

## Research Article

# A Multicentre, Fully Nurse-Coordinated, Intensive, Cardiovascular Prevention Intervention Programme after an Acute Coronary Syndrome

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## Abstract

The main objective of cardiovascular disease prevention is to reduce morbidity and mortality by promoting a healthy lifestyle, reducing risk factors, and improving adherence to medications. Secondary prevention after an acute coronary syndrome has proved to be effective in reducing new cardiovascular events, but its limited use in everyday clinical practice suggests there is considerable room for improvement. The short-term results of evidence-based studies of nurse-coordinated secondary prevention programmes have been positive, but there is a lack of long-term outcome data. The Alliance for Secondary Prevention after an acute coronary syndrome in the Emilia-Romagna region (ALLEPRE) is a multicentre, randomised, controlled trial designed to compare the effects of a structured, intensive nursing intervention on long-term outcomes and risk profiles after an acute coronary syndrome with those of the standard of care. Nurses fully coordinate secondary prevention in the intervention arm using a multi-dimensional nursing form after attending *ad hoc* teaching sessions. All of the patients randomised to the intervention group take part in nine 1-to-1 sessions with an experienced nurse from the participating centres that have the aim of promoting healthy lifestyles, reducing risk factors, and increasing adherence to medication over a mean period of five years. The primary clinical end point is the reduction in the risk of the 5-year occurrence of major adverse events.

**Keywords:** Multi-dimensional nursing form; Narrative; Acute coronary syndrome; Secondary prevention; Coronary heart disease

**Abbreviations:** ACS: acute coronary syndrome; ALLEPRE: Alliance for sEcondary PREvention after an acute coronary syndrome; MNF: Multi-dimensional Nursing Form; NANDA: North American Nursing Diagnosis Association.

## Introduction

Coronary heart disease is a chronic degenerative disease, and patients who recover from an Acute Coronary Syndrome (ACS) are at high risk of developing recurrent events [1].

Although secondary prevention measures have proved to be effective and are strongly recommended by all of the international guidelines [2,3], the EUROASPIRE IV surveys [4,5] have shown that there is still a high prevalence of conventional risk factors, that secondary prevention measures are inadequately implemented, and that their main goals were often not reached.

In addition, there are considerable discrepancies in secondary prevention practices between centres and countries, and cardiac prevention and rehabilitation programmes are widely underused despite their demonstrated effectiveness in reducing cardiovascular risk over time [6,7]. Over the last 10 years, nurses have been increasingly involved in successful cardiovascular risk management [8-10] but, although this has improved the levels of cardiovascular risk, it has not led to a clearly demonstrated reduction in hard endpoints such as major cardiovascular adverse events or mortality [7].

The aim of the ALLEPRE trial is to evaluate the benefit of a homogeneous, structured, secondary prevention intervention programme that is fully coordinated by nurses from in- and out-patient clinics in terms of major clinical events and the cardiovascular risk profiles of ACS patients living in the large Emilia-Romagna region of Italy. This paper describes the trial protocol with particular focus on the leadership role of nurses and the use of a specially developed Multi-dimensional Nursing Form (MNF).

## Materials and Methods

### Study Design

The ALLEPRE trial (NCT02522182) is a prospective, randomised, multicentre, interventional study designed to assess the efficacy of a fully nurse-coordinated prevention programme for patients hospitalised because of an ACS (Figure 1). Patient enrolment started in October 2012 and was completed in April 2022; the follow-up is still ongoing. The study was approved by the Ethics Committees of all of the participating centres, and written consent was obtained from all of the patients enrolled.

### Study Population

Eligible patients aged  $\geq 18$  years with an ACS (unstable angina, non-ST-segment elevation myocardial infarction [MI], or ST-segment elevation MI) admitted to the Cardiological Divisions of six participating centres in Emilia-Romagna (Italy) were considered for enrolment for up to 20 days after the index event and before being discharged. Once it had been verified that the patients were capable of participating in a prospective study, the only exclusion criterion was a life expectancy of  $< 12$  months because of severe non-cardiac disease.

