Improving myocardial infarction emergency care: a joint intervention study of the Berlin Brandenburg Myocardial Infarction Registry (B2HIR) and emergency medical services (QS-Notfall)

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Background: Rapid myocardial reperfusion is needed to improve clinical outcome after a ST-elevation myocardial infarction (STEMI). Missed early explicit STEMI diagnoses were shown to unfavourably delay STEMI care. A networked approach between emergency medical systems (EMS) and cardiology hospital departments is useful to establish early valid pre-hospital STEMI diagnoses.

Purpose: The publicly funded "QS-Notfall" joint health services research study intended to improve STEMI care in Berlin (BE) and Brandenburg (BB) by implementing pre-hospital tele-ECG transmission and online ECG training for EMS personnel.

Methods: As part of B2HIR, 21 cardiology hospital departments (19 in BE, 2 in BB) together with EMS (BE firefighters and regional BB EMS), supported by the Berlin Medical Chamber, established 2 joint interventions to accelerate STEMI care. All EMS and hospitals implemented GDPR compliant telemedical transmission and structured handling of pre-hospital ECGs from patients with chest pain. In addition, we developed an ECG e-learning for emergency physicians and EMS personnel ("STEMI einfach erkennen") and communication between EMS and hospitals was enforced. Patients with acute myocardial infarction (AMI) and symptom onset \( \leq \) 24h were enrolled. Symptom onset, first medical contact, time of hospital admission ("door"), time of guidewire passage into the coronary artery (reperfusion), and respective care delays were assessed. First obtained ECGs were blindly validated by 3 expert cardiologists. We compared a reference period to a 12-month intervention period with regard to care delays. In addition, STEMI care was analyzed according to the actual use of telemedical ECG transmission and according to the validity of ECG diagnoses.

Results: N=7303 cases were enrolled (reference period 3657, intervention period 3646, age 66.9y, 27.1% female, STEMI 49.4%). The usage of ECG transmission varied notably between hospitals (7.5%–74%). Tele EMS ECG usage in STEMI was associated with shorter door to reperfusion time (BB 11min, \( p < 0.04 \), BE 12min, \( p < 0.001 \)) compared to STEMI care w/o ECG transmission. The difference was more pronounced during hospital off-hours (BB 30min, \( p = 0.003 \) and BE 14min, \( p < 0.001 \)). An unmistaken EMS STEMI diagnosis related to a shorter door to reperfusion time (BE: by 106min; BB: by 49min) compared to an unsettled STEMI diagnosis (\( p < 0.001 \)). The rate of ECG transmission for STEMI patients in BE was 21.4%, in BB 55.7%. Accordingly, we found no significant difference in STEMI door to reperfusion delays between the reference period and the intervention period in BE (+1min) and a shorter reperfusion delay (by 11min) in BB (\( p = 0.049 \)).

Conclusions: The universal implementation of a joint intervention to improve STEMI care in a complex system of various EMS and hospital departments is challenging. Telemedical ECG transmission and an unmistaken early STEMI diagnosis are associated with a significantly shorter time delay to myocardial reperfusion.