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## **Review**

**Title:** Nurse-led telephone interventions for people with cardiac disease: a review of the research literature

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## **Abstract:**

**Background:** Nurse-led telephone follow-up offers a relatively inexpensive method of delivering education and support for assisting recovery in the early discharge period; however, its efficacy is yet to be determined.

**Aim:** To perform a critical integrative review of the research literature addressing the effectiveness of nurse-led telephone interventions for people with cardiac disease.

**Methods:** A literature search of five health care databases; Sciencedirect, Cumulative Index to Nursing and Allied Health Literature, Pubmed, Proquest and Medline to identify journal articles between 1980 to 2009. People with cardiac disease were considered for inclusion in this review. The search yielded 128 papers, of which 24 met the inclusion criteria.

**Results:** A total of 8,330 participants from 24 studies were included in the final review. Seven studies demonstrated statistically significant differences in all outcomes measured, used two group experimental research design and valid and

reliable instruments. Some positive effects were detected in eight studies in regards to nurse-led telephone interventions for people with cardiac disease and no differences were detected in nine studies.

Discussion: Studies with some positive effects generally had stronger research designs, large samples, used valid and reliable instruments and extensive nurse-led educative interventions.

Conclusion: The results suggest that people with cardiac disease showed some benefits from nurse-led/delivered telephone interventions. More rigorous research into this area is needed.

**Keywords:**

Nurse-led telephone interventions, cardiac disease and integrative review

**1. Introduction**

This paper represents an integrative review of the literature on nurse-led telephone follow up interventions for people with cardiac disease. An integrative review of the literature is a nonexperimental design in which information derived from primary research is methodically considered [1]. Past research is analysed and overall conclusions are drawn from many studies that reflect the past and current state of knowledge pertaining to a particular field [2]. Integrative reviews are conducted to make an extensive contribution to nursing literature and nursing knowledge [3]. This review is conducted to make a meaningful contribution related to telephone interventions aimed at improving people [outcomes of people during with](#) cardiac disease recovery. For this paper, nurse-led is defined as ‘nurse initiated and delivered education and support’ to patients. Cardiac diseases are defined broadly and include

patients diagnosed on hospital admission with acute coronary syndrome (ACS), unstable angina, myocardial infarction (MI), heart failure (HF), implantable defibrillation devices, percutaneous coronary interventions (PCI) or admissions for cardiac surgery including coronary artery bypass surgery (CABG) or cardiac valve repair or replacement surgery. Discussion of this review is divided into three sections. The first explores the patient characteristics and how and why patients are selected to participate in the research projects, the second examines the methodologies selected for the studies and the third considers the results of the nurse-led telephone interventions.

## Background

The average hospital length-of-stay for people in Australia with myocardial infarction has fallen from seven days in 1989 [4] to 5.3 days in 2007/8 [5]. One of the significant impacts of reduced in-hospital stays after admission with cardiac disease is the reduction in time available for nurses to contribute to effective pre-discharge patient and family education. This can result in patients and families managing the recovery process with limited informational support in the post-discharge period [6]. The educational needs of people with cardiac disease are well established [4, 7-14]. The timing of health education is influenced by a number of factors. Early discharge may adversely impact on preparing patients for discharge [15]. People with cardiac disease report dissatisfaction with a range of factors including their education upon discharge [16] and emotional distress post-discharge [6, 17-22]. This initial period after discharge for patients is characterised by feelings of uncertainty, depression, anxiety and lack of control [23]. Although patients report this initial discharge period

as extremely stressful there appears to be a lack of health care professional support during the initial discharge recovery phase [24].

The telephone has been used in the field of cardiac rehabilitation since the late 1970s, and initially its application was to monitor people with cardiac disease undergoing home based exercise training. However since the early 1980s it has been increasingly used as a tool to enhance knowledge and psychosocial recovery [25]. [A preliminary study](#) by Beckie [40] [was](#) included in this review. Telephone support could be a viable alternative to meeting the unmet educational and psychological support needs in the initial post-discharge recovery period as well as improving the transition of care from hospital to home. Telephone support offers the potential for an inexpensive, convenient, time effective delivery for cardiac patients which is patient-centred and individualised [16, 26-28]. In addition, telephone calls have a quick response and low refusal rate [28] and present an effective strategy for reaching rural, difficult to access or patients with several co morbidities [4].

Telephone support has been used in a range of clinical settings as a means of providing post discharge psychological support and education with varying degrees of success. Telephone interventions have been found to be effective in a number of chronic diseases including enhancing self efficacy in people with chronic obstructive airway disease [29], reducing emotional distress, improving physical functioning [30] and [improved](#) body image in women with breast cancer [31]. Telephone interventions have also been reported to decrease the symptoms of depression for people with cancer [32] and people with arthritis [33]. For people with diabetes, researchers have suggested improvements to adherence of attending annual eye and

foot exams, foot self-exams and pneumonia vaccination [34] and psychosocial adjustment [35]. Telephone support has also reportedly reduced hospital readmissions for asthma patients [36].

Others studies, have however, reported that telephone interventions have only limited effect or benefit for patients including limited improvements to psychological morbidity for breast cancer patients [37] and glycemic control, health related quality of life or patient satisfaction in people with diabetes mellitus [34]. Further-more no improvement in the uptake of cervical cancer screening for women with history of nonattendance [38] or self reported medication adherence for hypertensive patients [39].