### Study Organisation

A preliminary training phase involved 100 professional nurses working at the participating hospitals and community service centres (about 50% of each): about 80% of the nurses were female, the average age of the participants was 35 years, and they had an average professional experience of 5-10 years. The training was centralised, coordinated by the Training and Continuous Education Centre of Azienda Ospedaliero-Universitaria di Parma), and involved a multidisciplinary team of medical, nursing, and psychological experts who used specially prepared paper-based teaching materials. The course consisted of three full-day sessions designed to train nurses in the secondary prevention of cardiovascular disease using appropriate communication strategies aimed at reducing risk factors, modifying lifestyles, and improving adherence to prescribed pharmacological therapy. The knowledge and skills acquired by the nurses was assessed and certified, with the recognition of credits for continuing education in medicine.

In order to standardise secondary prevention activities in the participating centres, the nurses were also trained in protocol procedures using an innovative paper clinical file called the Multi-dimensional Nursing Form (MNF) [11], which has been validated and described elsewhere [12] and is included in the Supplementary material [13].

Given the high turnover of nurses in Italian hospitals, the course is repeated when necessary to ensure a steady number of participating nurses over time.

**Multi-dimensional Nursing form:** During the training sessions, the nurses were trained how to use our innovative MNF,

an interactive guide to patient assessment and education aimed at promoting all three of the study objectives. Based on the latest scientific evidence and the Cardiovascular Secondary Prevention Guidelines [6,14] it was prepared by a multi-disciplinary team of nurses, cardiologists and psychologists from the University Teaching Hospital of Parma, and will be used for all of the nine interviews planned for the patients in the study's experimental arm: a pre-discharge interview, followed by others after one, three, six, 12, 18, 24, 36 and 48 months. It is based on a "cure" and "care" nursing paradigm that affectively integrates the bio-clinical and psycho-socio-relational dimensions of nursing using NANDA language [15] and a cardiovascular narrative approach (Table 1). The model considers CVD in the three senses of "illness", "disease" and "sickness", and uses quantitative and qualitative data collected by means of narrative-based interviews in order to make a multi-dimensional assessment of each patient with the aim of arriving at a more profound understanding of them and their caregivers (the phase of nursing ascertainment). The model of care is based on a nurse/patient/caregiver co-construction of the therapeutic plan and personalised education in order to favour behaviours oriented towards reaching the ALLEPRE study end points. In addition to a socio-demographic part that includes the patient's personal details and CV medical history (the number of CV events at the time of admission), the MNF is divided into five areas, each of which is covered during all of the nine interviews:

- A) The assessment of classic risk factors (diabetes, smoking, hypertension, dyslipidemia, and obesity);
- B) The assessment of additive risk factors (physical activity, diet, and alcohol consumption);
- C) The assessment of psycho-social risk factors (anxiety, depression, anger/hostility, type A and D personality patterns, self-efficacy, and social support);
- D) The assessment of adherence to CV drugs (aspirin, anti-aggrenant, ACE inhibitor/sartan, statin, beta-blocker) and other drugs (e.g. antidepressants and anxiolytics), as well as the intentional (insufficient information, incredulity and irrationality) and non-intentional factors (forgetting) underlying therapeutic non-compliance;
- E) A narrative nursing assessment.

Areas A-D have fields for the ascertainment of CV risk factors, the definition of selected nursing diagnoses and related objectives, and the definition of the required educational interventions. Area E consists of a grid with stimulus questions that guide the narrative interview, which is essential for completing the assessment of aspects relating to disease perception, strategies for coping with the critical event, and the difficulties perceived by the patient in relation to the prescribed treatment (e.g. What are the difficulties you may encounter once you return home? What strategies will help you to confront the disease and its treatment?). (Table 1) shows some sample extracts of the MNF.

The nurses autonomously activate a multi-disciplinary medical network for the specific purposes of treating diabetes and/or hypertension, encouraging patients to stop smoking, promoting physical activity, and providing psychological support in accordance with the MNF recommendations (Supplementary Materials S2, S3, and S4).

Given the nurse-coordinated management of the prevention programme, the nurses undergo quality assessments made by a dedicated psychologist at each centre to evaluate the validity of their recommendations, the effectiveness of their communications, their adherence to protocol procedures, and their overall empathy.

