GOOD PRACTICE BRIEF

IMPROVING OUTCOMES FOR ACUTE CORONARY SYNDROME IN THE RUSSIAN FEDERATION:
An example of regionalization of services for improved quality and systems of care for acute coronary syndrome in Saint Petersburg

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Summary

Within the framework of the Federal Cardiovascular Programme, services for acute coronary syndrome (ACS) were transformed over a decade in St Petersburg. It was motivated by a relatively high cardiovascular mortality, high in-hospital mortality from ACS, low availability of modern technologies, low adherence to guidelines, insufficient quality of care and insufficient funding. A comprehensive regionalization of services led to high availability of care, efficacy in ambulance routing, a high degree of implementation of the model of care, increased access to reperfusion technologies, improved adherence to guidelines and improved quality of care. It was associated with a decrease of in-hospital mortality from ACS and a decrease in cardiovascular mortality.

Motivation

The cardiovascular mortality rate in St Petersburg is higher (by 12.8% in 2017) than in the Russian Federation in general *(1)*. ACS with ST-segment elevation myocardial infarction (STEMI) is characterized by having the highest mortality in the early stages of the disease. Quality and timeliness of care in the first stage is critical; thus, decreasing system delay from first medical contact to reperfusion therapy is important. This can be particularly challenging in a city the size of St Petersburg which has 5 million inhabitants. In 2006, access to reperfusion therapy, via thrombolysis or percutaneous coronary interventions (PCI), for patients with ACS was limited. Thrombolytics were expensive for the majority of hospitals, and late admission and lack of special training of medical staff meant that few STEMI patients benefitted. Availability of PCI was very low, and it was unaffordable for the majority of patients in emergency situations. Mortality from myocardial infarction within cardiac centres was more than 20% (Table 1).

Key Messages

- Reducing cardiovascular mortality in the Russian Federation is a national priority and this has greatly facilitated the service delivery transformation process at regional level.

- A comprehensive and sustained approach is needed to achieve better outcomes with action at policy, purchaser, and provider levels.

- A systematic approach to quality improvement based on timely quality data is needed.

- The ability of a health system to respond to acute events is dynamic, affected by changing factors such as road quality, traffic patterns and provider network, and needs constant review and adjustment.

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Reorganization of care for ACS

In 2006, all hospitals provided a similar and insufficient level of ACS care with limited availability of reperfusion, PCI and some types of medical therapy (Table 1). The patients were treated mostly with medical therapy, and diagnostic capabilities were limited. In some hospitals the PCI procedure and optimal diagnostic facilities were only available during working hours, usually from 9.00-16.00h. Improving the service delivery and quality of care for ACS in St Petersburg happened gradually over more than a decade. The aims were to achieve: easy access to high-quality guidelines-based care, a decrease of in-hospital mortality from ACS and improved outcomes, and a decrease in cardiovascular mortality.

Structure: the first stage was the development of a regional network and the introduction of a two-tier system of regional cardiovascular centres (RCCs) – hospitals that can perform PCI 24 hours a day, 7 days a week (24/7) – and primary cardiovascular departments (PCDs) – hospitals without catheterization laboratories. The Federal Cardiovascular Programme (2008–2013) specified the design of the network. There are now 16 RCCs, of which 13 offer 24/7 care and have the appropriate diagnostic facilities. PCDs have been excluded from the network since 2013, when the number of RCCs was sufficient and prehospital care including transportation time was acceptable.

Emergency transportation: the city comprises 18 districts (with populations ranging from 45 000 to 550 000) which have substantial differences in transport networks and traffic level. For emergency medical care, the city has been historically divided into three main areas (north, south and central), with emergency hospitals and ambulance stations located accordingly. Selection of an optimal route and target hospital for an ambulance is a complex problem, and dynamic traffic conditions need to be considered. Statistical data, public geographic information services (OpenStreetMap) and real-time data on traffic flow (Yandex Maps) were used in order to design a more efficient decision support system for ambulance personnel and dispatchers (2) (Fig. 1).

Pre-hospital care: previously, there was a lack of interaction between ambulance and hospitals and poor in-hospital logistics. Prehospital triage of ACS patients was fragmented with two different systems of *prehospital care* (emergency and urgent). Reorganization led to centralized dispatching, the option of phone consultation with an on-duty senior physician from the central ambulance station, routing with distance and time control, and the availability of resuscitation and intensive care teams. For some remote areas of St Petersburg, prehospital thrombolysis was needed. Responsible ambulance stations were identified, and ambulance staff was trained to perform thrombolysis. These stations were supplied with tenecteplase (from the municipal budget of city districts), and the territorial fund of obligatory medical insurance established a special insurance tariff for prehospital thrombolysis.

