Telecardiology Assessment and Cardiovascular Prevention in Italian Police Officers

Law enforcing and city patrolling is an extremely challenging task; police officers (PO), however, must face one more risk than everyday activities on the street: the cardiovascular risk. In a study on over 17,000 workers enrolled in law enforcement personnel, this occupational condition was associated with an increased risk of developing cardiovascular disease and cardiovascular risk factors.[1] Epidemiological studies show in security workers higher risk of cardiovascular morbidity and mortality, higher prevalence of risks factors including hypertension, hyperlipidaemia, metabolic syndrome, cigarette smoking and a sedentary lifestyle, obesity.[2]

Hence, the need for initiatives of active cardiovascular prevention in PO and security workers. In this perspective, telemedicine support may contribute to delivering of cardiovascular prevention strategies.[3,4] We, therefore, assessed in a pilot study the feasibility end the efficacy of cardiovascular prevention screening by remote telemedicine support in Italian PO.

One hundred consecutive POs serving in the National Police Department of Foggia, Italy, were enrolled in the study and underwent evaluation cardiovascular examination. Levels of blood pressure, cholesterol levels, glycemia, drug therapy, and remote telemedicine electrocardiogram were assessed and recorded. Cardiovascular risk factors control was compared with international guidelines in order to assess compliance with guidelines and awareness of cardiovascular risk and risk factors.[5,6] Individual cardiovascular risk was calculated according to European Society of Cardiology risk score.[5]

Cardiovascular screening was performed by National Police medical personnel, telemedicine remote electrocardiogram through regional telemedicine service. National Police medical personnel recorded electrocardiograms in Foggia whereas electrocardiograms were sent for interpretation and remote consultation in Bari, 150 km from Foggia. Since 2004 regional public emergency medical service (EMS, 118) in Apulia, Italy, is able to perform prehospital triage by telemedicine electrocardiogram as described elsewhere.[7,8] Prehospital electrocardiograms from the whole regional territory of Apulia are sent and interpreted by a regional telemedicine dispatch centrally located in Bari, regional capital city, which disposes for direct transfer in case of acute myocardial infarction: nearest cathlab is alerted by EMS dispatch central. Telemedicine consultation does not imply visual contact. Since 2015 the telemedicine service was further improved by an entirely digitalized system of electrocardiogram transmission and registration.[9] Twelve-lead electrocardiograms are recorded, digitally encrypted and transmitted by 4G network with a Touch ECG HD+ Digital System (Cardioline, Milan, Italy) recorder. Telemedicine dispatch central cardiologists immediately interpreted electrocardiograms and provided telemedicine consultation. An informed consent to personal data transmission, analysis, and storage was given by all participants according to current personal data protection laws.

Seventeen percent of screened police personnel were female, mean age was 51 ± 5 years, 20% of subjects were less than 30 years old. Prevalence of cardiovascular risk factors is given in Figure 1. Mean systolic arterial blood pressure was 135 ± 16 mm Hg, mean diastolic 83 ± 10 mm Hg. Forty-three percent of PO showed nonoptimal blood pressure levels, but only 17% were aware of their hypertensive condition; 76% of hypertensive subjects at cardiovascular screening were not on treatment with antihypertensive drugs. Hypertensive subjects assuming drug therapy did not reach the targets recommended by the guidelines (<130/80 mm Hg) in 77% of cases. The obese and male had higher blood pressure values (142 ± 15 vs 132 ± 16 mm Hg, 89 ± 10 vs 81 ± 9 mm Hg, 137 ± 16 vs 127 ± 14 mm Hg, 85 ± 9 vs 77 ± 12 mm Hg, respectively $p < 0.05$).

The mean waist circumference was 99 ± 15 cm and the mean body mass index was 27 ± 4. Sixty-six percent had a body mass index >25 and 25% >30. One third of POs were obese, much male than female (37% vs 19%). Twenty-one percent was smoker but 55% performed regular physical activity.

The mean values of total cholesterol were 178 ± 39 mg/dl, high-density lipoprotein 53 ± 14 mg/dl, low-density lipoprotein 103 ± 37 mg/dl. Twenty-seven percent had total cholesterol levels >200 mg/dl, 39% low-density lipoprotein levels >115 mg/dl, but only 18% declared to be hypercholesterolemic (Figure 2); of these 37% were not at the target as recommended by guidelines.

