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STEMI NETWORKS

THE HUB AND SPOKE CONCEPT

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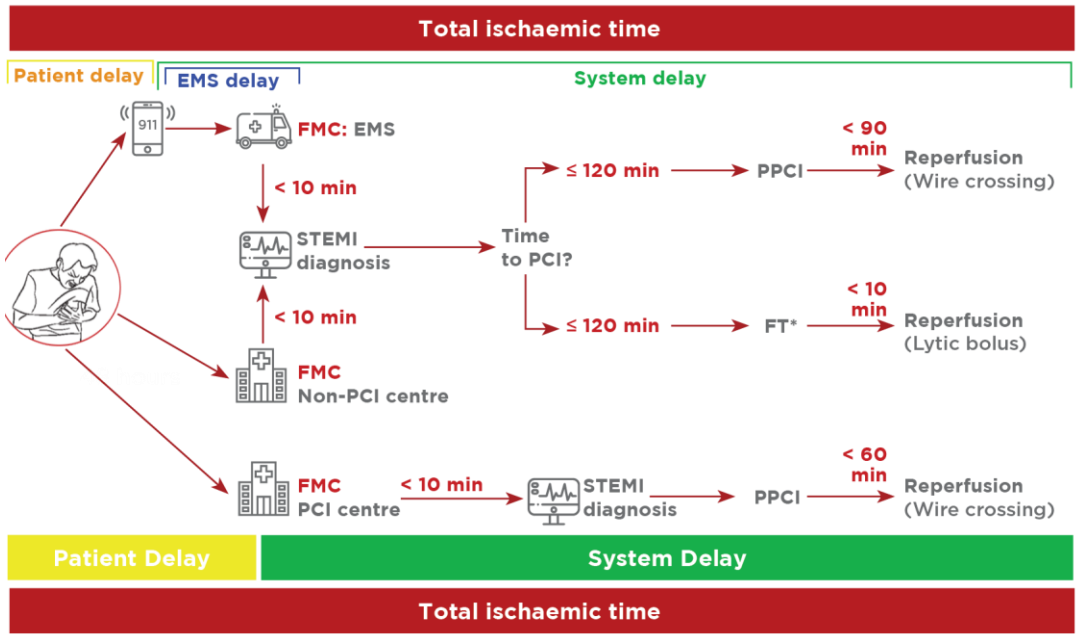
STEMI NETWORK ORGANISATION

STEMI NETWORKS ARE DIVERSELY ORGANISED AND CAN BE COUNTRY-WIDE, REGIONAL, OR CITY BASED

STEMI NETWORK COMPONENTS:[1,2]

1. Emergency Medical services (EMS)
   - Franco-German model Physicians present both in ambulances and hospital
   - Anglo-American model Ambulances staffed with paramedics/emergency medical technician, supported via telemedicine/ remote physician
2. Non-PCI-capable hospitals
3. Hospitals with PCI facilities



*FT, fibrinolysis; FMC, first medical contact; PCI: Percutaneous Coronary Intervention

1. Tubaro M, Danchin N, Goldstein P, Filippatos G, Hasin Y, Heras M et al. Pre-hospital treatment of STEMI patients. A scientific statement of the Working Group Acute Cardiac Care of the European Society of Cardiology. Acute Cardiac Care. 2011;13(2):56-67.
2. Hamon M, Pristipino C, Di Mario C, Nolan J, Ludwig J, Tubaro M et al. Consensus document on the radial approach in percutaneous cardiovascular interventions: position paper by the European Association of Percutaneous Cardiovascular Interventions and Working Groups on Acute Cardiac Care** and Thrombosis of the European Society of Cardiology. EuroIntervention. 2013;8(11):1242-1251.
3. Ibanez B, James S, Agewall S, Antunes M, Bucciarelli-Ducci C, Bueno H et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. European Heart Journal. 2017;39(2):119-177.
4. Huber K, Gersh B, Goldstein P, Granger C, Armstrong P. The organization, function, and outcomes of ST-elevation myocardial infarction networks worldwide: current state, unmet needs and future directions. European Heart Journal. 2014;35(23):1526-1532.

