REDE DE
TELEASSISTÊNCIA
DE MINAS GERAIS

Implementation of myocardial system of care in a rural area in Brazil using telecardiology

Prof. Antonio Luiz Pinho Ribeiro
Research and Innovation Head, University Hospital
Universidade Federal de Minas Gerais,
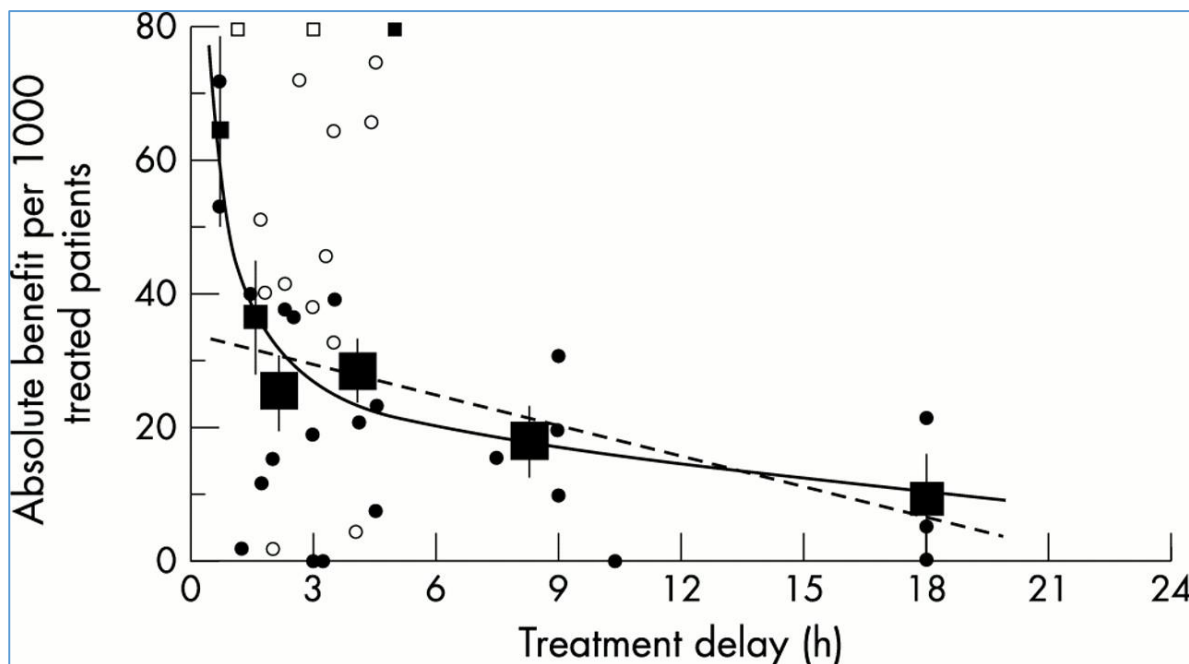Belo Horizonte, Brazil

