

ORIGINAL ARTICLE

Telecardiology on the Diagnostic Support of Chest Pain in Twenty-Two Emergency Care Units (UPA 24h) in The State of Rio de Janeiro

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Abstract

Background: Telecardiology may be a useful support in diagnosis and management of chest pain.

Objective: Evaluate the application of telecardiology to support the differential diagnosis of chest pain in patients admitted to Emergency Care Units.

Method: Observational, retrospective and documental study of 5,816 patients admitted with supposedly cardiologic chest pain in twenty two Emergency Care Units in the state of Rio de Janeiro. Data were tabulated and analyzed by Excel[®] software, using simple descriptive statistics, from the database of the Cardiology Consultancy Nucleus.

Results: Diagnostic disagreement was found in 1,593 (27.39%) cases. Of these, 1,477 (92.72%) were diagnosed locally as non-ST-elevation myocardial infarction (non-STEMI), 74 (4.64%) as acute myocardial infarction with ST-segment elevation (STEMI), 40 (2.52%) as acute pulmonary edema (APE) and 2 (0.12%) as tachyarrhythmia. Intensive care referral was requested to 100% of these patients. After telecardiology, the diagnoses were: 385 (24.17%) unstable angina, 289 (18.14%) congestive heart failure, 212 (13.31%) APE, 174 (10.92%) STEMI, 152 (9.54%) hypertensive emergency, 113 (7.09%) acute chronic renal failure, 89 (5.59%) non-STEMI, 89 (5.59%) pneumonia, 39 (2.45%) sepsis, 26 (1.63%) myopericarditis, 20 (1.26%) tachyarrhythmia and 5 (0.31%) aortic disease. The outcome after telecardiology was 1,178 discharges (73.94%), 338 (21.21%) referrals, 62 (3.90%) deaths and 15 (0.95%) unknown.

Conclusion: Telecardiology was effective in chest pain diagnosis and management, optimizing hospital admission in the public health system. (Int J Cardiovasc Sci. 2019;32(2):158-162)

Keywords: Telemedicine/methods; Chest Pain/diagnostic imaging; Emergency Medical Services; Electrocardiography/methods; Myocardial Infarction.

Introduction

Cardiovascular diseases are the leading cause of death in the world and were responsible for 32% of deaths on the planet by 2015.¹ In Brazil, as reported by the Mortality Information System - SIM - ischemic heart disease is the leading cause of death,² generating very high medical and socioeconomic expenditures to the public health system.³ In the United States of America, cardiovascular diseases have generated direct and indirect costs of more than 200 billion dollars to the health system with estimates of about US\$ 220 billion in expenditures by 2020.⁴

It is estimated that about 5% of patients with chest pain and myocardial infarction are mistakenly discharged without a confirmed diagnosis in the emergency room.⁵ Early diagnosis and treatment of ischemic heart diseases are critical for the reduction of morbidity and mortality, hospitalization time and optimization of costs in emergency care.³ Proper management and follow-up of these patients has been a priority for the public health system.⁶

The 24-hour Emergency Care Units (UPA 24h) emerged as part of Brazil's Emergency Policy program,

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which structures and organizes emergency care in the country. The UPA 24h are structures of intermediate complexity between the primary health care units and the chain of hospitals. In the state of Rio de Janeiro, the UPA 24h were implemented in 2007. According to the state's demand profile, there was a need for cardiology support to general practitioners working at the UPA 24h units in the care of patients with chest pain. In 2009, the Cardiology Consultancy Nucleus (CCN) was set up for the purposes of providing specialized remote assistance in the medical care for patients with cardiac disorders at these units.

The objective of this study is to evaluate the support of telecardiology in the diagnostic qualification of chest pain in twenty-two 24-hour Emergency Care Units (UPA 24h) in the state of Rio de Janeiro.

Methods

Study design

This is an observational, retrospective and quantitative study.

Study population

A study carried out with 9,692 patients evaluated by telecardiology, including 5,816 (60%) who were admitted with chest pain supposedly caused by a cardiac disorder, in twenty-two UPA 24h in the state of Rio de Janeiro. The information was extracted from the database of the Cardiology Consultancy Nucleus of the Health Department (SES) of the State of Rio de Janeiro, from January 1, 2012 to December 31, 2013.

Statistical Analysis

The categorical variables were tabulated and analyzed using the Excel software®, using simple descriptive statistics: absolute numbers, mean and frequency.

Collection and evaluation of data by the Cardiology Consultancy Nucleus

The purpose of the CCN was to answer questions and provide specialized advice to the diagnosis and decision-making of cardiac cases admitted by the general practitioner in the UPA. The general practitioner could request, whenever necessary, specialized support, based on the guidelines of the Brazilian Cardiology Society, as it related to the UPA 24h scenario.

