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Letter to the Editor

Impact of telemedicine support by remote pre-hospital electrocardiogram on emergency medical service management of subjects with suspected acute cardiovascular disease

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The use of pre-hospital triage with electrocardiogram is recommended in any case of suspected acute coronary syndrome or acute cardiovascular disease [1]. Pre-hospital 12-lead electrocardiogram in the case of suspected acute myocardial infarction has been advocated and recommended by guidelines [2,3] and scientific statements [4]; however, its use is still low [5].

Pre-hospital electrocardiogram is particularly useful when primary angioplasty with direct referral for primary angioplasty by-passing emergency room (ER) should be performed in subjects with ST-elevation acute myocardial infarction (STEMI). Pre-hospital triage with electrocardiogram [6] and tele-medicine support [7,8] may be useful in shortening time to reperfusion, as documented in a series of networks for the treatment of STEMI [9,10].

Telemedicine support may facilitate the implementation of pre-hospital triage by electrocardiogram [11–14]. Telemedicine support by a cardiologist interpreting remote pre-hospital electrocardiogram may improve the accuracy of electrocardiogram interpretation of automated algorithms and paramedics.

We aimed to report in this study the perceived impact of remote telemedicine support for pre-hospital electrocardiogram triage in emergency medical service (EMS) staff personnel.

A regional EMS service (1-1-8, the Italian corresponding for 9-1-1) is currently active in Apulia, Italy, a region with 4-million inhabitants, with the support of a telemedicine hub located in Bari, the capital city of Apulia [15]. The region is covered by a single public health care service, a single public EMS, and a single tele-medicine service provider. A regional network for primary angioplasty in STEMI was also started in Apulia in January 2012 [16].

The telephone number 1-1-8 is the Italian public free service for general medical or surgical emergencies, whose aim is an immediate diagnosis of critical diseases in order to avoid emergency room delay-to-diagnosis. Final hospitalization is arranged by teams of physicians and 1-1-8 district central, connected by mobile phone: direct admission to a critical care unit is arranged according to the level of care. Patients are discharged from the ambulance and not transported at all in case of normal findings. According to Italian legislation, 1-1-8 crews usually include a physician skilled in emergency medicine and/or nurses and electrocardiogram should be preferably read by a cardiologist.

All crews of regional 1-1-8 EMS (N = 154) are therefore equipped with a CardioVox P12 12-lead electrocardiogram recorder (Aerotel™, Holon, Israel): the devices may record a complete 12-lead ECG which is read by a cardiologist available 24/7 after (mobile-)telephone transmission to a unique regional telemedicine support "hub", located in Bari, capital city of Apulia. 1-1-8 personnel (paramedics and physicians) may be shown back ECGs on smart-phones connected with tele-cardiology hub [17]. Logistic support for telemedicine hub was provided by Cardio-online Europe S.r.l., Bari, Italy. A cardiologist available 24/7 within tele-cardiology hub promptly interprets the electrocardiograms

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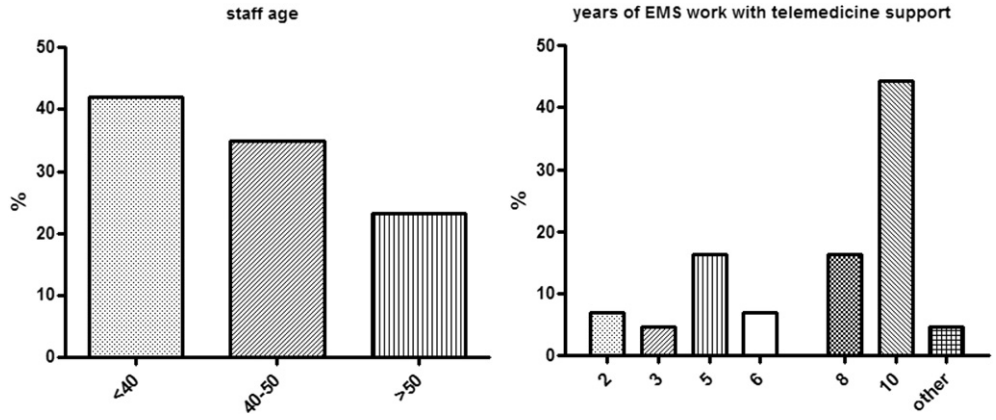

Fig. 1. Emergency medical service 118 staff personnel age and years of experience with telemedicine pre-hospital electrocardiogram support.

sent by EMS personnel from all over Apulia. In case of STEMI, the patients are immediately addressed to the nearest cath-lab for the appropriate treatment.