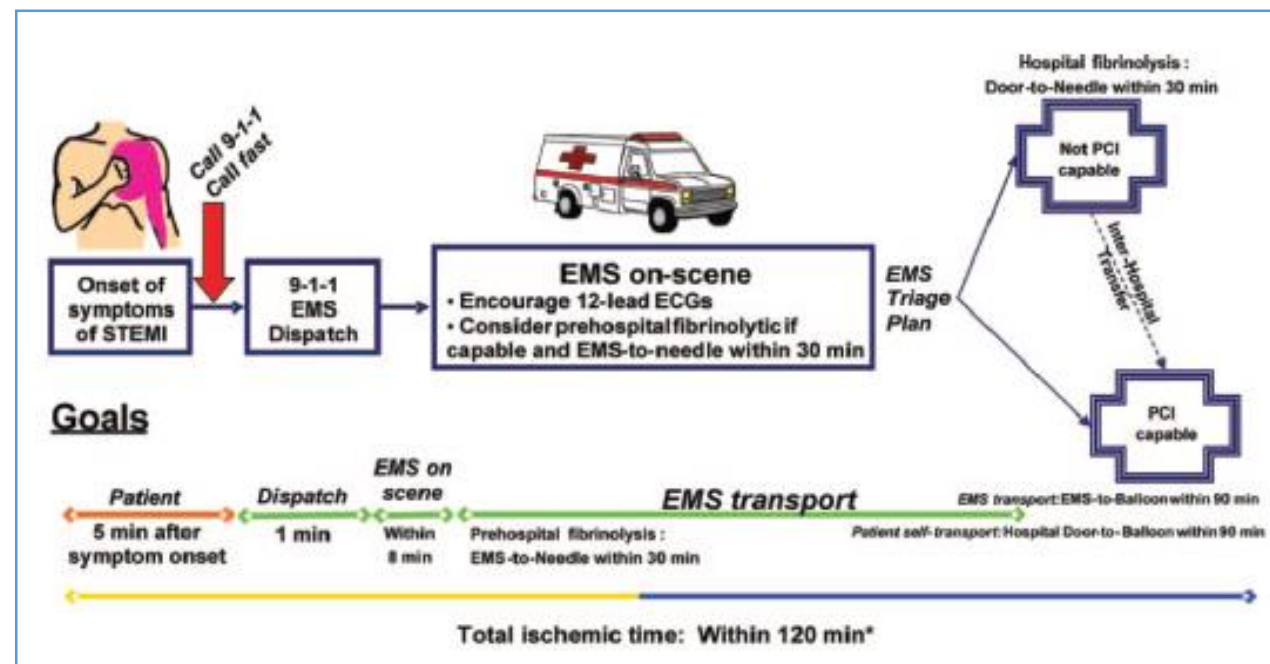**Conference for Global e-Health Grand Rounds**
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Mortality of myocardial infarction is related to the time untill medical treatment

Boersma plot: meta-analytic data showing the association between time to reperfusion and benefit of thromboliytic drugs.   Boersma et al, Lancet 1996; Vol. 348: 771-775

Systems of care were deveolped to allow the rapid transportation of STEMI to medical care to allow fibrinolisis or primary angioplasty.

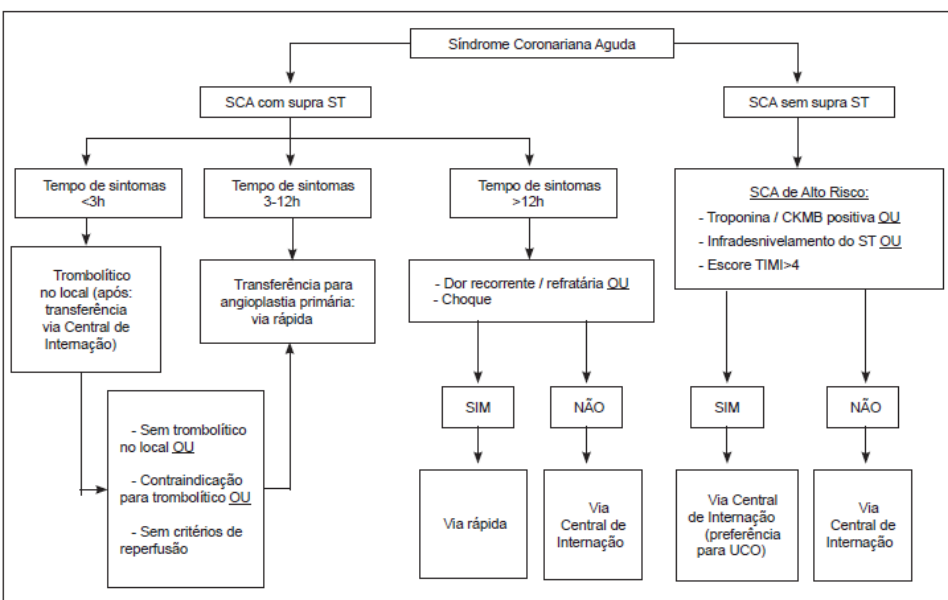# Myocardial Infarction System of Care in the city of Belo Horizonte

- Tele-ECG to connects emergency units of Belo Horizonte to Coronary Care Unit and Telehealth Center to improve treatment for patients with myocardial infarction

Pre-hospital care

Coronary Unit

Intermediate care Unit

Transition ambulatory

Specialized or basic health unit

Myocardial Infarction System of Care in the city of Belo Horizonte

- Flowchart for patients with acute myocardial infarction
- Tele-ECG was implemented in seven Emergency Units
- Emergency Units teams were trained