Eleven percent had impaired fasting glucose levels, declared diabetics (non −insulin-dependent) were 6%. Of the patients with impaired fasting blood glucose levels, only 5 knew about it and one of these was not at the target recommended by guidelines.[10]

The mean cardiovascular risk according to ESC score was 3% (intermediate); 22% had a significant cardiovascular risk levels requiring careful prevention interventions (>5% at 10 years, Figure 3) but 66% showed intermediate levels of cardiovascular risk according to ESC score (1% to 5%). Cardiovascular risk was higher in male than in female (4% ± 2.2% vs 1.6% ± 1.0%, $p < 0.001$).

In 57% of cases remote telemedicine electrocardiogram was normal, in 41% just minor anomalies were found requiring nonurgent cardiologist evaluation, 2% of cases revealed findings requiring urgent cardiologist contact (Figure 4); in one case an unstable angina was diagnosed and an urgent coronary angioplasty required (Figure 5). Minor anomalies found at

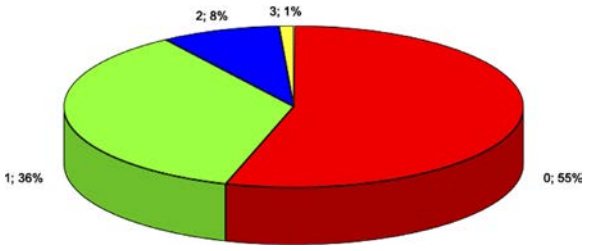

Figure 1. Prevalence of cardiovascular risk factors in the population of police officers enrolled in the study: red, none; green, 1; blue, 2; yellow, 3. (Color version of figure is available online.)

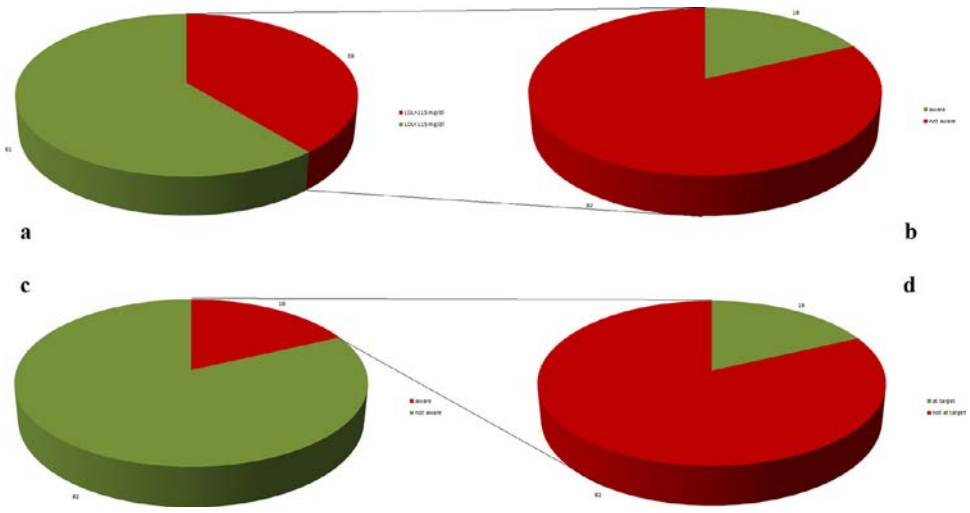

Figure 2. *(A)* Prevalence of increased levels (>115 mg/dl) of LDL cholesterol in the population of police officers. *(B)* Subjects with cholesterol levels >115 mg/dl aware of their condition of hypercholesterolemia. *(C)* Subjects declaring as hypercholesterolemic. *(D)* subjects declaring as hypercholesterolemic with LDL cholesterol levels <115 mg/dl.

remote telemedicine electrocardiogram were sinus bradycardia/tachycardia (16%) and ST strain (19%). Two cases of suspected left ventricular hypertrophy, 1 case of I-degree arterioventricular block, 2 cases of suspected ischemic heart disease were also found.