In summary there is considerable research addressing nurse-led health education interventions using telephone contact post-discharge. The purpose of this paper is to critically review the research literature addressing nurse-led telephone interventions for people with cardiac disease to better inform clinical practice in the management of this chronic disease and make suggestions for further research.

## **2. Methods**

### ***2.1 Inclusion and exclusion criteria***

In order to complete a critical integrative review, articles were considered for inclusion if they met the following criteria;

- Related to telephone or telephone interventions
- Related to people with cardiac disease
- Related to the post-discharge period

- Nurse delivered
- Published between 1980-2009 and
- Hypothesis tested

Exclusion criteria were as follows:

- Not in English
- Not cardiac recovery monitoring interventions

## ***2.2 Search for relevant studies***

An extensive and systematic literature search was undertaken using the documented criteria. The studies in this analysis were retrieved through an electronic search of five health care databases (Cumulative Index to Nursing and Allied Health Literature, Medline, Pubmed, Proquest and Sciencedirect). Search words used were: ‘telephone’, ‘telephone intervention’ and ‘cardiac’. Article abstracts were reviewed to establish relevance and where suitable, full text articles were retrieved for closer examination of the inclusion and exclusion criteria. These studies were examined under the following headings: interventions, aim, research design, instruments, results or findings, discussion, limitations, implications for the future and conclusions.

## **3. Findings**

The review was conducted in June, 2009 (see figure 1). Initially 128 full text articles were retrieved from the search of these databases. There were 63 studies excluded on the basis of the inclusion and exclusion criteria and 41 articles were repeat articles.

Twenty-four met the inclusion criteria which focused on nurse-led or delivered telephone interventions for people with cardiac disease and were included in this review (see table 1)[6, 16, 18, 23, 26, 28, 40-57].

### ***3.1 Sample sites***

Of the 24 studies, 17 were single site studies [6, 16, 18, 28, 40, 42, 43, 45-48, 52-57], five studies had between two to four sites [23, 49-51, 58], one study utilised ten sites [41] and only one conducted a 51 multisite study [44]. Nine studies were conducted in the United States of America [6, 18, 41, 42, 47, 51, 55-57], six were conducted in Canada [16, 40, 46, 48, 50, 52] and three studies in Australia [26, 43, 54]. Two studies were conducted in the United Kingdom (UK) [18, 28] and Norway [45, 53] and one sample in each of Germany [23], Sweden [49] and Argentina [44].

### ***3.2 Sample sizes***

Seven of the 24 reviewed studies had between 3536 to 240 participants [23, 44-47, 53, 55], seven had between 100 to 200 participants [16, 26, 41, 42, 48, 50, 54] and ten had less than 100 participants [6, 18, 28, 40, 43, 49, 51, 52, 56, 57].

Statistical power analysis provides an estimation of the required sample size, to enable statistical judgments that are accurate and reliable. Performing power analysis and sample size assessment is an important aspect of experimental design, because without these calculations, sample size may be inflated or inadequate. Small sample sizes run the risk of leading to erroneously rejecting the research hypothesis and can lead to Type II errors [59]. If a sample size is too large, time and resources will be wasted, often for minimal gain [60].



Six studies that reported using power calculations indicated sufficient sample sizes [16, 26, 44, 45, 55, 56]. One study did not report power analysis however, collected data on more than 3500 participants [46]. One study reported conducting a power analysis but the author did not indicate the sample size required [40]. Four studies conducted power analysis however did not attain the required sample size [16, 42, 48, 54]. Twelve studies did not report conducting a power analysis or provide sufficient justification for the size of their samples [6, 23, 28, 41, 43, 47, 49-53, 57]. Even though only six studies had significant power, all papers will continue to be reviewed.

### ***3.3 Research design***

All studies used convenience sampling of people with cardiac disease. Randomised Control Trials (RCT) are considered the most rigorous method of assessing health care interventions [61-63]. However, poorly conducted RCTs may yield misleading results. Fourteen studies reported using convenience sampling randomised control design [23, 26, 28, 41-43, 45, 48, 49, 51-54, 56]. Five studies used two group randomised controlled trial post test only [6, 16, 40, 44, 55]. Two studies used two group quasiexperimental, nonrandomised equivalent control group, pre and post test [47, 50], one study used two group non randomised post test only [57], one study used retrospective cohort design with unequal size groups [46], one study used no control group post test design [18]. The major weakness of quasiexperimental or cohort designs is that the cause and effect inferences are difficult to establish rigorously [59]. Other plausible rival explanations for the findings may need to be taken into consideration [59]. Statistical analysis performed by these studies were reviewed and appeared to be appropriate considering the level of measure of the tools, sample sizes and study objectives.

### ***3.4 Instruments***

From the 24 studies reviewed six measured one outcome [28, 45-48, 51], eight measured two outcomes [18, 26, 40, 44, 49, 50, 52, 53] and ten investigated three or more outcomes [6, 16, 23, 41-43, 54-57]. The following section shows groupings of similar outcome measures and they include risk factors, functional status, psychological status, self management and self efficacy, complications and hospital consumption and satisfaction with the telephone intervention.

#### **Risk factors and knowledge**

The studies which examined risk factors as an outcomes measure ranged from measuring smoking cessation rates [50, 53], cholesterol levels [47] to multiple risk factors including systolic blood pressure, cholesterol levels, physical activity, diet or body mass index or Framingham Risk Factor Scores [23, 43, 54]. Two studies analysed patients attending cardiac rehabilitation programs (CRP) that aimed to help patients by reducing their risk factor behaviours [18, 46]. Patients' knowledge of life style recovery skills was collected using Horn and Swain Knowledge Test [40] and knowledge was assessed by Redfern *et al* [54] by asking participants of risk factor behaviours. No valid or reliable instrument was reported in this study [54].