- Three Coronary care units (HCUFMG, Santa Casa, São José)
- Dedicated mobile for the communication between Emergency Departments (UPA) and CCUs
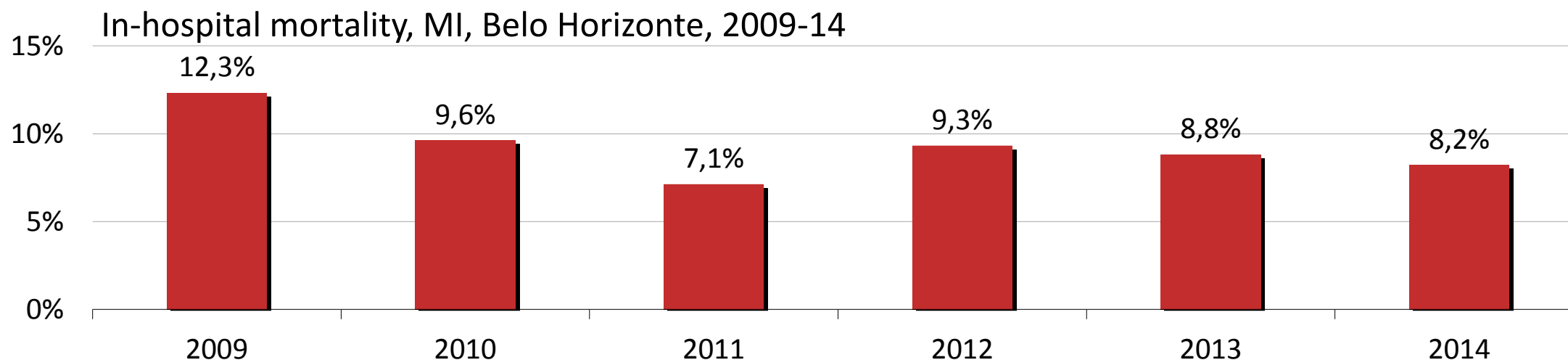- Partnership between hospitals and City Health Department

Myocardial Infarction System of Care in the city of Belo Horizonte

- 2.576 ECGs in 2011/2012
- More use of reperfusion therapy
- Trend of reduction of hospital mortality

Milena Soriano Marcolino[1,2,4], Luisa Campos Caldeira Brant[1,2], Janaina Guimarães de Araujo[3], Bruno Ramos Nascimento[1,2], Luiz Ricardo de Ataide Castro[1,2], Paula Martins[3], Lucas Lodi-Junqueira[1,2], Antonio Luiz Ribeiro[1,2,4]
Hospital das Clínicas da Universidade Federal de Minas Gerais[1]; Faculdade de Medicina da Universidade Federal de Minas Gerais[2]; Secretaria de Saúde da Prefeitura de Belo Horizonte[3], Rede de Teleassistência de Minas Gerais[4], Belo Horizonte, MG – Brasil

In-hospital mortality, MI, Belo Horizonte, 2009-14

Year	Mortality
2009	12,3%
2010	9,6%
2011	7,1%
2012	9,3%
2013	8,8%
2014	8,2%

The Minas Telecardio project 2- Implementation of a STEMI network in the North of Minas