To the best of our knowledge, this is the first study showing the feasibility of cardiovascular risk prevention in security workers supported by telemedicine. Control and awareness of cardiovascular risk is unsatisfactory in Italian PO, but telemedicine support may facilitate interventions of cardiovascular prevention and early diagnosis of cardiovascular disease. We found very high levels of cardiovascular risk in Italian PO, further confirming the need for careful initiatives aimed at reducing such levels of risk with lifestyle changes and, when required, drug therapy. Also therapy adherence and compliance with international guidelines require radical improvements.

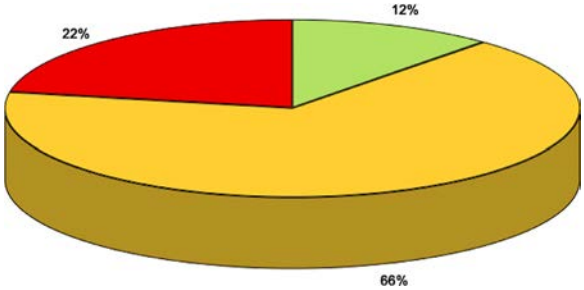

Figure 3. Cardiovascular risk classes according to ESC score: Green <1% low risk, orange 1-5% moderate risk, red 5% to 10% high risk. (Color version of figure is available online.)

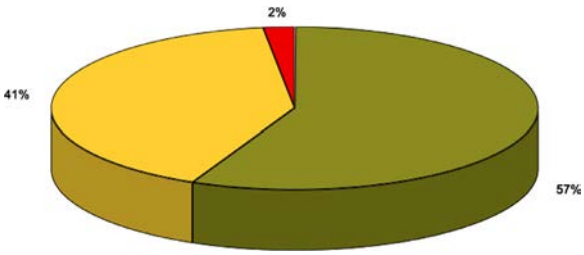

Figure 4. Remote telemedicine electrocardiogram findings: Green normal, not requiring any further evaluation; orange minor findings not requiring urgent evaluation; red findings requiring urgent evaluation by a cardiologist. (Color version of figure is available online.)

Cardiovascular disease is the main cause of death in the middle aged and older adults in most European countries. Lifestyle interventions and risk factor modifications, however, can effectively reduce cardiovascular morbidity and mortality.[11] Smoking cessation, healthy food choice, increased physical activity, control of blood pressure, cholesterol, and diabetes, and the selective use of prophylactic drug therapies may reduce the risk of recurrent nonfatal and fatal disease, and improve survival.[12] Stress is also ubiquitously present but invisible enemy of cardiovascular system.[13] Sources of stress can be multifactorial as stress may be the result of traumatic life events or work demands.

Police work is known to be a physically and psychologically demanding job.[14] Law enforcement personnel represent one of main risk working categories for symptomatic cardiovascular diseases. These events may occur either during the individual's profession career or become clinically evident only after retirement. The health and wellness of law enforcement personnel impact not only the affected individual but also have implication for public safety.[15]

Data compiled by the National Law Enforcement Officers Memorial Fund over the 10-year period of 2000 to 2010 (2001 excluded because of the September 11 attacks) indicates that approximately 7% of occupational deaths in law enforcement personnel were the