#### **Functional status**

Functional status was measured using Wares Short Form Health Survey and Short Form- 36 [56] or physical function using Patient Concerns Assessment and Short Form Health Survey SF-12 [41]. In addition one study used Charlson Quality of Life and Functional Status [42] and two the Minnesota Living with Heart Failure scale [42,

57]. Other studies measured quality of life by using instruments including Short Form-36 (SF-36) [16, 40, 45], Short Form-12 Health Survey [42], Perception of Health Status and Quality of life Scale [57], Ferrans & Power Quality of Life Index Cardiac Tool [51], European Quality of Life 5D [49] and The Seattle Angina Questionnaire [52].

### **Psychological status**

Psychological status was another outcome measure and centred on investigating patients' anxiety and depression. Four studies investigated anxiety and the instruments included Symptom Checklist 90 [23], Psychological Adjustment State Trait Anxiety Inventory [41], Beck Anxiety Inventory [48] or State Anxiety Inventory [40]. Five studies measured depression, of these three used the Centre for Epidemiologic studies Depression Scale [23, 41, 52], one study each used Geriatric Depression Scale [6] and one used the Beck Depression Inventory [42]. Two studies measured both anxiety and depression and used the Hospital Anxiety and Depression Scale [26, 28].

### **Self management and self efficacy**

The outcome measure of self management and self efficacy was investigated by four studies. Shearer [56] used two tools and these included the Power as Knowing Participation in Change Tool VII and Self Management of Heart Failure Scale. Dougherty *et al*, [41] measured self efficacy by two tools - the Sudden Cardiac Self Efficacy and the Sudden Cardiac Arrest- Behaviour and Knowledge. Johnson *et al* [50] investigated smoking self efficacy using the Smoking Abstinence Self Efficacy Scale and Holst [49] measured self care behaviours using the European Self Care Behaviour Scale.

## **Complications and hospital consumption**

Several studies used a variety of methods to investigate hospital consumption and complications post discharge. Six studies investigated hospital readmission rates [16, 41, 42, 44, 57, 64] and two reviewed mortality rates [42, 44]. Four studies collected a range of health care utilisation rates including hospital length of stay, number of admissions, emergency visits and symptom experienced [41, 42, 55, 57]. All six of these studies investigated health care resource use by gathering data from patient's charts or financial records. Weaver and Doran [6] reviewed postoperative cardiac surgery recidivism or complications requiring readmission as measured by clinical and doctors' records. Recidivism is defined as number of times complications required emergency visit by patients [6]. Johnson [18] evaluated post cardiac surgery convalescence problems using a chart audit approach.

## **Satisfaction**

Four studies investigated patient satisfaction with health care and the telephone interventions. One study used the Continuity and Transitions Dimensions from the Picker Institute Survey [6] and three studies asked satisfaction with care questions without reporting the use of valid or reliable instruments [16, 42, 55].

## **Reported tools Validity and Reliability**

Best practice research and clinical trials require sound measurement methods [65]. Many scientific based studies assess measurements as objective or physical quantities such as weight, blood pressure or urinalysis and interpretation of these results is straightforward [65]. Two of the reviewed studies used biochemical measures including cholesterol lipid levels [47] and nicotine metabolite concentration [53].

Such biochemical measures are recognised as the gold standard [50]. Seven studies conducted chart reviews for continuous variables including hospital consumption rates, emergency visits and mortality rates [16, 18, 41, 42, 44, 55, 57]. Two studies used dichotomous measures either attending CRP or not attending [18, 46].

In contrast measuring the results of a person's beliefs, knowledge, symptoms or quality of life is subjective and questionnaires are developed for such purposes. Seventeen studies used at least one form of questionnaire [6, 16, 23, 28, 40-42, 45, 48-52, 54, 56-58]. Of these seventeen studies, eleven studies used more than one questionnaire [6, 16, 23, 40-42, 49, 52, 56-58].

The results of a psychometric assessment have meaning or validity only in the circumstance of the constructs they intent to assess [66]. Validity describes how well the results can be interpreted as supporting or refuting the proposed interpretations of the instruments scores [65]. Reliability refers to the consistency of the scores from one assessment item to another [65].

Seventeen studies used 26 instruments with eight studies reporting reliability as Cronbach alpha coefficients greater than 0.8 [16, 40, 41, 48-51, 56]. This indicates that items of these questionnaires were highly correlated or equivalent [65]. One study indicated, for the three tools used, Cronbach alpha coefficients from 0.45 to 0.72 [26] questioning the assessment items internal consistency or reliability [65]. Validity must be established for each intended instrument for interpretation [65]. Eight of the reviewed studies did not mention or state the validity or reliability of the instruments used [23, 28, 42, 45, 49, 52, 54, 57].

### ***3.5. Studies' Results***

The overall results from the 24 studies were mixed. Positive effects were reported for seven studies in all outcomes measured [40, 44, 46, 47, 51, 53, 54] including hospital readmission and mortality [44], attendance to CRP [46], risk factor behaviours [40, 47, 53, 54] and quality of life [51].

Eight studies reported mixed results with both positive findings and no statistically differences detected [23, 41, 42, 48, 50, 52, 55, 56]. Mixed studies reported positive findings were for risk factors [23, 50], quality of life [41], psychological status [23, 41, 48, 52], self efficacy [41, 56] and resource use [42, 55]. Mixed studies reported no statistically significant differences in quality of life [52, 56], psychological status [23, 42, 48], smoking self efficacy [50], health care use [41] and satisfaction [42, 55].