North of Minas region

- **Area:** 128,454,108 km²

- **Micro regions**: 9

- **Counties** :89

- **Population**: 1,6 mi

- **Demographic density**: 12,6 hab/km²

- **HDI**: medium-low
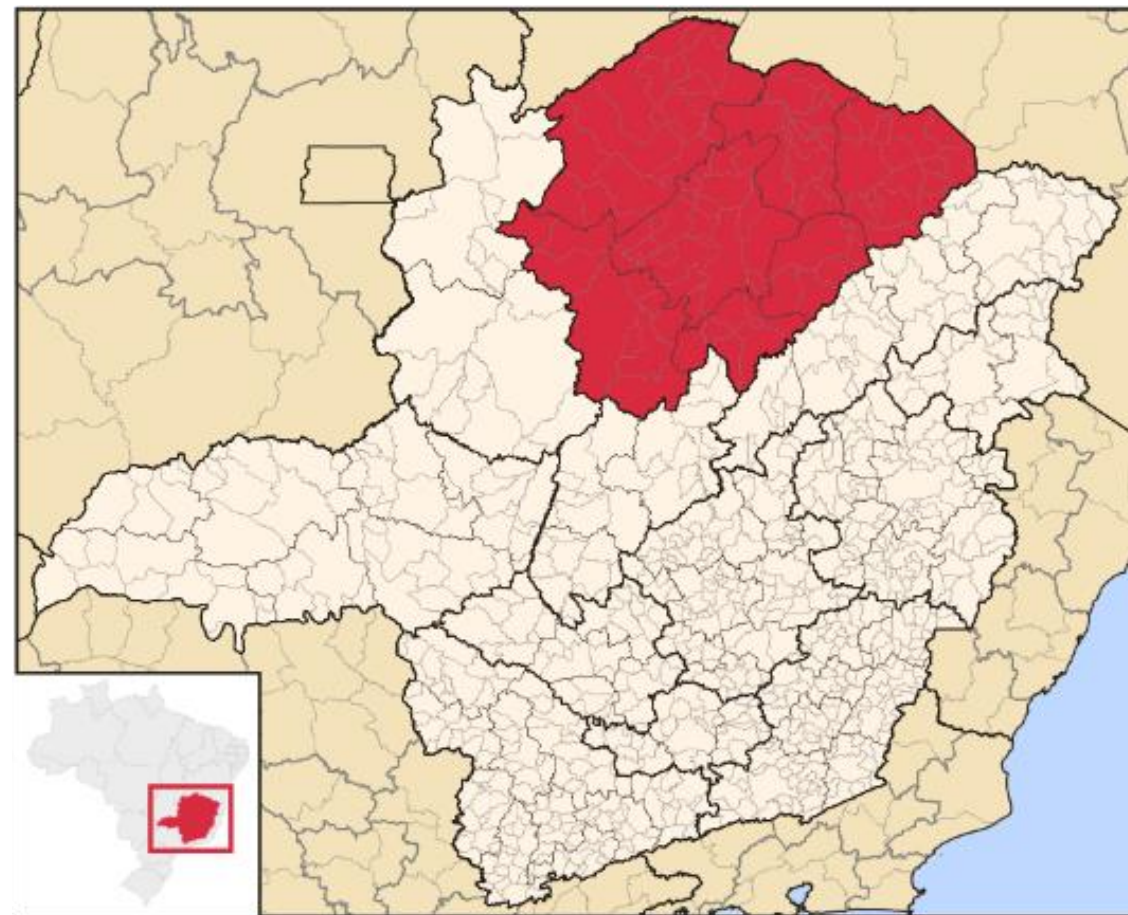
The Minas Telecardio project 2- Implementation of a STEMI network in the North of Minas

- Integration of the emergency department of regional hospitals, pre hospital service (ambulance), coronary care and hemodynamic services to develop rapid diagnosis and treatment systems

- Implantation of Tele-ECG (digital-ECG):
  - in 48 units of ambulance in north of Minas
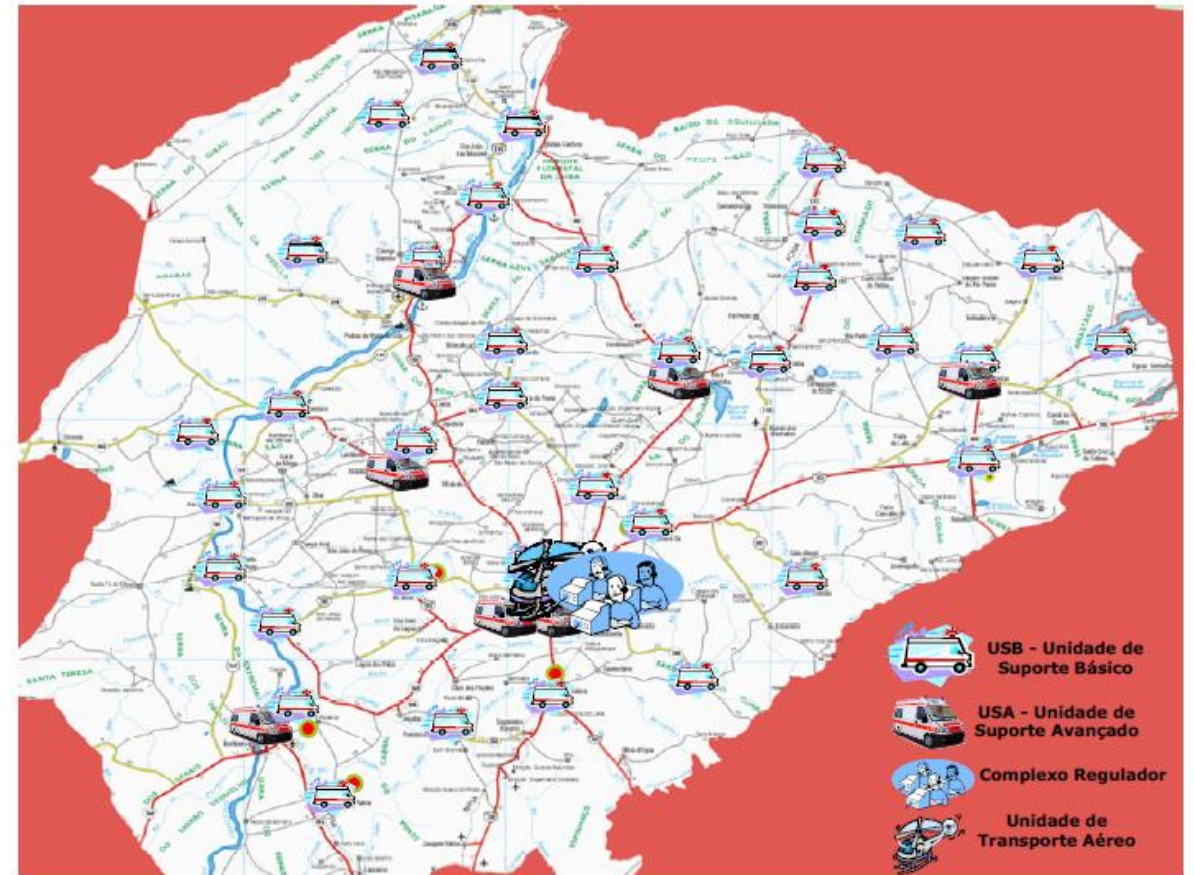
The Minas Telecardio project 2 - Baseline