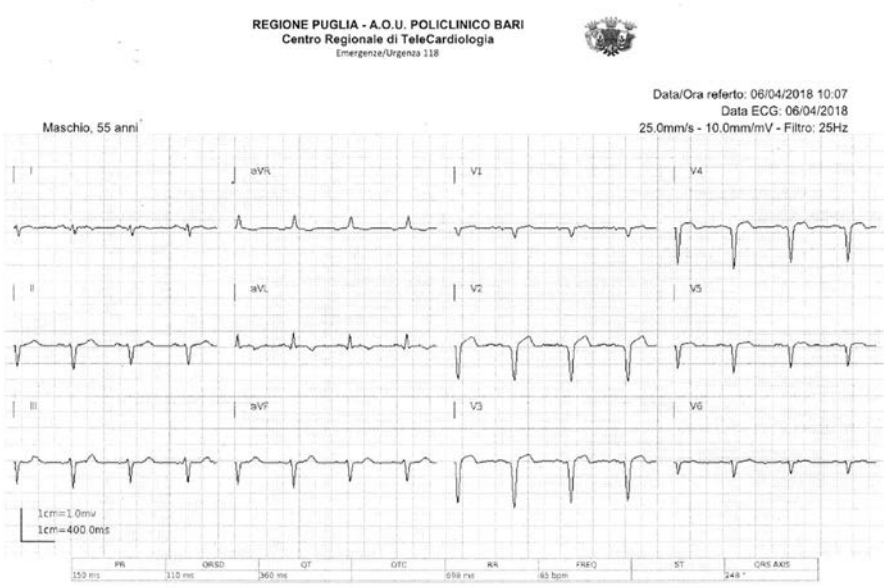

Figure 5. Telemedicine electrocardiogram showing QS wave and ST anomalies in anterior leads; the patient was referred for urgent coronary angiography in the absence of previously known coronary disease.

result of fatal heart attack.[16] Early studies based on 1950s US census data suggested that the death rate in POs from atherosclerotic heart disease was higher than that of other occupation.[17] Data from literature showed that POs exposure to stress was associated with hypertension, obesity, dyslipidemia, impaired glucose metabolism, and metabolic syndrome.[18]

Despite such very high cardiovascular risk profile characterizing policemen and security workers, their awareness, therapy and control of cardiovascular risk factors are actually unsatisfactory. A significant number of PO with cardiovascular risk factors did not achieve targets recommended by the international guidelines despite drug therapy.

Our results are in line with the evidence coming not only from international studies evaluating the quality of cardiovascular prevention[19–21] but also from the same regions of southern Italy. The CAPITAL study (Cardiovascular Prevention with Telecardiology in Puglia)[22] was based on the assessment of cardiovascular risk and compliance to guidelines on cardiovascular prevention, and on an electrocardiogram screening with remote telemedicine support performed in pharmacies of Apulia: 37% of the patients enrolled in the study and treated with antihypertensive drugs did not achieve the target levels and 60% of subjects treated with lipid-lowering drugs did not achieve the target levels.

Other studies assessed in the same region, Apulia, efficacy of telemedicine support in acute myocardial infarction,[23] atrial fibrillation,[24] elderly,[25] and syncope.[26] Studies were held in primary prevention also in school students,[27] young sport practicing,[28] and prison detainees.[29]

In the general population, therefore, telemedicine support and pharmacy-based assessment may be helpful in implementing strategies aimed at the improvement cardiovascular prevention. Very few data, however, are available on the application of telecardiology in a military[30] or navy context.[31–34] Military helicopters have been used for the transfer of patients in large telemedicine networks for the treatment of acute myocardial infarction; a fully integrated telemedicine support, however, has been significantly implemented just in the US army. Fighter pilots had the highest rates of acute myocardial infarction and chronic ischemic heart disease; results showed among US Navy pilots, that they were more than 3 years younger at the time of cardiovascular disease onset then other officers.

Very few data, however, is available on cardiovascular prevention in security workers and especially POs. Our findings may therefore support the use of telemedicine support for primary prevention and early diagnosis of cardiovascular disease.

In conclusion, control and awareness of cardiovascular risk is unsatisfactory in Italian police officers. Telemedicine support may facilitate interventions of cardiovascular prevention and early diagnosis of cardiovascular disease. This is an observational pilot study not intended at demonstrating significant reduction in adverse cardiovascular events by prevention strategies or interventions.

Disclosures

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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27 June 2020
17 July 2020

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https://doi.org/10.1016/j.amjcard.2020.07.028

Duration of $P2Y_{12}$ inhibitor Prescription After Percutaneous Coronary Intervention in Patients on Oral Anticoagulants (from NCDR CathPCI Registry)

Patients on oral anticoagulation (OAC) undergoing percutaneous coronary intervention (PCI) are at high risk of bleeding while on dual antiplatelet therapy (DAPT). Recommendations on duration of antiplatelets in those patients are evolving. The purpose of this study was to examine the duration of $P2Y_{12}$ inhibitor prescription following PCI in patients on chronic OAC. The study linked the American College of Cardiology's National Cardiovascular Data Registry (ACC NCDR) CathPCI with Medicare Part D prescription claims to examine $P2Y_{12}$ inhibitor use in the 12 months following PCI in patients aged ≥65 years on chronic OAC discharged on aspirin between July 2009 and December 2013. Primary outcome was duration of $P2Y_{12}$ inhibitor use.