Nine studies reported no differences detected in any outcome measured [6, 16, 18, 26, 28, 43, 49, 67]. These include risk factors [43], attendance to CRP [18], quality of life [16, 45, 49, 57], psychological status [26, 28], post-discharge complication or resource use [6, 16, 18, 57] and satisfaction [6, 16]. No study reported negative results.

Of the nine studies that reported no differences detected, eight reported the use of a psychometric assessments that lacked sensitivity or reliability [6, 16, 18, 26, 28, 45, 49, 57], seven of the studies over estimated the effects of the intervention including the expertise of the nurse conducting the intervention or the number of phone calls received [6, 16, 18, 28, 43, 49, 67], and six did not report justification of the sample

size [6, 16, 18, 28, 43, 49]. Another concern was the design of the studies, three studies performed post testing measures only [6, 16, 18]. Without baseline measures it is difficult to ascertain if the intervention had any effect.

#### **4.0 Discussion**

The purpose of this integrative review was to examine the research literature on the effects of nurse-led telephone interventions on people with cardiac disease. The results of this review were mixed. A total of 24 studies were reviewed, of these 15 had a least one positive finding [23, 40-42, 44, 46-48, 50-56]. The remaining nine studies did not detect any significant differences in any outcome measured [6, 16, 18, 26, 28, 43, 49, 57, 67]. This mixture of positive and no differences detected is similar to previous reviews for other conditions including nurse-led telephone interventions for people with cancer [68] and people who have had a stroke [69].

The nine studies in this review that did not detect positive findings had some similarities including reduced study rigor and sub optimal design, non expert nurse providing the intervention and fewer numbers of telephone calls. Other issues identified related to the validity and/or reliability of the instruments used to measure the outcomes.

The research design for 19 of the 24 reviewed articles was reported as two group experimental design including randomised control trials. This design is considered the most advance type of quantitative research design [70]. These studies are more likely able to show an association between the variable being manipulated or independent

variable and the causal variable or dependent variable [70]. In this review for all 24 studies the variable being manipulated or the independent variable was the telephone intervention. The dependent variables varied and ranged from risk factors, physical function, psychological status, self management or efficacy, complications and hospital consumption and satisfaction thus making comparisons more difficult.

Experimental designs are characterised by the use of a control group/s to which the treatment or intervention group/s is compared [70]. When studies compare two or more groups often the existence of a relationship between the treatment and non treatment groups is measured by comparing the average or mean of the two groups for the measured outcome [71]. Two of the reviewed studies collected or reported data on the intervention groups only and both of these studies did not detect statistically significant differences [18, 49]. The use of no control group research design is termed non experimental or quasi experimental and the major disadvantage in this design is it is weak in its ability to determine causal relationships [72].

An important consideration in conducting and evaluating applied research is the sampling size or number of participants in the study. Power analysis is conducted by researchers to determine or justify the effect size and the size of the sample. This is used to minimise the Type II error or the potential to incorrectly reject that there is a relationship between the dependent variable and independent variable [71]. In clinical trials, using inadequate sample sizes is precarious and the likelihood of Type II error is therefore large [71]. In this review eight studies had small sample sizes of below 100 participants in total, these studies potentially rejected hypothesis that there exists a



relationship between the telephone intervention and at least one outcome measured [6, 18, 28, 43, 49, 50, 52, 57].

This review has identified concerns regarding the intervention provided. Many of the reviewed studies that did not detect differences did not state the amount of experience of the nurses providing the telephone intervention [6, 16, 18, 28, 43, 45, 49]. Clinical nurse specialists or advance practice nurses have taken on an increasing role in chronic disease management, across many disciplines [73]. Previous studies comparing expert to novice nurses in the cardiovascular speciality [74] or critical care area [75], have demonstrated the expert nurse had greater knowledge in clinical expertise. Expert nurses were more proactive for surgical intensive care patients in collecting essential health assessment cues and anticipating problems earlier than novice nurses [76]. Many of the registered nurse-led heart failure interventions found little to no significance in improving patient outcomes whereas all advance nurse practice led studies had positive results [77-79].

The other concern regarding the telephone interventions that did not detect differences was the number of calls. Five of the seven nurse-led telephone intervention studies that did not detect differences were either two to three phone calls in total or follow-up telephone calls were conducted for no longer than one month [6, 16, 18, 28, 43]. Further research is required as there are limited reported studies investigating the effects of expert nurses providing the telephone interventions versus novice nurses, frequent calls or follow-up telephone calls for longer than three months.

The final concern in regards to research rigor for this review is the validity or reliability of the instruments used in the studies. Correlation coefficients are frequently provided in studies of psychometric assessments or instruments [71]. The function of correlation coefficients is to indicate if the instrument is really measuring the underlying construct of interest (validity) [65, 71] and accuracy or consistency of the scores from one use of the assessment to another (reliability) [65]. Studies in this review that have reported no statistically significant differences could potentially be due to the lack of sensitivity of the instrument to detect a difference rather than the efficacy of a telephone intervention.