583 cases de Acute Coronary Syndrome

- 306 (52.4%) Unstable Angina
- 204 (34.9%) STEMI
- 73 (12.5%) NSTEMI

- Mortality:
  - In-hospital: ACS 9.4%
  - In-hospital: STEMI 17.2 %

- Reperfusion in STEMI patiens: 46%
  - 88 primary PCI and six fibrinolysis

STEMI total mortality 20.3 %

Bárbara Campos Abreu Marino[1,2], Milena Soriano Marcolino[1,2], Rasível dos Santos Reis Júnior[3], Ana Luiza Nunes França[2], Priscilla Fortes de Oliveira Passos[2], Thais Ribeiro Lemos[2], Izabella de Oliveira Antunes[1], Camila Gonçalves Ferreira[1], André Pires Antunes[1,4], Antonio Luiz Pinho Ribeiro[1,2,5]

Time points assessed in patients with ST elevation myocardial infarction (n = 204)

Duration (min)	All patients (n = 204)
Prehospital service response time* (n = 77)	80 (24-177)
Transportation time from the place of assistance to the hospital in Montes Claros (n = 77)	45 (18-84)
Total duration of prehospital transportation† (n = 77)	177 (50-312)
Door-to-ECG time‡ (n = 80)	27 (11-70)
Door-to-balloon time (n = 141)	94 (41-386)
Door-to-needle time (n = 4)	67 (49-73)
Time between pain onset and request for medical service (n = 204)	486 (248-1657)
Total ischemia time§ (n =137)	683 (391-1963)