Monitoring quality: assessing the quality of care was key in developing the regional ACS network. A group of independent experts from the territorial fund performed two quality of care audits. The 2013 audit was by order of the city deputy governor, and after analysing the defects of care, a checklist of the 10 most common mistakes in quality control was developed for experts of insurance companies. A special computer scoring system developed to measure quality of care was implemented in all city hospitals, insurance companies and the quality control department of territorial fund. The next independent audit was performed in 2016 and showed significant improvement of quality of care. Total citywide electronic ACS registry based on the territorial fund of obligatory medical insurance started in the February of 2016. To promote access to myocardial necrosis biomarkers testing, troponin test at admission was established as quality indicator by insurance companies and for the ACS registry.

Access to resources: the Federal Cardiovascular Programme helped to increase access to medicines and technologies, as well as programmes for cardiac rehabilitation after ACS. A centralized supply of thrombolytics started in some regions in 2008 and in St Petersburg in 2010. The number of angiographs increased, with additional angiography equipment installed in large emergency hospitals. The staff deficit was eliminated for key roles such as cardiovascular interventionists and intensive care unit physicians.

Impact

There have been substantial improvements in the process and outcomes since 2016 (Table 1). The availability of reperfusion therapy (thrombolysis and PCI) has increased dramatically (Fig. 2). Other achievements include high availability of care (proportion centres/population, proportion of patients undergoing PCI), efficacy in ambulance routing, a high degree of implementation of the model of care (high proportion of hospitalizations in specialized centres), increased access to reperfusion technologies, improved adherence to guidelines and improved quality of care. A decrease of in-hospital mortality due to ACS and a decrease in cardiovascular mortality were also reported.

Fig. 1: Heatmap of transfer time to nearest PCI hospital at 40 km/h (computer modelling)
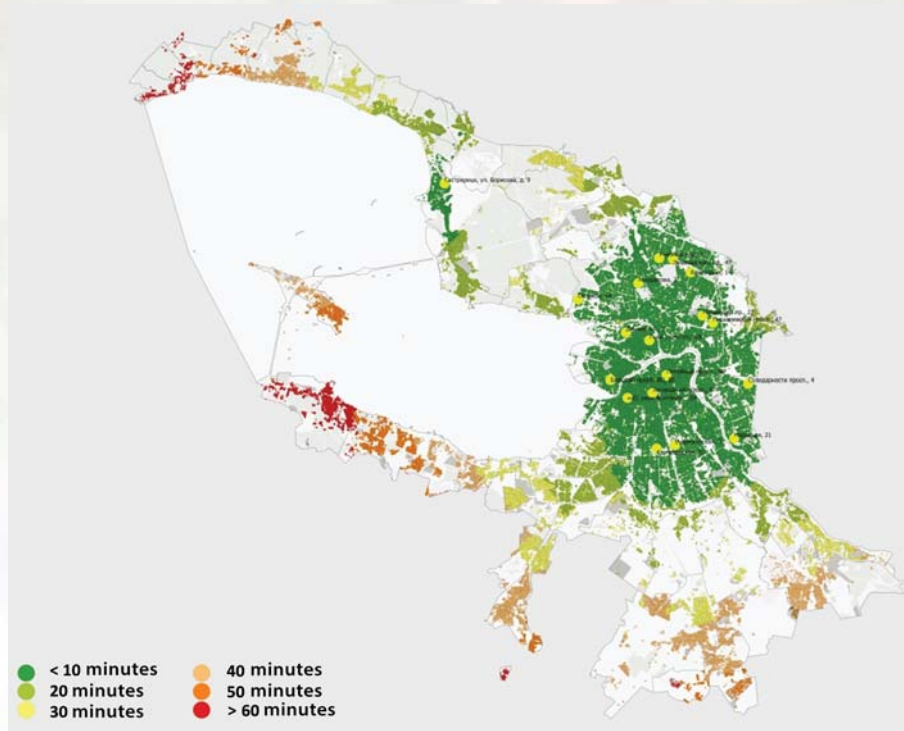