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“STEMI FAST TRACK”

GET A PATIENT TO THE CATHLAB AS SOON AS POSSIBLE

PATIENT WITH CHEST DISCOMFORT → Patient recognition, EMS phone alert

PRE-HOSPITAL EMERGENCY UNIT (EMS-FMC) → 12-lead ECG and “phone cath lab alert”

EMERGENCY TRANSPORT → Option 1: directly to “24-7” PPCI center bypassing non-PCI hospitals and ER/CCU of “24-7” PPCI center.
Option 2: Thrombolysis capable unit “Spoke hospital”

“24/7” PCI CENTER → PPCI and CICU support

PCI: Percutaneous Coronary Intervention; EMS: Emergency Medical Services; ECG: Electrocardiography; CICU: Cardiac Intensive Care Unit

Armstrong P, Gershlick A, Goldstein P, Wilcox R, Danays T, Lambert Y et al. Fibrinolysis or Primary PCI in ST-Segment Elevation Myocardial Infarction. New England Journal of Medicine. 2013;368(15):1379-1387.

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STEMI NETWORKS AIMS AND GUIDELINES

THE AIM OF A STEMI NETWORK IS TO ENSURE EARLY RECOGNITION OF STEMI, SHORTEN TIME DELAYS TO TREATMENT, AND OPTIMISED OUTCOMES[1,3]

NETWORK ORGANISATION RECOMMENDATIONS FROM THE ACC/AHA[2] AND ESC[3]

1. Single **emergency telephone** number
2. **Protocols** for standardised care (diagnosis, therapy, transfer)
3. Optimal **pre-hospital care** (ambulances equipped with ECGs and defibrillators, correct/prompt diagnosis, pre-activation of the cath lab, early initiation of thrombolysis if timely PPCI is not possible)
4. Bypass non-PPCI capable hospitals to increase proportion of patients receiving **timely PPCI,** if possible within 120 minutes
5. Cardiology/intensive care **specialist** as network leader
6. Involve healthcare **authorities**
7. Continual **quality improvement** with prospective registries & regular meetings of involved parties

PPCI: primary percutaneous coronary intervention; ECG: Electrocardiography

1. Huber K, Gersh B, Goldstein P, Granger C, Armstrong P. The organization, function, and outcomes of ST-elevation myocardial infarction networks worldwide: current state, unmet needs and future directions. European Heart Journal. 2014;35(23):1526-1532.
2. O'Gara P, Kushner F, Ascheim D, Casey D, Chung M, de Lemos J et al. 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction. Circulation. 2013;127(4).
3. Ibanez B, James S, Agewall S, Antunes M, Bucciarelli-Ducci C, Bueno H et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. European Heart Journal. 2017;39(2):119-177.

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EUROPEAN STEMI NETWORKS: TWO MODELS

VIENNA STEMI NETWORK[1,2]

- Central triage system started in 2003, organised by Vienna Ambulance System
- 24/7 access to cath lab facilities with experienced interventionalists
- Guaranteed through rotational system between tertiary centres: all centres available during the day & only two centres at night
- Fibrinolysis is a part of reperfusion strategy when patient transfer is delayed > 90 mins
- Since initiation, the number of patients receiving timely PPCI has increased and the numbers receiving fibrinolysis have decreased (now only ~3% of patients); marked decline in numbers receiving no reperfusion therapy

FRENCH SERVICE D'AIDE MÉDICALE URGENTE (SAMU) SYSTEM[2]

- Nationwide system implemented in 1995, & monitored by FAST-MI STEMI registry
- One SAMU medical response centre for each region, responsible for mobile intensive care unit (MICU) dispatch (1 physician, 1 nurse, & a driver (trained emergency medical technician) provide basic/advanced life support on-site &/or during transfer)
- MICU alerts medical centre ahead of arrival about medical status of the patient to allow direct admission & avoid treatment delay
- Implementation has improved outcomes, and increased reperfusion, mainly due to increased PPCI
- When PPCI is not possible, a pharmaco-invasive strategy is implemented

PPCI: Primary Percutaneous Coronary Intervention

1. Huber K, Gersh B, Goldstein P, Granger C, Armstrong P. The organization, function, and outcomes of ST-elevation myocardial infarction networks worldwide: current state, unmet needs and future directions. European Heart Journal. 2014;35(23):1526-1532.
2. Danchin N. Systems of Care for ST-Segment Elevation Myocardial Infarction. Journal of the American College of Cardiology: Cardiovascular Interventions. 2009;2(10):901-908.