Fifty consecutive EMS 118 staff personnel randomly selected in the Bari/Barletta/Andria/Trani districts in Apulia were enrolled in the study. A questionnaire with 19 items exploring age, gender, personal qualification (paramedic, physician), years of use of telemedicine pre-hospital electrocardiogram support, town's population and ER prompt availability, personal satisfaction with telemedicine electrocardiogram support, individual indications to pre-hospital telemedicine electrocardiogram adopted in everyday clinical practice, and clinical impact on hospitalization decisions and diagnoses possibly changed after pre-hospital telemedicine electrocardiogram was administrated to all participants in the study.

The study was authorized by local Health Authority and agrees with the declaration of Helsinki.

Continuous variables were reported as mean ± standard deviation and compared with Student's t-test or ANOVA, dichotomic variables as percentages and compared with χ^2 test. Correlations were tested with Pearson's test.

A p value < 0.05 was considered as statistically significant.

Questionnaires were returned in 43 subjects of 50 interviewed. Mean age of subjects enrolled in the study was 44 ± 7 years, 72% of EMS 118 staff were males; 42% were younger than 40-year old, 35%

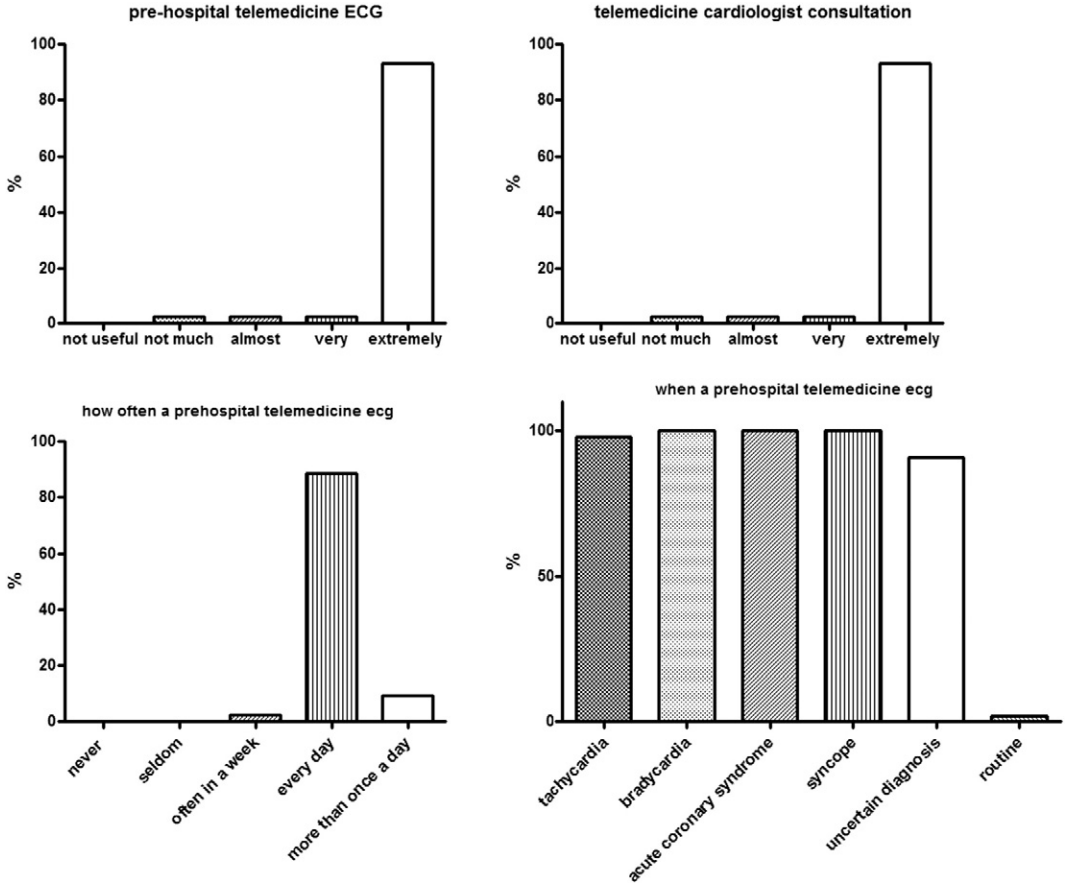

Fig. 2. Emergency medical service staff personnel appreciation of telemedicine pre-hospital electrocardiogram support and remote cardiologist consultation (upper panel). Frequency and indications to telemedicine pre-hospital electrocardiogram by suspected acute cardiovascular disease (lower panel).