- ● < 10 minutes
- ● 20 minutes
- ● 30 minutes
- ● 40 minutes
- ● 50 minutes
- ● > 60 minutes

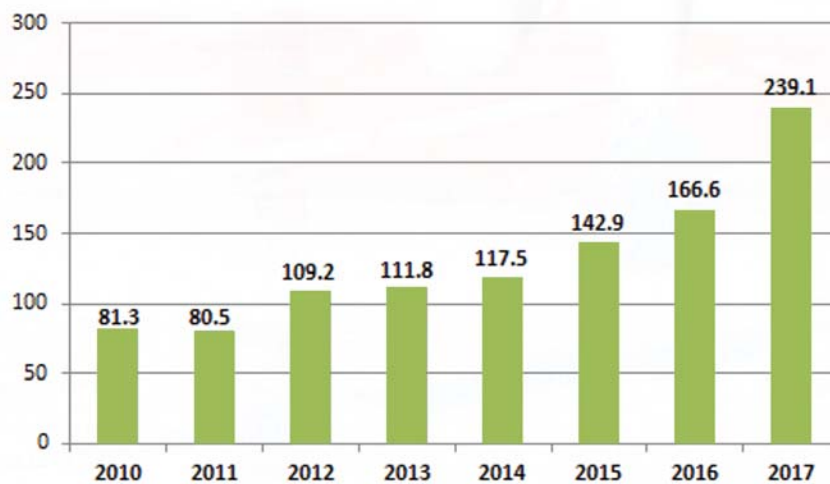**Fig. 2: Number of PCI in ACS patients (per 100 000) in St Petersburg, 2010–2017, by year**

Year	Value
2010	81.3
2011	80.5
2012	109.2
2013	111.8
2014	117.5
2015	142.9
2016	166.6
2017	239.1

Table 1. Improvement in processes and outcomes of care for ACS in St Petersburg, Russian Federation

Indicator	2006	2016
Reperfusion therapy: thrombolysis	Streptokinase administered in hospital (alteplase)	Tenecteplase administered in ambulance
Number of PCI centres	2, open 08:00–17:00	16, 13 of them open 24 hours a day, 7 days a week
Primary PCI in STEMI	~0%	>60%
ACS network	No	Dispatched, GPS/traffic monitoring
Registry	No	All cases, citywide registry
Mortality (MI) in CV centres	>20%	5–7%

GPS: global positioning system; MI: myocardial infarction.

Improvements have not just been in acute care. Currently, early in-hospital rehabilitation for all patients with ACS is available. Insurance covers rehabilitation programmes in a countryside sanatorium for ACS patients of working age. For all patients antiplatelet drugs are available for 6 months free of charge. Providing all ACS patients with all the necessary medications for 1 year and developing outpatient rehabilitation programmes are key next steps.

Lessons learned

- **Reducing cardiovascular mortality in the Russian Federation is a national priority and this has greatly facilitated the service delivery transformation process at regional level.** Regional governments implemented initiatives within the Federal Cardiovascular Programme which led to the organization of cardiac centres and monitoring of cardiovascular disease/mortality statistics and indicators.

- **A comprehensive and sustained approach was needed to achieve better outcomes.** This required action with multiple pathways including at regional, local, policy, provider and purchaser levels. Examples include: raising awareness among the public and symptoms recognition, medical education, additional hospitals, working groups, routing model for ambulances, quality control, citywide registry, monthly meetings, analytics, information technologies, network coordination and insurance funding.

- **A systematic approach to quality improvement based on timely quality data is needed.** Initiatives included: monitoring of the volume and quality of care in hospitals, independent quality audits, the citywide ACS registry (from 2016) with automated analytics and quality control, monthly meetings of a registry working group and monthly data assessment, and monthly meetings of managers of cardiovascular centres of hospitals in the Healthcare Committee of the Government of St Petersburg.

- **The ability of a health system to respond to acute events is dynamic, affected by changing factors such as road quality, traffic patterns and provider network, and needs constant review and adjustment.** Since the beginning of the development of a regional ACS network, traffic has increased substantially and new highways were introduced. Dynamic changes in traffic patterns require regular reassessment of the shortest routes to hospitals. The growth of high-technology care in hospitals has outpaced the development of outpatient and rehabilitation care. Further work is needed to prevent recurrent cardiac events. The complexity of the regional system of ACS care and the difficulty in performing effective assessments to identify areas of improvement demonstrate the need for continual improvements in information technologies and analytics.

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