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STEMI NETWORKS AROUND THE WORLD

INDIA, CHINA, RUSSIA

- Only few STEMI networks in accordance with International guidelines
- REVERSE-STEMI trial: in Shanghai physicians travel to outlying catheter laboratories instead of transporting patients

AUSTRALIA

- Well-organised STEMI networks in urban areas however long transfer times in rural areas

MIDDLE EAST

- Wide disparity in STEMI care owing to geographical diversity

LATIN AMERICA

- In Salvador, Bahia, Brazil, a regional STEMI alert team receives ECG from telemedicine centre and advises EMS to start pharmaco-invasive treatment or immediate transfer for PPCI

SOUTH AFRICA

- Limited number of centres with PPCI facilities and long transfer times

PPCI: Primary Percutaneous Coronary Intervention

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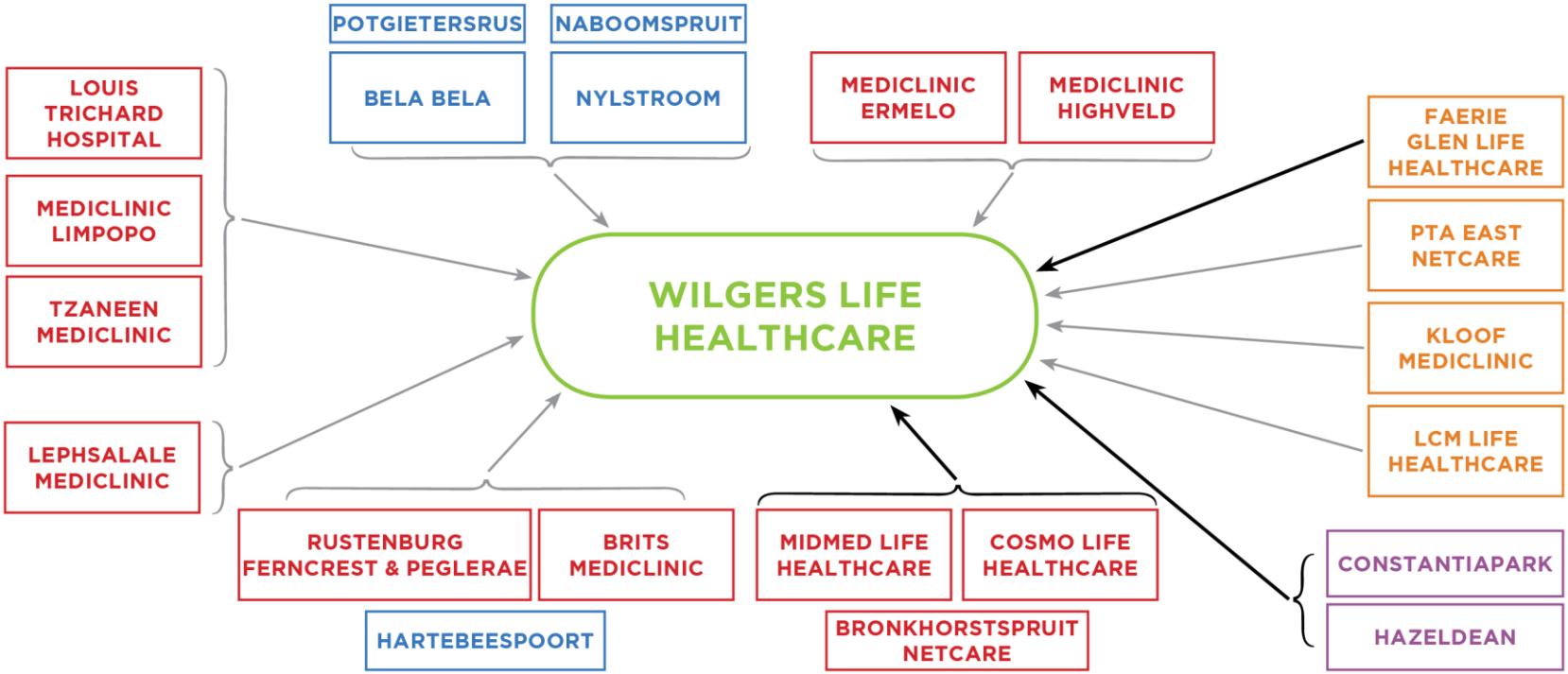
MAPPING HUB AND SPOKE WILGERS HOSPITAL



A Hospitals	24 Hour Cath Lab
B Hospitals	09:00-17:00 Cath Lab
C Hospitals	Non Cath Lab hospitals < 30 mins away
D Hospitals	Non Cath Lab hospitals > 30 mins away
GP Practice	Small Towns with GP Practice > 30 mins away
GP Practice	GP Practice < 30 mins away

- Primary: Almost all patients to be sent to Wilgers
- Secondary: Hospital would send to Wilgers as well as another hospital
- Alternative: Only if there is no Cardiologists on duty

Huber K, Gersh B, Goldstein P, Granger C, Armstrong P. The organization, function, and outcomes of ST-elevation myocardial infarction networks worldwide: current state, unmet needs and future directions. European Heart Journal. 2014;35(23):1526-1532.