Re-training sessions take place in the case of a nurse with a suboptimal score. In this sense, the completed MNF cards (n = 100/300) were randomly analyzed in order to evaluate the effectiveness of the MNF in terms of the completeness and appropriateness of the “closed” fields, and the completeness and accuracy of the “open” fields. In general, the MNF has proved to be an effective means of assessing and planning the process of care. The appropriateness, accuracy and completeness of the closed and open fields were above the pre-established standard (80%).

The patients randomized to standard care follow the standard secondary prevention practices of the hospital they attend.

**End points:** The ALLEPRE study has two co-primary endpoints: a clinical and a surrogate endpoint. The primary clinical end point is a composite of cardiovascular death, the first occurrence of a non-fatal re-infarction, and non-fatal stroke after 5 years (minimum 24 months, maximum 86 months; median treatment duration 60 months). The secondary clinical endpoints are: 1) a composite of cardiovascular mortality, non-fatal re-infarction, non-fatal stroke, and myocardial ischemia-driven revascularisation; 2) non-fatal reinfarction; 3) non-fatal stroke; 4) cardiovascular mortality; and 5) all-cause mortality.

The primary surrogate endpoint is the improvement in achieving the goals relating to risk factors and lifestyle and pharmacological adherence suggested by all of the international guidelines [2,16,17] between baseline and month 24. The secondary endpoint is the improvement in achieving the goals of the co-primary surrogate end point between baseline and month 60.

Follow-up is still ongoing at the time of writing: outcomes in both arms are recorded arms by cardiologists during three programmed follow-up visits (12, 24, and 60 months after randomisation) using a web-based electronic case report form. At the end of the study, the outcomes will be verified on the basis of the clinical records and/or death certificate of the individual patients, and all of the events will be adjudicated by an independent Clinical Event Committee of three cardiologists who are unaware of the patients’ treatment allocation.

On the basis of the results of the GRACE UK-Belgian Study [1], it is conservatively expected that the cumulative rate of the co-primary composite clinical endpoint of cardiovascular mortality, non-fatal re-infarction, and non-fatal stroke in the standard care arm during the 5 years of follow-up will be 28%. Using the formula of Lakatos and Lan [20], at least 1,030 patients are required in each group to detect a 25% risk reduction in the experimental arm with 90% power and a 2-sided significance level of 0.25. The estimated sample size is also more than sufficient for the 24-month analysis of the co-primary surrogate endpoint.

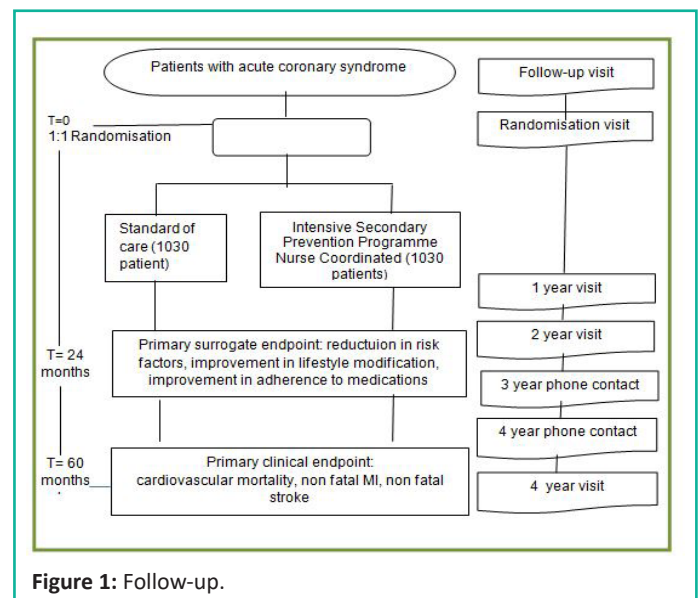


Figure 1: Follow-up.

Table 1: MNF sample extracts.

