality of Life
Statistically Significant Outcomes
Clinically Significant Outcomes
Moderate
Study Quality
None
RCT
Study Design
Home (Performer)
Delivery Method
65.5 years
Average Patient Age
Unidentified
Patient Gender
Other CR
N = 1
Primary Diagnosis
Variety of Cardiac Events
Type of Home Cardiac Rehabilitation
Home Based Rehabilitation
Type of Home Cardiac Rehabilitation
Educational Consult or Nurse led
Type of Home Cardiac Rehabilitation
Average Patient Age
58.2 - 64 years
Patient Gender
Mostly Male 58-62%
Primary Diagnosis
Various Cardiac Events
Adherence
Cholesterol
Quality of Life
Statistically Significant Outcomes
Clinically Significant Outcomes
Moderate
Study Quality
Cohort
n=3
Study Design
None
Types of Home Cardiac Rehabilitation
Home Setting
N= 19
Average Patient Age
In the 60s
Patient Gender
Mostly Males
Primary Diagnosis
Various Cardiac Events (Arrhythmias, Angina)
Study Design
Systematic Review or Integrative Review
n= 5
Study Quality
High
Statistically Significant Outcomes
None
Clinically Significant Outcomes
Adherence Blood Pressure Cholesterol Exercise Quality of Life
Moderate
Statistically Significant Outcomes
Blood Pressure Exercise Quality of Life Readmission Smoking Cessation
Clinically Significant Outcomes
Cholesterol Exercise Quality of Life Improved Knowledge
RCT
n= 7
Study Design
Study Quality
High
Statistically Significant Outcomes
Cholesterol Exercise Quality of Life Smoking Cessation
Clinically Significant Outcomes
None
Negative Outcomes
Increased Chest pain Dizziness Center cut performed Home in exercise
Moderate
Statistically Significant Outcomes
Blood Pressure BMI Cholesterol Exercise Quality of Life Reoccurrence Rates Improved Knowledge
Clinically Significant Outcomes
None
Low
Statistically Significant Outcomes
BMI Cholesterol Exercise Quality of Life
Clinically Significant Outcomes
None
Cohort
n= 6
Study Design
Study Quality
Moderate
Statistically Significant Outcomes
Cholesterol Exercise
Clinically Significant Outcomes
None
Negative Outcomes
Increased Peak VO2
Lower Peak VO2 than center based did have Inc. in exercise capacity within group results.
Low
Statistically Significant Outcomes
Exercise Quality of Life
Clinically Significant Outcomes
Blood pressure Cholesterol Exercise Improved Knowledge Quality of Life
Negative Outcomes
Increased Weight
Clinically Significant Outcomes
Moderate
Statistically Significant Outcomes
Quality of Life Improved Knowledge
Clinically Significant Outcomes
None
Other Qualitative
n= 1
Study Design
Study Quality
Moderate
Statistically Significant Outcomes
Clinically Significant Outcomes
Quality of Life Improved Knowledge
None
Intervention group inc. weight at home, but comparison group had dietary counseling that may have benefited them
Statistically Significant Themes
Blood Pressure
BMI
Cholesterol
Exercise Tolerance
Quality of Life
Reoccurrence Rates
Smoking Cessation
Improved Knowledge
Home Based Rehabilitation
Statistically Significant Evidence Theme
Blood Pressure
BMI
Cholesterol
Exercise Tolerance
Quality of Life
Reoccurrence Rates
Smoking Cessation