### Limitations

Limitations inherent in the design of some of these studies do not permit an assessment that nurse-led telephone follow-up calls are beneficial (or not) in all circumstances. There is some evidence to support the implementation of post discharge telephone programs. The main outcome of this review is to establish that well designed, large samples which are adequately powered, using multisite, randomised, double blind studies have been presented in the literature. Areas of concern include poor research design, small samples, low powered, instruments that lack sensitivity and limited educative telephone interventions in regards to the number of calls and the experience of the nurse delivering the calls.

### Implications for practice

Nurse-led telephone interventions may help people with cardiac disease for a variety of outcomes including reducing risk factor behaviours, improving physical

functioning, improving psychological status, reducing hospital consumption and postoperative complications. For this review studies that have detected significant differences between the dependent variables with the telephone intervention were conducted by strong research rigor and extensive educative interventions. Strong research rigor includes use of randomised control trials, adequately powered, valid reliable instruments, objective measures or biochemical levels and pre and post testing. Extensive educative interventions included expert cardiovascular clinical nurses or advance practitioner nurses delivering the telephone interventions or providing more than six telephone calls for at least three months of follow-up.

## **5.0 Conclusion**

This paper presents a critical integrative review of the literature on nurse-led/delivered telephone follow-up interventions for people with cardiac disease. Of the 128 articles retrieved, 24 met the inclusion criteria, seven demonstrated statistically significant differences between all outcomes measured, used strong research design and valid and reliable instruments. From these seven, five had sample sizes between 3,536 to 136 participants. The remaining two studies had smaller sample sizes (total of 23 to 74 participants) and used strong research rigor, valid and reliable of instruments with extensive educative telephone interventions. Eight studies had statistically significant results in at least one outcome measured whereas nine did not detect statistically significant differences. No studied reported negative findings. From these nine studies that did not detect statistically significant differences in outcomes measured, issues were raised in regards to research rigor, small sample size, instruments that lacked sensitivity and the extensiveness of the telephone intervention.

This review has established that there is not sufficient evidence of the benefits. More quality research into this area is needed.

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Table 1

A summary of 24 studies found to meet the review inclusion criteria

Authors, date, country	Study Intervention/ Aim	Study Methods, sample, study patients	Study Findings	Study Discussion	Study Conclusion	Authors' Comments
Grancelli, et al, 2006, Argentina, [44]	INTERVENTION Telephone intervention by trained nurses, according to individuals needs AIM Reduce mortality	2 group, RCT, post test only N= 1518 patients with stable Heart Failure Equal groups	<b>Hospital readmission and mortality rates</b> ↑ for intervention group	Appropriate statistical analysis, double blinded, large sample, multiple sites, Tailored to individual	Positive differences detected Simple low cost intervention Frequent calls	1) RCT, post test only 2) Multisite (51 centres) 3) Adequately powered 4) Objective measures 5) Trained staff 6) Frequent calls (>5 calls)
Harkness, et al, 2005 Canada, [46]	INTERVENTION Single telephone call, provided at 2 weeks  AIM Encourage attendance to CRP	2 group, Retrospective cohort, post test only, N=3536 CABG and VSP, study group n=1251 control group n=2285	<b>Attendance at CRP</b> ↑ for intervention group	Large sample Referral bias, limited intervention, no randomisation, reduced methodology	Positive difference detected Cost effective, time effective, simple, quick, easy	1) Retrospective, post test unequal groups 2) Single site 3) Large sample no power reported 4) Dichotomous measure 5) Cardiovascular nurse 6) Single call
Harris et al, 2003, USA, [47]	INTERVENTION Modified CRP including telephone calls and specialised case managers with ongoing support  AIM Reduce lipid levels	2 group, quasiexperimental design, pre test post test, N = 342 People with MI or angina, 1997 group, usual CRP n = 184, 1998 study group n= 158	<b>Serum Lipid (LDLc mg/dl)</b> ↑ for intervention group	Difference in rate attending CRP in 1997 (rate of attendance 11%) to 1998 cohort (rate of attendance 22%)	Positive difference detected Levels of attendance to CRP still remain very low (22%) but improved from 11%,	1) Non randomised cohort differences patient was by time, potential for bias 2) single site 3) no power calculation reported 4) gold standard objective measure 5) case managers 6) number of calls depended on individual

Quist-Paulsen & Gallefoss, 2003, Norway, [53]	INTERVENTION Individualised telephone follow-up for > 5 months and 1 clinic visit at 6 months  AIM Increase smoking cessation rates	2 group, RCT, pre test post test, N= 240 Cardiac patients (MI, angina or CABG) equal groups	<b>Smoking cessation</b> by self report and <i>verified with urine test (nicotine metabolite concentration)</i> ↑ smoking cessation rate for intervention group	Used fear tactics to motivate patients	Positive difference detected for at least 12 months of follow up Cost effective	1) RCT, pre and post test 2) No randomisation 3) Single site 4) No power analysis reported 5) Gold standard objective measure verifying self report 6) Cardiac nurses without special training 7) Frequent calls (6 calls)
Redfern, 2009, Aust [54]	INTERVENTION Brief patient centred modular program, clinic visit and telephone support for 12 months  AIM improve management of risk factors and quality of life	2 group, RCT, pre test post test N= 136 people ACS Equal groups	<b>1. Cholesterol, systolic BP, smoking status, physical activity</b> ↓ intervention group <b>2. Knowledge</b> ↓ intervention group <b>3. Short Form – 36 (SF-36)</b> ↓ intervention group	Short term results were maintained long term Limited Generalisability due to one site, small sample	Positive differences detected Cost effective easily translated to other location Alternative for large numbers of patients not accessing CRP	1) RCT, pre and post test 2) Computer generated randomisation 3) Single site 4) Power conducted but sample lower than required 5) Mixed objective with subjective measures 6) Frequent calls (4 ten minute calls over 3 months) 7) Not state expertise of nurses
Beckie, 1989, Canada, [40]	INTERVENTION Supportive educative telephone program during initial 6 weeks post-discharge  AIM gain knowledge, decision making, coping skills and reduce anxiety	2 group RCT, Post test only N= 74 CABG patients, equal groups	<b>1. Horn &amp; Swain Knowledge Test</b> ↑ intervention group <b>2. State Anxiety Inventory</b> ↓ intervention group	Low power but effect probably larger than medium	Positive differences detected Cost effective	1) RCT, Post test only 2) No randomisation 3) Single site 4) Power analysis conducted not stated sample size required 5) Valid reliable instruments 6) Frequent calls (4-6 calls) 7) Cardiac rehabilitation nurse specialist
Kutzleb, 2006,	INTERVENTION	2 group, RCT,	<b>Ferrans &amp; Power</b>	Very small sample	Positive	1) RCT, pre and post test