The Minas Telecardio project 2 – Protocol and patient flow definition

- Measurement of SAMU transportation times

- Selected municipality to primary PCI : Transfer time until 120 min

Montes Claros

Until 2 hours

From 2 to 3 hours

From 3 to 4 hours
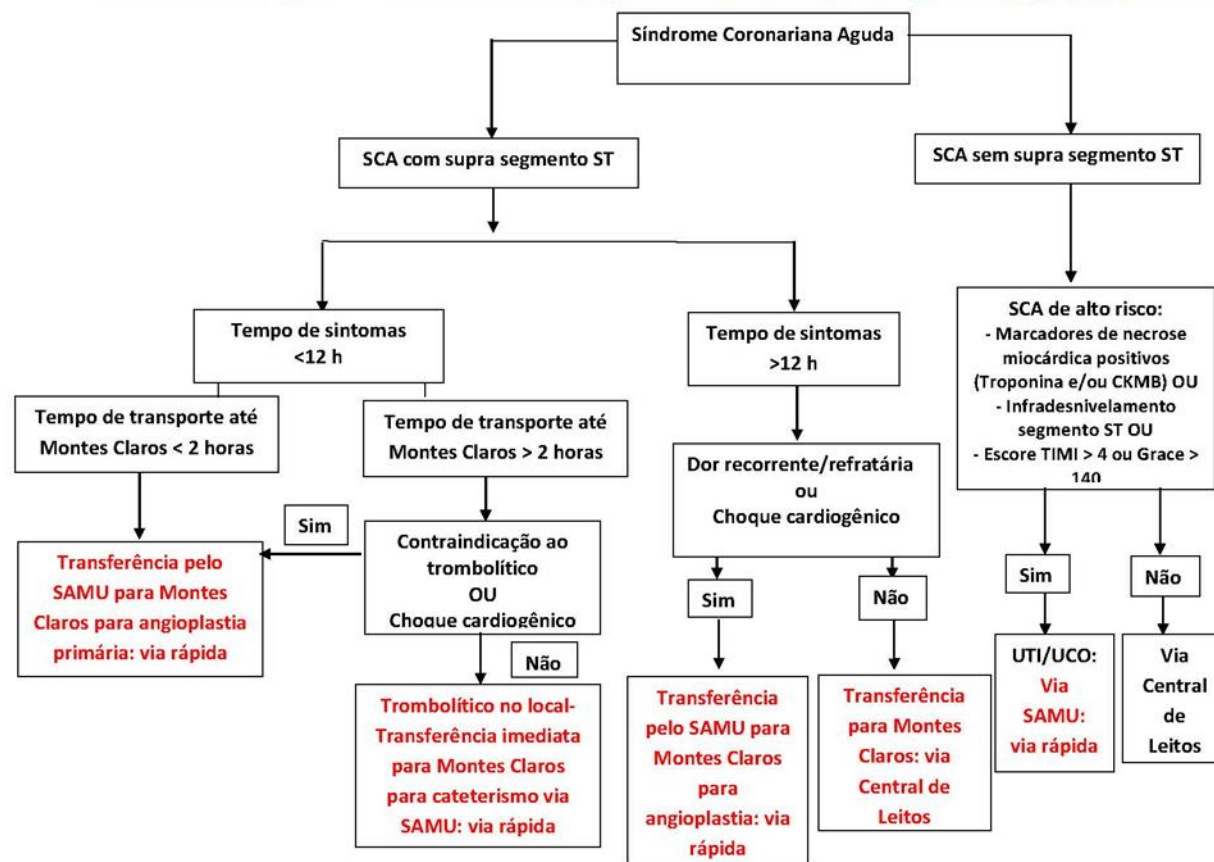
> 4 hours (until 10 hours)
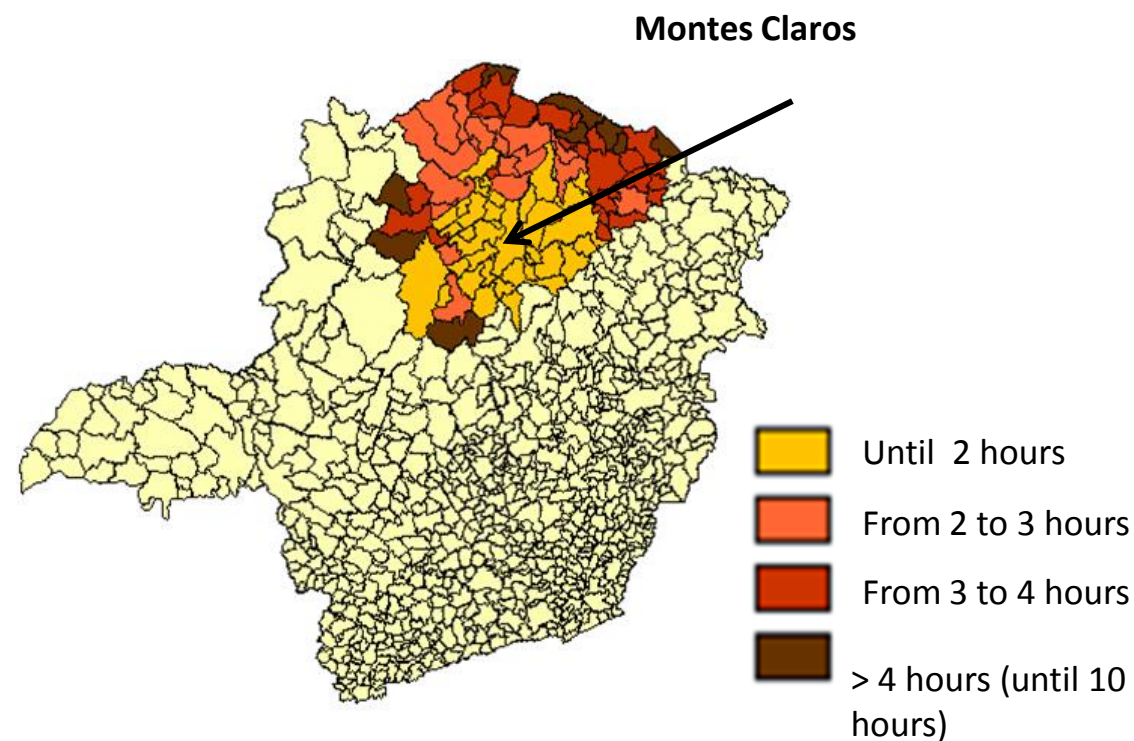
The Minas Telecardio project 2 – Protocol and patient flow definition

