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Review

Telemedicine for cardiovascular disease continuum: A position paper from the Italian Society of Cardiology Working Group on Telecardiology and Informatics ☆

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ABSTRACT

Telemedicine is the provision of health care services, through the use of information and communication technology, in situations where the health care professional and the patient, or 2 health care professionals, are not in the same location. It involves the secure transmission of medical data and information, through text, sound, images, or other forms needed for the prevention, diagnosis, treatment, and follow-up of a patient.
First data on implementation of telemedicine for the diagnosis and treatment of acute myocardial infarction date from more than 10 years ago. Telemedicine has a potential broad application to the cardiovascular disease continuum and in many branches of cardiology, at least including heart failure, ischemic heart disease and arrhythmias. Telemedicine might have an important role as part of a strategy for the delivery of effective health care for patients with cardiovascular disease.
In this document the Working Group on Telecardiology and Informatics of the Italian Society of Cardiology intends to remark some key-points regarding potential benefit achievable with the implementation of telemedicine support in the continuum of cardiovascular disease.

1. Introduction

Telemedicine is the provision of health care services, through the use of information and communication technology, in situations where the health care professional and the patient, or 2 health care professionals, are not in the same location [1]. According to the World Health Organization, telemedicine is defined as "the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities" [2].

It involves the secure transmission of medical data and information, through text, sound, images, or other forms needed for the prevention, diagnosis, treatment, and follow-up of a patient.

Telecardiology applications can be categorized as pre-hospital, in-hospital and post-hospital. The major purpose of pre-hospital 12-lead electrocardiographic diagnosis is the early detection of acute myocardial infarction with ST-segment elevation and the communication of that information to the receiving emergency physician before the arrival of the patient [3]. In-hospital telecardiology is used between small hospitals in rural regions and main hospitals, with the aim to improve access to echocardiography diagnoses in the intensive care unit, emergency room and newborn nursery. Post-hospital applications include teleconsulting between general practitioners and specialists, home telenursing for chronic cardiac diseases and the diagnosis of arrhythmias.

First data on the implementation of telemedicine for the diagnosis and treatment of acute myocardial infarction date from more than

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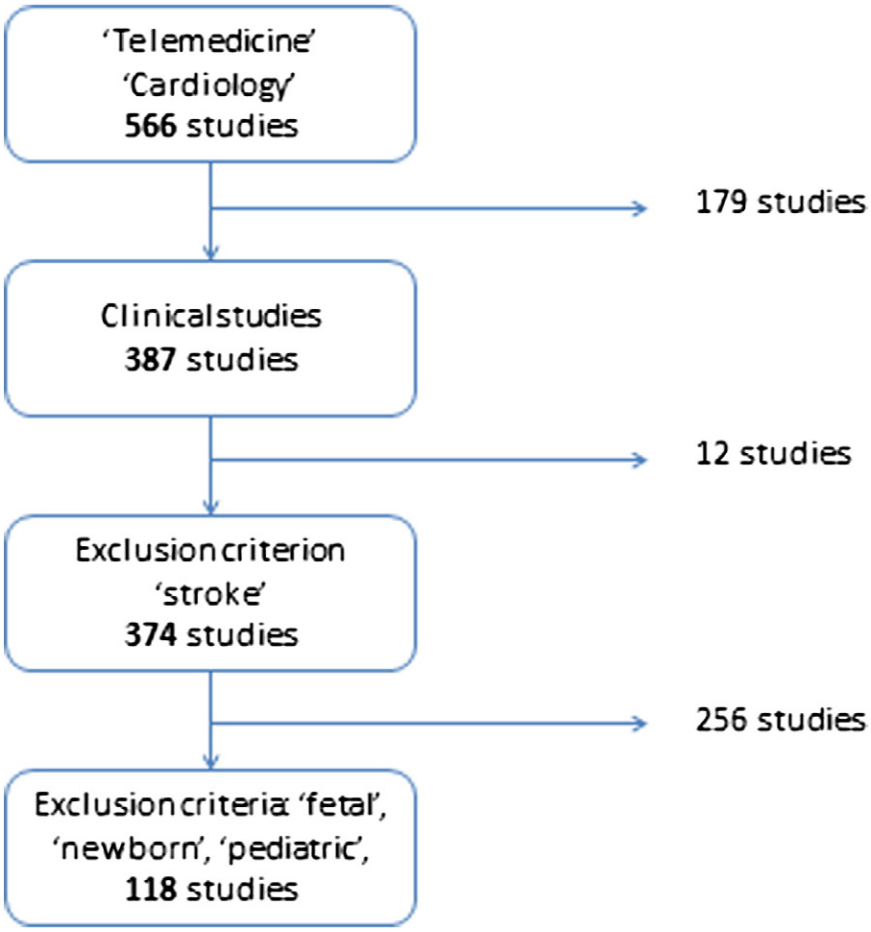

Fig. 1. Study selection.

10 years ago [4]. Studies on the transmission of electrocardiograms from a moving ambulance were reported even before [5]. Up to July 1, 2014 more than 540 references could be retrieved from a PubMed research by typing the key-words "telemedicine" and "cardiology" [6].

In this document the Working Group on Telecardiology and Informatics of the Italian Society of Cardiology intends to remark some key-points regarding potential benefit achievable with the implementation of telemedicine support in the continuum of cardiovascular disease. The present study does not aim to be a comprehensive review nor to summarize all the available literature on the topic of telemedicine support for cardiologists. Therefore, the aim of this Position Paper by the Italian Society of Cardiology Working Group on Telecardiology and Informatics is to provide recommendations for an aware use of telemedicine support in every-day practice for cardiologists, with the aim of increasing the likelihood of success in translating these new technologies into improved clinical outcomes.

2. Methods

2.1. Data sources and searches

The PubMed database was systematically searched for studies published from January 1990 through December 2014. Our PubMed search query was 'telemedicine' and 'cardiology' or 'telecardiology' or 'pre-hospital electrocardiogram', specifically focusing on title/abstract (Fig. 1).

All references from selected studies were therefore assessed for relevant articles.

2.2. Selection criteria

Studies retrieved from the preliminary database search were examined: studies focusing on pregnancy pediatric cardiology or including the term 'newborn', 'pregnancy', 'pediatric', or 'fetal' were excluded from the study. Non-clinical studies not involving humans and patients were also excluded. Studies on stroke diagnosis and treatment were excluded. Original studies were preferred over review papers.

We have restricted the citations to, in our view, the most relevant and informative publications (Table 1).

3. Telemedicine for primary and secondary prevention of cardiovascular disease

Telemedicine support was used for the early diagnosis of cardiovascular disease. Several studies addressed the feasibility of remote support by a cardiologist for general practitioners [7,8]. Telemedicine could be a useful tool in the diagnosis of chest pain in primary care. When two-hundred general practitioners were equipped with a portable electrocardiograph which could transmit a 12-lead electrocardiogram via a telephone line and a cardiologist was available 24 h a day for an interactive tele-consultation, the telecardiology service showed a sensitivity of 97.4%, a specificity of 89.5% and a diagnostic accuracy of 86.9% for the assessment of chest pain [9].

A telecardiology service may provide a useful tool in the home management of chronic atrial fibrillation and in the first detection of new cases of atrial fibrillation [10]. Telemedicine is particularly useful in