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WHERE IS MY NEAREST CATH LAB IN PRETORIA & CENTURION

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SECONDARY TRANSFER

1. **Accounts for considerable delays**
2. **Consultation at Hub Hospital Arranged prior to transfer?**
3. **Transfer Delays**
    - Diagnosis
    - In Hospital
    - EMS
    - Not prepared to take a decision
4. **Transfer patients for PCI:**
    - If feasible, all successfully thrombolysed patients within 2-24 hours
    - High risk STEMI and NSTEMI patients
    - Failed thrombolysis

PCI: Percutaneous Coronary Intervention

1. Huber K, Gersh B, Goldstein P, Granger C, Armstrong P. The organization, function, and outcomes of ST-elevation myocardial infarction networks worldwide: current state, unmet needs and future directions. European Heart Journal. 2014;35(23):1526-1532.
2. O'Gara P, Kushner F, Ascheim D, Casey D, Chung M, de Lemos J et al. 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction. Circulation. 2013;127(4).
3. Ibanez B, James S, Agewall S, Antunes M, Bucciarelli-Ducci C, Bueno H et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation. European Heart Journal. 2017;39(2):119-177.
4. Danchin N. Systems of Care for ST-Segment Elevation Myocardial Infarction. Journal of the American College of Cardiology: Cardiovascular Interventions. 2009;2(10):901-908.
5. Hamon M, Pristipino C, Di Mario C, Nolan J, Ludwig J, Tubaro M et al. Consensus document on the radial approach in percutaneous cardiovascular interventions: position paper by the European Association of Percutaneous Cardiovascular Interventions and Working Groups on Acute Cardiac Care** and Thrombosis of the European Society of Cardiology. EuroIntervention. 2013;8(11):1242-1251.

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RISKS OF SECONDARY TRANSFER

1. **REPERFUSION DELAYS** if not thrombolysed
2. **CONSIDERABLE DELAYS** based on ambulance availability, case priority, travel time, approval times
3. **INAPPROPRIATE LEVEL OF CARE** of pre-hospital provider selected
4. **LIMITED EQUIPMENT**
5. **IN-TRANSPORT INSTABILITY** or cardiac arrest
6. Patient anxiety and **TRANSPORT STRESS** (especially HEMS)
7. **CONSTANT MONITORING**

1. Huber K, Gersh B, Goldstein P, Granger C, Armstrong P. The organization, function, and outcomes of ST-elevation myocardial infarction networks worldwide: current state, unmet needs and future directions. European Heart Journal. 2014;35(23):1526-1532.
2. O'Gara P, Kushner F, Ascheim D, Casey D, Chung M, de Lemos J et al. 2013 ACCF/AHA Guideline for the Management of ST-Elevation Myocardial Infarction. Circulation. 2013;127(4).
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HOW TO LOG A TRANSFER

1. **DETERMINE APPROPRIATE RECEIVING FACILITY** and arrange acceptance with hospital wards and receiving cardiologist
2. If private, **DETERMINE THE CORRECT AMBULANCE SERVICE** for the medical aid
3. **CONTACT AMBULANCE SERVICE:**
    - Have all patient details on hand, including latest observations
    - Stress the importance of the transfer if failed thrombolysis or still ischaemic: “potentially life threatening”
    - Clearly mention whether the patient was given thrombolysis or not
    - Provide the diagnosis as STEMI
    - Mention if special equipment is needed such as an infusion pump, pacer, ECG monitoring or defibrillator (not all ambulances carry these all the time)

1. Huber K, Gersh B, Goldstein P, Granger C, Armstrong P. The organization, function, and outcomes of ST-elevation myocardial infarction networks worldwide: current state, unmet needs and future directions. European Heart Journal. 2014;35(23):1526-1532.
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