Among all the information collected by the CCN about the patients admitted with chest pain, the following were important to support the differential diagnosis: sex, age, main complaint, time of onset of symptoms, comorbidities, electrocardiogram (ECG), laboratory tests and physical examination information.

At the first synchronous contact between the general practitioner and the telecardiologist, the latter collected the information reported and the initial diagnosis suggested by the UPA physician. The ECG was sent by fax or e-mail and immediately analyzed by the specialist. Based on this clinical, electrocardiographic and laboratory information (when laboratory tests were immediately required), the telecardiologist presented his/her diagnosis to the general practitioner and advised on the immediate management of the case. Therefore, all the information available for the clinical reasoning at the time of the teleconsulting was shared between the general practitioner and the telecardiologist.

Patient follow-up was performed by the CCN team through active search (by making daily calls to the UPA), assisting in the management of the cases until an outcome was reached. Once the telecardiologist issued an opinion, the patients who needed hospitalization were registered by the UPA in the State System of Regulation (SER) and/or in the city's system of regulation (Sisreg) for hospital transfer purposes.

All patients underwent double-blind peer evaluation by the CCN team of cardiologists with over 10 years of experience in cardiology. In none of the cases was there diagnostic disagreement among the specialists.

Results

The mean age found in the group of patients admitted with chest pain was 59.20 ± 11.33 years, with a predominance of the male gender (59.32%, $n = 3,450$).

The average length of stay in the UPA 24h was three days.

The main comorbidities reported were systemic arterial hypertension (49.87%; $n = 2,900$), diabetes mellitus (10.09%; $n = 587$), smoking (14.79%; $n = 860$), previous coronary artery disease (7.60%; $n = 442$), dyslipidemia (8.82%; $n = 513$), dilated cardiomyopathy (3.73%; $n = 217$), previous stroke (2.13%; $n = 124$), family history of coronary artery disease (2.13%; $n = 124$) and obesity (0.84%; $n = 49$).

Of the 5,816 patients admitted for chest pain supposedly due to cardiac disorders and evaluated by

the telecardiologist, there was diagnostic agreement with the general practitioner from the UPA 24h in 72.61% of the cases (4,223 patients) and diagnostic disagreement in 27.39% of the cases (1,593 patients).

In the group in which there was diagnostic disagreement, the general practitioner classified patients as follows: 1,477 (92.72%) non-ST-segment elevation acute myocardial infarction (NSTEMI), 74 (4.64%) ST segment elevation acute myocardial infarction (STEMI), 40 (2.52%) acute pulmonary edema (APE) and 2 (0.12%) tachyarrhythmia. After evaluation by telecardiology, the diagnoses were: 385 (24.17%) unstable angina (UA), 289 (18.14%) congestive heart failure (CHF), 212 (13.31%) APE, 174 (10.92%) STEMI, 152 (9.54%) hypertensive emergency (HE), 113 (7.09%) acute chronic renal failure (ACRF), 89 (5.59%) non-STEMI, 89 (5.59%) pneumonia, 39 (2.45%) sepsis, 26 (1.63%) myopericarditis, 20 (1.26%) tachyarrhythmia, 5 (0.31%) orovalvar disease (OVD). (Table 1).

Table 1 - Diagnosis of chest pain between the initial evaluation by the general practitioner and after the telecardiology

Diagnoses	General practitioner N (%)	Telecardiologist N (%)
Non-STEMI	1,477 (92.72)	89 (5.59)
STEMI	74 (4.64)	174 (10.92)
APE	40 (2.52)	212 (13.31)
Tachyarrhythmia	2 (0.12)	20 (1.26)
Unstable angina	0	385 (24.17)
CHF	0	289 (18.14)
Hypertensive emergency	0	152 (9.54)
ACRF	0	113 (7.09)
Pneumonia	0	89 (5.59)
Sepsis	0	39 (2.45)
Myopericarditis	0	26 (1.63)
OVD	0	5 (0.31)
Total	1,593	1,593

Non-STEMI: non-ST-elevation acute myocardial infarction; STEMI: ST-segment elevation acute myocardial infarction; APE: acute pulmonary edema; CHF: congestive heart failure; OVD: orovalvar disease; ACRF: acute chronic renal failure.

The general practitioner had requested intensive care admissions for the 1,593 patients identified by telecardiology as discordant diagnoses. After a careful evaluation by telecardiology, only 338 patients really needed to be transferred, and the great majority, 1,178 patients (73.94%), were discharged after clinical stabilization. Sixty-two (3.9%) patients died and 15 (0.95%) had an unknown outcome (Table 2).

The main points of diagnostic disagreement identified by telecardiology are described in the following table.