USA, [51]	Weekly telephone calls by registered nurse for 12 months  AIM Improve quality of life	pre test, post test N=23 people with HF equal groups	<b>QOL index Cardiac Tool</b> ↑ for intervention group	Limited Generalisability	difference detected Long term follow up was effective improving QOL for HF patients	2) Randomisation by unit patient admitted 3) Two sites 4) No power analysis reported 5) Valid reliable instrument 6) Frequent calls (52 calls) 7) Clinical nurse specialist and researchers
Riegel, et al, 2002, USA [55]	INTERVENTION Telephonic case management for 6  AIM Reduce resources use	2 group, RCT, post test only N= 358 people with HF Study group n= 130, control group n= 228	<b>1. Hospitalisation rate</b> ↓ @ 3 months <b>2. Readmission rates</b> No difference <b>3. Hospital days</b> ↓ @ 6 months <b>4. Multiple admissions</b> ↓ @ 6 months <b>5. Emergency visits</b> No difference <b>6. Inpatient costs</b> ↓ @ 6 months <b>7. Patient satisfaction</b> ↑ @ 3 & 6 months	Significant cost savings demonstrated Standardisation of the intervention is suggested Severity of illness another factor Limitations due to randomisation procedure	Positive differences detected for HF resources use by nurse-delivered case management telephone interventions	1) RCT, post test only 2) Single site 3) Randomisation by physician rather than patient 4) Adequate power 5) Objective measures used 6) Frequent calls (14 calls) 7) Registered nurse using software
Mittag, et al, 2006, Germany, [23]	INTERVENTION Monthly telephone intervention for 12 months  AIM Reduce risk factors and increase quality of life	2 group RCT, pre test, post test, Cardiac medical and surgical patients N = 297, equal groups	<b>1. Framingham risk factor scores</b> ↓ scores for intervention group <b>2. Symptom Checklist 90</b> ↓ depression for women for intervention group <b>3. Centre for</b>	Cost effective Use of nurse case managers effective in reducing risk factor behaviours for this group of people but failed to increase women's physical activity But women only	No conclusion	1) RCT, pre and post test 2) Three sites 3) Randomisation by computer 4) No power calculation reported 5) Instrument lack sensitivity 6) Frequent calls (>12 calls) 7) Trained nurse working with psychologist

			<b>Epidemiology Studies Depression Scale</b> No difference	18% and power in effects for women is low		
Dougherty, et al 2005, USA, [41]	INTERVENTION Cardiac nurse specialist led telephone support for 8 weeks  AIM Reduce concerns and symptoms experienced	2 group, RCT, pre test, post test N=168 people with ICDD, equal groups	<b>1. Patient Concerns Assessment &amp; Short Form Health Survey SF-12</b> <b>2. Psychological adjustment state trait anxiety inventory and Centre for Epidemiologic Studies Depression</b> ↓ for intervention group <b>3. Sudden cardiac arrest self efficacy and Sudden Cardiac Arrest – Behaviour and – knowledge</b> ↑ intervention group <b>4. Health care utilisation</b> No significance differences	Previous report positive effects for 8 weeks This report sustained over 12 months Self confidence to manage ICDD care Randomisation procedure did not work in equally distributing characteristics across groups Use of self report Burdensome questionnaire package rusting in motivated participants able to comprehend	Positive differences detected within first 8 weeks and sustained at 6 and 12 months	1) RCT, pre and post test 2) Randomisation by computer 3) 10 sites 4) No power calculation reported 5) Instruments valid and reliable 6) Frequent calls (8 calls) 7) Cardiac nurse specialist
Dunagan, et al, 2005 USA, [42]	INTERVENTION Telephone calls by specially trained nurses  AIM Improve self management behaviours	2 group, RCT, pre test, post test N= 151 HF patients, equal groups	<b>1. Number of admissions, hospital length of stay, mortality &amp; hospital costs</b> <b>2. Charlson QOL and Functional Status, SF-12 Health Survey and</b>	Nurse delivered telephone intervention significantly delayed subsequent rehospitalisation But not sustained for 12 months	No conclusion	1) RCT, pre and post test 2) Randomisation by block design 3) Single site 4) Inadequate power (required 250 subjects) 5) Validity and reliability not reported 6) Limited number of calls (3