- Adaptation of the ACS Ministry of Health protocol to regional needs

- Presentation of flow proposal and ACS protocol at local meeting
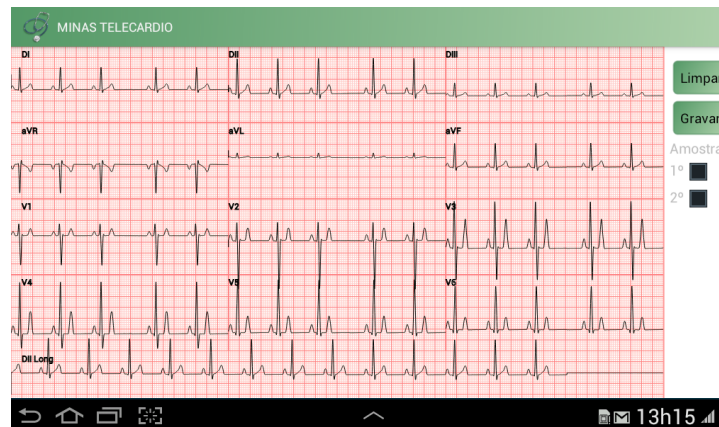

Rede de Atenção ao Infarto na Região Ampliada Norte de MG

The Minas Telecardio project 2 – Development of a teleECG solution

- Development of a tablet-based interface

- Tests with the digital ECG and tablet in SAMU ambulance

- Adaptation of the SAMU central regulation center to receipt and interpret ECGs obtained in ambulances

- ECG sent to cardiology hospitals

The Minas Telecardio project 2 – Extensive health care team training

Ambulance staff, physicians and nurses of the local hospitals were extensively trained with protocols of chest pain, acute coronary syndrome, prehospital fibrinolysis and STEMI

Training sessions lasted 8-hours and used simulation-based learning techniques and educational materials was given for all members.