Discussion

By analyzing the results found in this study, we observed the importance of telecardiology in remote

Table 2 - Outcome of patients with chest pain after evaluation by telecardiology

Outcome after telecardiology	N	%
Discharge	1,178	73.94%
Transfer	338	21.21%
Death	62	3.90%
Unknown	15	0.95%
Total	1,593	100%

Table 3 - Main points of diagnostic disagreement between the general practitioner and the telecardiologist

Points of diagnostic disagreement	N	%
CPK/CKMB elevation with normal troponin	1,059	66.48
Troponin interpretation curve	305	19.15
Electrocardiography	227	14.25
Exclusive clinical evaluation	2	0.12
Total	1,593	100

Key: CPK: creatine phosphokinase; CKMB: MB fraction of creatine phosphokinase.

support to the general practitioner in the differential diagnosis of chest pain at the emergency care, directly influencing proper diagnosis, treatment and referral of the patients.

The importance of cardiological remote support for diagnosis and clinical management has been described by other authors^{7,8} and Molinari et al.,⁹ that evaluated 456 patients with chest pain and/or other symptoms suggestive of an acute cardiac event, comparing the initial diagnosis of the general practitioner with the final diagnosis of the cardiologist. In this study,⁹ two points stand out in our findings: the first one is the high percentage of diagnostic disagreement 31% (140 patients)⁹ compared to 27.39% (1,593 patients) in our study, demonstrating the need of the remote specialist; and the second one is the reduction of unnecessary admissions that was 63%⁹ compared to 73.9% (1,593 patients) in this study, thus representing effective savings in terms of unnecessary costly hospitalizations. Similar studies¹⁰⁻¹³ related to cost reduction have also proved the effectiveness of telecardiology in primary care.

In our study, the main points of diagnostic disagreement in patients admitted with chest pain were abnormalities on the electrocardiogram, showing ST-segment elevation not recognized at admission, similar to those described by Brunetti et al.,¹⁴ high CPK and MBK values with negative troponin defined as non-ST-elevation acute myocardial infarction and other causes of chest pain with positive troponin related and not related to cardiac disorders but not characterizing acute myocardial ischemia, which was also described by Chiu et al.¹⁵

Of all the inconsistent diagnoses, it is worth mentioning the patients arriving at the UPA 24h with ST-segment elevation acute myocardial infarction (STEMI) but who did not have this diagnosis recognized by the general practitioner. In this group, 80% of patients presented time from onset of chest pain to admission (delta t) shorter than 12 hours, but only 34% were evaluated in time by the telecardiology and received reperfusion treatment. This result was compatible with the finding in the TIET study,¹⁶ in which 44% of the STEMI patients who were within the 12-hour window of the onset of symptoms did not receive any thrombolytic therapy without any justification. The recognition of this diagnosis by the general practitioner, as well as the percentage of thrombolysis is still very low, as previously reported by other authors,^{15,17,18} with a significant impact on morbidity and mortality rates.^{19,20} This demonstrates the urgent need to implement measures that allow the rapid

diagnosis of STEMI and, consequently, the therapy in a timely manner.

Regarding the safety of the thrombolytics administered (alteplase and tenecteplase), there were no reports of hemorrhagic complications or side effects secondary to medication in the period evaluated.

A total of 1,255 admissions at tertiary hospital were avoided. As already described by other authors,^{10,11} telecardiology plays an important role in avoiding unnecessary hospital admissions in patients with a supposed cardiac event in the first care by the general practitioner.

This study also shows the importance of a continued relationship established by telemedicine between the telecardiologist and the general practitioner on a daily basis to guide the management of patients admitted with suspected acute coronary syndrome until outcome, as recommended by the Brazilian Guidelines on Telecardiology in Acute Coronary Syndrome and other Cardiac Diseases.²¹ This new procedure of work can be considered a support in the country's health system.

Limitations

The retrospective and observational nature does not allow us to make comparisons and associations to demonstrate the statistical significance of telecardiology. The presence of only one telecardiologist per day may not meet all the demand of the emergency care units when synchronous teleconsulting is required by the general practitioner at the emergency room.

Conclusion

Telecardiology has been shown to be an important and effective tool to support the differential diagnosis of chest pain in patients admitted at emergency care units, optimizing bed occupancy in the public health system.

The use of telecardiology as a remote support for general practitioners handling patients with chest pain symptoms is feasible, resulting on diagnostic support and identifying patients that really need to be transferred to tertiary referral hospital, thus avoiding unnecessary bed occupancy and expensive tests.

Authors' contributions

Research creation and design: Farah S. Data acquisition: Farah S, Andréa BR, Silva RC. Data analysis

and interpretation: Farah S. Critical revision of the manuscript as for important intellectual content: Farah S, Monteiro, A.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

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Ethics approval and consent to participate

This study was approved by the Ethics Committee of the Universidade do Estado do Rio de Janeiro under the protocol number 70594917.3.0005282. All the procedures in this study were in accordance with the 1975 Helsinki Declaration, updated in 2013. Informed consent was obtained from all participants included in the study.

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