			<p><b>Minnesota Living with Heart Failure Questionnaire</b>          ↑ intervention group @ 6 months but not 12 months  <b>3. Satisfaction with care</b>  <b>4. Beck Depression Inventory</b>          No difference detected</p>	<p>Missing data          Generalisability of findings          Single site</p>		<p>calls within 2 weeks)          7) Specially trained nurses</p>
<p>Hartford, 2002, Canada, [48]</p>	<p>INTERVENTION          nurse-delivered telephone calls over 7 weeks</p> <p>AIM          Reducing anxiety for patient and partner</p>	<p>2 groups, RCT pre test, post test N= 131 CABG equal groups</p>	<p><b>Beck Anxiety Inventory</b>          No difference for patients          ↓ anxiety in partner</p>	<p>Instrument not sensitive enough to detect effect, small sample</p>	<p>Positive difference detected for partners but not patients</p>	<ol style="list-style-type: none"> <li>1) RCT, pre and post test</li> <li>2) Randomisation by number</li> <li>3) Single site</li> <li>4) Power calculation requiring 144</li> <li>5) Instrument lack sensitivity with correlation coefficient of 0.75</li> <li>6) Frequent calls (6 calls)</li> <li>7) Research nurse</li> </ol>
<p>Johnson, et al, 1999, Canada, [50]</p>	<p>INTERVENTION          Weekly telephone calls supplemented with education package</p> <p>AIM          Reduce smoking cessation behaviours</p>	<p>2 group, Quasi experimental design, non equivalent control group, pre test post test N = 102 Cardiac diagnosis, equal groups</p>	<p><b>Smoking cessation</b>          ↑ cessation rate for intervention group  <b>Smoking Abstinence Self Efficacy Scale</b>          No significance differences detected</p>	<p>No biochemical measure, validity and reliability stated but instrument may have not been sensitive enough to detect differences, use of self report small sample</p>	<p>No conclusion</p>	<ol style="list-style-type: none"> <li>1) Non randomised two group pre and post test self identified smokers</li> <li>2) Two sites (cardiac units)</li> <li>3) No power calculation reported</li> <li>4) Valid and reliable instrument</li> <li>5) Frequent calls (6 calls over 3 months)</li> <li>6) Clinical nurse specialist</li> </ol>

Shearer, et al, 2007, USA, [56]	INTERVENTION Nurse-delivered telephone intervention  AIM Improve self management skills	2 groups, RCT pre test post test, N= 90 people with HF equal groups	<b>1. Knowing Participation in Change Tool VII</b> <b>2. Wares' Short Form health survey and Short Form -36</b> No differences detected <b>3. Self Management of heart failure scale</b> ↑ intervention group	Small sample, Limited Generalisability due to demographics, instrument lack sensitivity, Difficulties in understanding the instrument, Missing data reducing power	Positive difference detected for self management	1) RCT, pre and post test 2) Randomisation 3) Single site 4) Adequate power but small sample 5) Instrument not sensitive enough to detect effect of intervention 6) Frequent calls (6 calls) 7) Clinical HF experienced nurses
Norris, 2007, Canada, [52]	INTERVENTION 1 group received additional telephone call  AIM Reduce depression	3 group, RCT pre test post test N = 95 people CAD, group A mail & written n=26, group B telephone and written, n= 27, group, C usual care n= 42	<b>Centre for Epidemiologic studies Depression Scale</b> Improved depression scores <b>Seattle Angina Questionnaire</b> no differences detected	Benefits of screening for depression, Results of this study demonstrated interventions potentially reduce psychological distress and long term prognosis	Single referral protocol was effective in decreasing depressive symptoms one year following cardiac event	1) 3 group, RCT pre test post test 2) Randomised by computer 3) Single site 4) No power conducted reported 5) No reported validity or reliability of instruments 6) Single phone call 7) By nurse
Tranmer & Parry, 2004, Canada, [16]	INTERVENTION Telephone calls by cardiovascular step down RN  AIM Improve quality of life, reduce contacts with health care system and symptom distress	2 group, RCT, post test only, N= 184 Cardiac surgical patients Equal groups	<b>1. SF36 Medical Outcomes Study SF-36</b> <b>2. Symptom distress Memorial Symptom Assessment Scale,</b> <b>3. Unexpected health care contacts,</b> <b>4. Satisfaction</b> No statistically differences	Sample selection error made in randomisation, outcome measures and timing, estimation of the intervention and lack of sensitivity of instrument	Provision of telephone support is feasible but no differences detected for this study	1) RCT, post test only 2) Randomisation error 3) Single site 4) Inadequate power (needed 200) 5) Sensitivity of instrument low $\alpha$ from 0.76 to 0.88 6) Second tool designed for people with cancer 7) Frequent calls (5 over 4 weeks)

