



Clinical Paper

Prodromal symptoms and health care consumption prior to out-of-hospital cardiac arrest in patients without previously known ischaemic heart disease[☆]



Henrik Höglund^a, Jan-Håkan Jansson^b, Ann-Sofie Forslund^c, Dan Lundblad^{a,*}

^a Department of Public Health and Clinical Medicine, Sunderby Research Unit, Umeå University, Sweden

^b Department of Public Health and Clinical Medicine, Skellefteå Research Unit, Umeå University, Sweden

^c The Northern Sweden MONICA Myocardial Registry, Department of Research, Norrbotten County Council, Luleå and Department of Health Science, Division of Nursing, Luleå University of Technology, Sweden

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ABSTRACT

Aims: To describe prodromal symptoms and health care consumption prior to an out-of-hospital cardiac arrest (OHCA) in patients without previously known ischaemic heart disease (IHD).

Background: The most common lethal event of cardiovascular disease is sudden cardiac death, and the majority occur outside hospital. Little is known about prodromal symptoms and health care consumption associated with OHCAs.

Design: Case-crossover study.

Methods: Medical records of 403 OHCA cases without previously known IHD, age 25–74 years in the MONICA myocardial registry in Norrbotten County 2000–2008, were reviewed. Presenting symptoms and emergency visits at public primary care facilities and internal medicine clinics in Norrbotten County were analyzed from the week prior to the OHCA and from the same week one year previously, which served as a control week. Unlike most studies we included unwitnessed arrests and those where no cardiopulmonary resuscitation (CPR) was attempted.

Results: Emergency visits were more common during the week prior to the OHCA than during the control week, both for visits to primary care (29 vs. 6, $p < 0.001$) and to internal medicine clinics (16 vs. 0, $p < 0.001$). Symptoms were more prevalent during the week prior to the OHCA (36.7 vs. 6.7%, $p < 0.001$). The most prevalent symptoms were chest pain (14.6 vs. 0%, $p < 0.001$), gastrointestinal symptoms (7.7 vs. 1.2%, $p < 0.001$) and dyspnoea/peripheral oedema (6.9 vs. 0.2%, $p < 0.001$).

Conclusions: Patients who suffer an OHCA seek health care and present prodromal symptoms significantly more often the week prior to the event than the same week one year earlier.

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1. Introduction

Cardiovascular disease is the leading cause of death world-wide and is projected to remain so in the future.¹ The most common lethal event of heart disease is sudden cardiac death, and for many victims cardiac arrest is also the first overt manifestation of heart disease.^{2,3} Cardiac arrest occurs most often outside of the hospital setting.² The most common cause of cardiac arrest is ischaemic

heart disease (IHD),^{2,4} although studies have shown that 40–60% of coronary heart disease (CHD) deaths have had no prior history of CHD.^{5–7} Furthermore, the proportion of cardiac arrests occurring without known CHD has increased in northern Sweden between 1989 and 2007.⁷ It is difficult to assess the incidence and survival rates for OHCA because different studies use varying criteria and outcomes. Furthermore, many studies have only included patients who were assessed by emergency medical services.^{8–10} Survival rates at 28 days after the event are below 3% in Northern Sweden when cases in which no CPR was performed were included in the study.⁷

Not much has been published describing symptoms or health care consumption prior to an OHCA in patients without previously known IHD. Many of those who have suffered an OHCA did not have previously known cardiovascular disease,^{3,7,11} and therefore

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* Corresponding author at: Department of Internal Medicine, Sunderby Hospital, SE-97180 Luleå, Sweden.

E-mail address: Dan.Lundblad@nll.se (D. Lundblad).

they had not been followed regularly by health care providers as are patients with known IHD. There are some studies, which have approached the subject of prodromal symptoms in OHCA cases, and they have shown certain symptoms to be common before a cardiac arrest.^{5,6,12} In those studies different methods were used, and almost all studies included only cases where CPR was attempted, thereby missing many OHCA patients.⁸ Identifying possible characteristics in OHCA patients without previously known IHD is of vital importance to combat a condition that carries such a poor prognosis.^{2,6,7,11,13} Identification of patients at risk is the first step towards possibly finding a way to prevent sudden cardiac arrest. The aim of the present study was to describe prodromal symptoms and health care consumption during the week prior to the OHCA – including unwitnessed events and when no cardiopulmonary resuscitation (CPR) was performed.