MULTI-DIMENSIONAL NURSING FORM (MNF)	
<b>PERSONAL DATA</b>	
Patient's ID: _____ (Insert patient's tax code)	
Randomisation date (day/month/year):	
Name and Surname	
Gender: Male <input type="checkbox"/> Female <input type="checkbox"/> Other <input type="checkbox"/>	
Date of birth :	
Education: Primary School <input type="checkbox"/> Secondary School <input type="checkbox"/> High School <input type="checkbox"/> University <input type="checkbox"/>	
Marital Status: Married <input type="checkbox"/> Separated/divorced <input type="checkbox"/> Single <input type="checkbox"/> Partner <input type="checkbox"/> Widow/wer <input type="checkbox"/>	
Living status: Living alone <input type="checkbox"/> Living with non self-sufficient person(s); <input type="checkbox"/> Living with self-sufficient person(s) <input type="checkbox"/>	
Cardiovascular health: first event <input type="checkbox"/> not first event <input type="checkbox"/> Episode number <input type="checkbox"/>	

Nursing assessment		Nursing Diagnosis (NANDA)	Therapeutic Goal	Obtained	To be kept	Nursing Interventions
<b>OBSITY</b> No <input type="checkbox"/> Yes <input type="checkbox"/>	Weight = kg Height = _m BMI = kg/m <sup>2</sup> (see chart)	Insert NANDA code(s); [ ]	BMI 18-24.9	[ ]	[ ]	Dietary education and physical exercise Education to control other cardiovascular risk factors Caregivers' involvement during educational event Use of patient leaflet during educational events

“B” Psycho-social risk factors (example)

Nursing Assessment		Nursing Diagnosis (NANDA)	Therapeutic Goal	Obtained	To be kept	Nursing Interventions
To integrate with "narrative nursing" assessment (Area E);						
ANXIETY No [ ] YES [ ]	Score	Insert NANDA code(s) [ ]	[ ]	[ ]	[ ]	Listen actively to patient assist patients in expressing their thoughts and feelings without assuming a relational approachhave an empathic approach help patients in spottingworrying situations identify dysfunctional copingstyles assess the existence of psychological problems preceding heart disease, thepresence of work or family social or relational problems identify frequent family and work requests and the availability of personal resources Active involvement of caregivers

"D" Pharmacological compliance (example)

To integrate with "narrative Nursing" assessment E AREA		Nursing Assessment (NANDA_____)	Therapeutic Goal	Obtained	To be kept	Nursing Interventions
Unintentional factors/memory impairments No [ ] Yes [ ]	Specify: Old age [ ] Memory impairment [ ] Unfavourable socio-economic context [ ] Other [ ]	Risk of non-compliance withtherapeutic regimen related to: [ ]	Stress the importance of remembering therapeuticregimen: patient must state that he has understood the role of taking medications andremembers the number, doses and times of takingmedicines, using an appropriate instrument	[ ]	[ ]	Train to self-monitor by means of schedules, reminders, pill counter and so on. Try to discover the best way toharmonise the foreseen changes with patient's life style. Use "teach back" technique. Create a relationship of mutual trust and responsibility. Involve caregivers

E" Narrative Nursing Assessment (example)

SURVEYED AREA	Interview questions	KEYWORD	STRINGS (patient's narrative abstracts)
Compliance with therapeutic plan	Can you tell mehow you will behave when you go home?	Understanding the nature of prescribedbehavioural changes ((e.g. physicalexercise, checking diet, and stopping smoking)) Understanding the number and types of prescribed medications, and when totake them Understanding the importance of changes in life style and and takingprescribed medications; Understanding risks connected to lack of compliance	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
	What are the main problems you see in terms of changes due tothe disease andyour therapeutic prescriptions?	(Intentional Factors) Mistaken belief that drugs are ineffective and/or harmful Mistaken beliefs about illness Feeling of being unable to manage changes Disproportionate work/family and domestic burden Emotional response to disease (for instance, refusal, skepticism) Emotional response to therapy (for instance, restricting, unnecessary)(Unintentional Factors) Cognitive impairment (obliviousness) Unfavourable socio-economic; context (e.g. low income, inadequate healthcareeducation).	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>

Expected Results and Discussion

Over the last 50 years, the importance of treating the acute phase of ACS has been clearly demonstrated [2,3] but, despite the newly available drugs and the evolving technologies of cardiovascular procedures, post-ACS mortality and morbidity rates remain high [1]. Secondary prevention, which consists of controlling established risk factors, modifying life styles, and ensuring adherence to appropriate treatment regimens, has proved to be effective in patients with coronary heart disease and is strongly recommended by all of the international cardiovascular societies [2,4,18].