						8) Advance nurse practitioner
Wheeler & Waterhouse, 2006, USA, [57]	INTERVENTION Home health care RN followed up by student nurses for 12-14 weeks  AIM Reduce symptoms and readmission by student nurse	2 group, quasiexperimental post test only N= 40 people with HF student nurses n= 20, control group n= 20	<b>1. Readmission &amp; Symptoms</b> Reduced but not significant <b>2. Minnesota Living with Heart Failure questionnaire</b> Reduced but not significant <b>3. Perception of health status and quality of life scale</b> No difference	Fewer HF patients who received long term follow up by student nurses were readmitted during study Small sample sized, low power, short follow up, data collected from student nurses not the patient	Appears to be effective in achieving positive outcomes but not statistically	1) Non equivalent control group, post test only 2) No randomisation 3) Single site 4) No power reported 5) No reported validity or reliability of instrument (but not measured for control group) 6) Frequent calls (4 to 8 calls) 7) Student nurse delivered
Hanssen, et al, 2009, Norway, [45]	INTERVENTION telephone calls by nurse  AIM Improve quality of life	2 group, RCT, pre test, post test, N = 288 people with MI, study group n=156 control group n=132	<b>36-Item Short Form Health Survey version 1.0</b> No statistically differences detected for long term	No long term effects on HRQOL, significant improvements in both groups Small sample size, proven reliability of the instrument Between 26-35% loss to follow up	Positive and significant results at 6 months but not sustained at 12 to 18 months	1) RCT, pre and post test 2) Randomised by simple procedure (not stated) 3) Single site 4) Adequate power 5) No validity or reliability of instrument reported 6) Frequent calls (6 calls) 7) Nurse delivered (No mention of the experience)
Weaver & Doran, 2001, USA, [6]	INTERVENTION Telephone calls, AIM reduce post operative complications, readmission rates, depression and increase satisfaction	2 group RCT, post test only N= 90 Cardiac surgical patients Intervention group n=44 Control group n=46	<b>1. Recidivism</b> <b>2. Depression</b> <b>3. Complications</b> No statistically differences detected <b>4. Satisfaction</b> ↑ higher rate but not statistically	No statistically significant differences	No conclusion	1) RCT, post test only 2) No randomisation 3) Single site 4) No power reported 5) No valid or reliable instrument 6) Frequent calls (5 calls over one month)

			significant			
Johnson, 2000, UK, [18]	INTERVENTION single telephone call AIM Improve attendance to CRP, assess service and post operative complications	Post test quasiexperimental no equivalent control group design N = 82 CABG patients,	<b>1. CRP attendance</b> ↑ for intervention group but not statistically <b>2. Wound problems</b> ↓ from 30% to 23% not significant	Audit design, resources dictate only one call 44% stated would of liked the call within 2 weeks of discharge	Benefitted from gathering patient opinion before starting service	1) Post test no equivalent control group 2) No randomisation 3) Single site 4) No power reported 5) Dichotomous measure 6) Single call 7) No mention of nurse experience
Gallagher, et al, 2003 Australia, [58]	INTERVENTION Cardiac nurse-delivered telephoned calls  AIM reduce anxiety and depression	2 group, RCT, pre test, post test N = 196 cardiac surgical and medical patients, equal groups	<b>1. Hospital Anxiety and Depression Scale</b> and <b>2. Psychosocial adjustment to illness scale</b> No differences detected	Telephone intervention demonstrated no benefit for psychosocial recovery Non selective sample of women were used, difficulties in delivery	No statistically significant differences but was acceptable and suitable	1) RCT, pre and post test Female patients only 2) Randomised cluster method 3) Four sites 4) Adequate power 5) Instrument lack sensitivity 6) Frequent calls (5 calls) 7) Developed by Cardiac clinical nurse consultant but unsure of expertise of nurse delivering
Holst, 2007, Sweden, [49]	INTERVENTION Single education and counselling session and monthly phone calls for 1 year  AIM Optimise intake of fluids, body weight monitoring, detection of signs and symptoms	2 group, RCT pre test post N=60 HF patients study group n =60 unknown control group	<b>1. European Quality of Life 5D</b> No difference detected  <b>2. European Self Care Behaviour Scale (EHFScBS)</b> no difference detected	Required more comprehensive educative program, missing data in some areas, small sample, self reported questionnaires,	No positive benefits were detected for this group of patients	1) RCT pre and post test No mention of control group Subgroup analysis of larger RCT 2) No randomisation 3) Four sites 4) No power reported 5) Instruments lack sensitivity 6) Frequent calls (>12 calls) 7) No mention of nurse experience
Roebuck, 1999,	INTERVENTION	2 group, RCT,	<b>Hospital anxiety and</b>	Reported	No conclusion	1) RCT pre and post test



UK, [28]	Two telephone calls  AIM reduce anxiety and depression levels	pre test, post test, N= 78 CSP Study group n=45 control group n=33	<b>depression scale</b> No statistically significant difference	beneficially but no statistically significant differences were detected Participants may not have had raised anxiety or depression on discharge yet		2) Randomisation by alternative block selection 3) Single site 4) No power reported 5) No mention of validity or reliability of instrument no documented anxiety and depression scores were documented by authors on discharge 6) Two phone calls 7) No mention of nurse expertise
Fernandez, 2009, Australia, [43]	INTERVENTION Three telephone calls AIM Reduce blood pressure and cholesterol	2 groups, RCT, pre test, post test N= 51 ACS patients, study group n= 29, control group n=22	<b>Behavior risk factors including smoking, BP, Body Mass Index, diet, exercise and cholesterol</b>  no difference detected	Inadequately powered,, missing data, instrument or measure lack sensitivity	No statistically differences detected	1) RCT, pre and post test 2) Randomisation by statistician 3) Single site 4) No power reported 5) Objective measures 6) Three phone calls over 8 weeks 7) Calls by single trained registered nurse

**Key:**

CABG = Coronary Artery Bypass Graft

LDL = Lipid Density Levels

CAD = Coronary Artery Disease

HRQOL = Health Related Quality of Life

CSP = Cardiac Surgical Patient

MI = Myocardial Infarction

ACS = Acute Coronary Syndrome

ICDD = Implantable Cardioverter Defibrillation Device

QOL = Quality of Life

VSP = Valve Surgical Patients

CRP = Cardiac Rehabilitation Program

HF = Heart Failure