2. Materials and methods

2.1. Patients

All patients registered from 2000 to 2008 in the northern Sweden MONICA myocardial registry were included based on the following inclusion criteria: 25–74 years of age, resident in Norrbotten county, had an OHCA, and had no history of known or treated chronic IHD prior to the event. OHCA was defined according to WHO MONICA criteria: “If the patient collapsed apparently lifeless, or is found dead outside hospital, or if the first medical record on arrival at hospital shows that the patient was in cardiac arrest on arrival. Cardiac arrest does not have to be witnessed or confirmed by electrocardiographic evidence”.

2.2. Study design

Data concerning design, registration procedure and the validation process for myocardial infarction (MI) diagnosis in the WHO MONICA project have been published elsewhere.¹⁴ The validation includes medical history, clinical symptoms, cardiac biomarkers and electrocardiography (ECG) in the same way for both fatal and non-fatal events. Non-fatal events are validated and registered as definite MI. For fatal events necropsy reports and death certificates are also used, and fatal events are registered as definite MI or possible MI. Based on the original WHO protocol, non-fatal events were defined as being alive at 28 days after the onset of symptoms in relation to the OHCA. In our registry there were 420 patients with OHCA of which 403 cases had sufficient information in their medical records. The 403 cases included 279 with definitive or probable MI aetiology to their OHCA and which were validated using MONICA diagnostic criteria (OHCA-V). In 124 cases, OHCA-V diagnosis criteria could not be fulfilled due to insufficient data.

2.2.1. Emergency care visits

Medical records were checked for any emergency care visits at a public primary care facility and at all internal medicine clinics in Norrbotten County within one week prior to the OHCA and during the same week one year prior to the OHCA, which served as the control week. The purpose of this was to identify differences in health care consumption and to avoid confounding variables, such as differences in life-style and overall health if just an age-matched control would have been used. The number of visits during each of these two weeks was recorded. Emergency visits where the patient himself actively sought health care for any symptom were registered. A visit was defined as any physical visit at a health care facility, and all visits were registered. If a patient visited health care facilities or internal medicine clinics outside the study area this was not registered. Furthermore, the patients did not have

to present with symptoms overtly related to heart disease or the cardiovascular system in general.

2.2.2. Symptom presentation

For each patient, symptoms presented during the week preceding OHCA were also recorded, irrespective of whether or not they were associated with a health care visit. Symptoms were described either by the patient or by health care personnel/relatives/witnesses. The data concerning symptoms in these latter instances was compiled from the notes in the medical records of the patient, which means that they were always indirectly described by the doctor or nurse who wrote the medical record. A typical scenario involved a relative who told the doctor on site that the patient had not been feeling well or that the patient had been in telephone contact with a doctor or nurse and mentioned some symptom. Reports, that were received from friends or acquaintances after the patient had died, that were not associated with a health care visit, were also recorded. Symptoms gathered in the control week one year before OHCA were extracted from medical records from primary care facilities and internal medicine clinics. These records described either a health care visit, a home- or care centre visit or a telephone contact. The symptoms were categorized as: chest pain, palpitations, pre-syncope, dyspnoea/oedema, fatigue, headache, fever/infection, gastrointestinal symptoms, anxiety, other pain, and other symptoms. This selection was based on the most common findings in previous similar studies.^{5,6,12,15} The severity of the symptoms was not assessed. The number of reported symptoms varied from none to all of the above symptoms for each patient. A separate variable was created to record if a patient had at least one of the reported symptoms.

3. Statistical analysis

A case-crossover design¹⁶ was used where each individual experiencing a health event served as his/her own reference meaning that each individual acted as his/her own control. This study design has been used for other OHCA studies.^{17,18} In our study the week instantaneously preceding the event (OHCA) was the case week during which health care consumption and symptoms were registered and the same week one year before was the control week. Significance tests were performed for differences in health care consumption and for symptoms the week before the OHCA and the week a year earlier. Wilcoxon signed-rank test was used to compare health care consumption. McNemar's test for paired samples was used for symptoms. The Mann-Whitney test was used to compare health care consumption between sexes, and differences in symptoms between sexes were analyzed with the χ^2 -test. For all significance tests, $p < 0.05$ was considered significant. All of the analyses were performed using IBM SPSS Statistics, version 20. Approval for the study was obtained from the Regional Ethical Board.

4. Results

4.1. Characteristics (Table 1)

The final study population comprised 403 patients, and the characteristics of the study population are found in Table 1. There were 75% men and 25% women, and the mean age was 63 years (62 for men, 64 for women), ranging from 30 to 74 years. Of the entire 403 patients only 16 survived beyond 28 days. The cause of OHCA was definitive or probable MI (OHCA-V) in 279 (69.2%). In the remaining 124 cases the diagnosis was not established. Of the total 403 cases, less than half were never attended to by an ambulance team but

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