The involvement of nurses is a key element in the primary and secondary prevention of CVDs [19-21]. Nurse-led health education programmes increase the patients' awareness and understanding of a disease and its treatment, and improve their expectations concerning their health [22], thus favouring treatment compliance [7,9,10,22,23]. Even relatively brief, individualised interventions [24-26] based on multiple methods (e.g. direct contact, printed booklets, and the use of audio-visual aids) can lead to self-care behaviours [24], and may improve outcomes [25,26] even in the long term [27].

One major challenge when trying to improve health results in ACS patients is to implement multi-dimensional, structured nursing care pathways oriented towards therapeutic continuity



[28,29] because the limitations of many programmes include the partial nature of their goals (e.g. concentrating on only one or just a few classic risk factors) and the lack of structured healthcare instruments whose efficacy has been demonstrated in terms of outcomes. For example, the Global Secondary Prevention Strategies to Limit Event Recurrence after Myocardial Infarction study does not propose a nursing care model for managing patients during follow-up or describe the changes in nursing care activities generated by the training, and the RESPONSE study [31] did not specify whether or not the healthcare professionals had participated in a special training programme, and therefore does not describe what the content of such a programme might have been or what method was used. Finally, the paper describing the principal results of the EUROACTION study [10] does not mention the training of nurses, the nursing model and instruments used, or any collaboration with other professionals such as psychologists or dieticians.

The GOSPEL study (the only trial measuring the clinical effects) failed to demonstrate any beneficial effect on its primary composite endpoint of cardiovascular mortality, non-fatal MI, non-fatal stroke, and hospitalisation due to angina pectoris, heart failure, or urgent revascularisation [7] mainly because of recruitment bias (a relatively young and low-risk population with recent MI within three months of routine referral to a cardiac rehabilitation centre) and a loss of power due to the fact that a large proportion of the patients were lost to follow-up and/or dropped out.

Our study is the first to evaluate the use of an innovative nursing instrument aimed at maximising the potentially great contribution that nurses can make to CV secondary prevention. Based on a multi-disciplinary approach, it allows a multi-dimensional assessment that takes into account bio-clinical and psycho-socio-relational factors, and thus responds to four major healthcare needs: 1) to assess risk factors and treatment compliance in ACS patients by means of standardised parameters based on scientific evidence; 2) to identify disease-related problems and factors predicting noncompliance by means of narrative interviews that allow the personalisation of subsequent interventions; 3) to maintain continuity of care between hospital and home with the aim of improving health outcomes by increasing treatment compliance and reducing the incidence of re-infarctions and re-hospitalizations as a result of multiple follow-up visits; and 4) to overcome the known limitations of concentrating exclusively on bio-clinical findings and ignoring psycho-socio-relational factors by evaluating the efficacy of an instrument in terms of its effects on nursing practices in various operational contexts.

The inclusion of the MNF in a 5-year clinical trial will make it possible to assess whether the patients treated using the form's underlying model of integrated care leads to better health outcomes than those obtained using traditional standards of care. The trial incorporates all of the elements that have been shown to be most effective in meta-analyses, [5,32-37] and can be expected to provide a clinical benefit in terms of a lasting improvement in risk profiles.

### Conclusions

The ALLEPRE trial is the first to test a structured, fully nurse-led, intensive secondary prevention programme based on a broad multi-disciplinary network of primary care and hospital nurses in a large population of high-risk ACS patients in Emilia-Romagna (which is sufficiently representative of Italy as

a whole) by evaluating its clinical efficacy on major endpoints and its feasibility and impact on the regional healthcare system. Its two main limitations are that it is an open-label trial that may lead to a risk of ascertainment bias (although this should be mitigated by the activities of the Clinical Event Committee), and the fact that the patients in the control group follow heterogeneous prevention programmes that depend on the policies of their individual hospitals, but this simply reflects real world heterogeneity.

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