The Minas Telecardio project 2 – STEMI medication kit for the ambulances

- Standardization of drug therapy in all phases of the treatment

- Medication Kit:
  - Tenecteplase
  - Aspirin
  - Clopidogrel
  - Enoxaparin
  - Beta-blockers
  - Nitrate
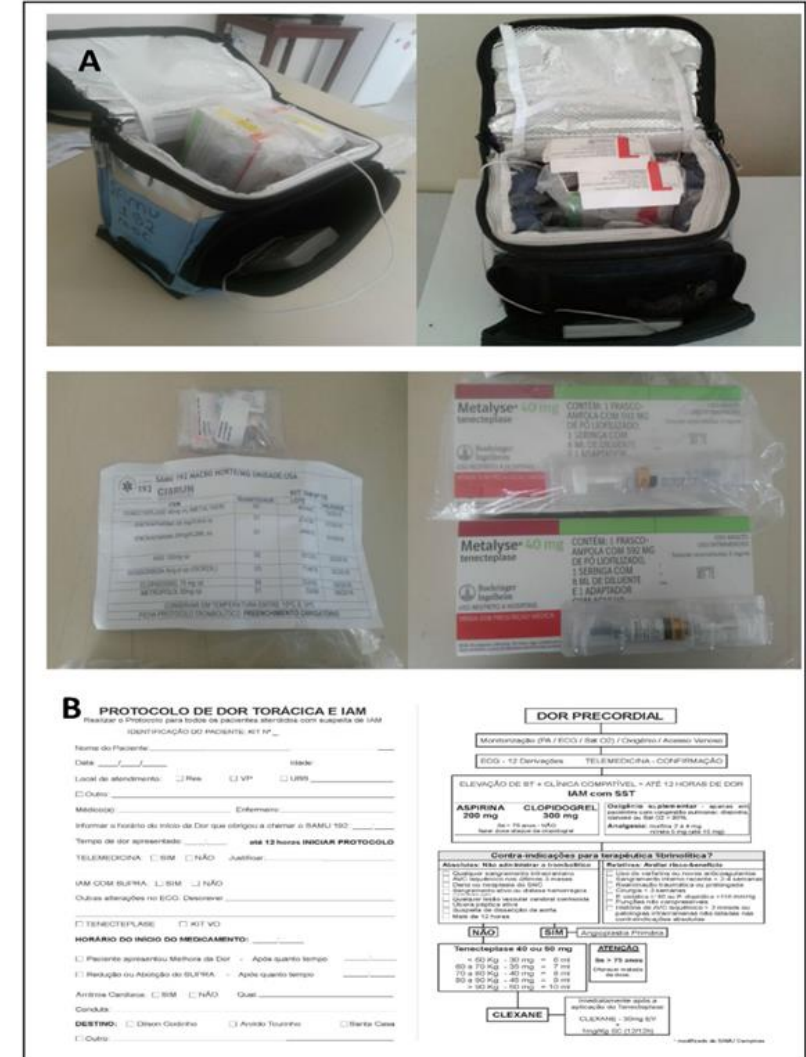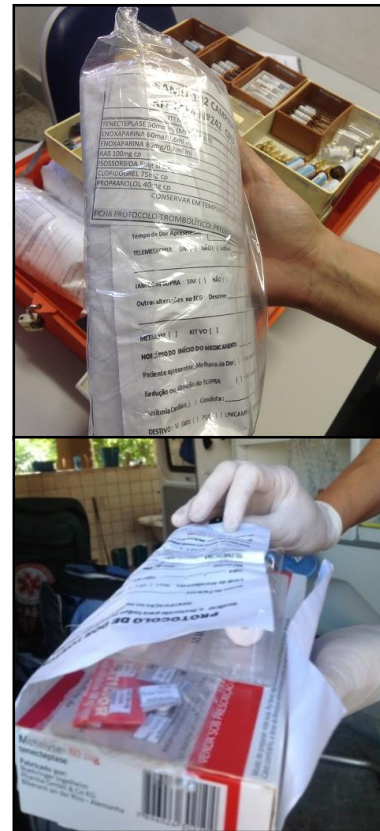
The Minas Telecardio project 2 – Results

Increase in the frequency of patients with suspected chest pain or MI that perform an ECG

Marino BCA, Ribeiro ALP, Alkmim MBM, Antunes AP, Boersma E, Marcolino MS. Coordinated regional care of myocardial infarction in a rural area in Brazil – Minas Telecardio Project 2. European Heart Journal – Quality of Care and Clinical Outcomes. May 2016. doi: 10.1093/ehjqcco/qcw020

The Minas Telecardio project 2 – Results

Reduction of mortality after the intervention

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The Minas Telecardio project 2 – Results

Improvement in the frequency of evidence based drugs use in STEMI patients

Medication	Before implementation	After implementation	P
Medication in 24 hours	N=208	N=143	
Aspirin	196/208 (94.2)	143 (100.0)	**0.003**
P2Y12 inhibitor	182/208 (87.5)	143 (100.0)	**<0.001**
Heparin	155/208 (74.5)	136 (95.1)	**<0.001**
Statins	170/208 (81.7)	131 (91.6)	**0.012**
Medication at discharge*	N=169	N=122	
Aspirin	163 (96.4)	122 (100.0)	**0.035**
P2Y12 inhibitor	128 (75.7)	115 (94.3)	**<0.001**
Statins	153 (90.5)	122 (100.0)	**<0.001**

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The Minas Telecardio project 2 – Perspective

- STEMI system of care for all regions of the State of Minas Gerais
- AHA Get with the guidelines in Brazil (SBC/AHA/MS/Hcor)