

Mexican Institute of Social Security (Imss): National Network Plan for ST-Elevation Acute Myocardial Infarction, “Infarction Code”

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Introduction

Infarction code is a strategic plan implemented in the IMSS in order to reduce the times of medical care processes from First Medical Contact (FMC) to discharge and rehabilitation of the patient with ST-segment Elevation Myocardial Infarction (STEMI).

Recent developments have provided a unique opportunity for the organization of regional networks of STEMI receiving centers. Due to the fact that the cumulative evidence has shown that Percutaneous Coronary Intervention (PCI) primary is the most effective for the STEMI reperfusion strategy, the development of integrated networks using “control centers” could extend the benefits the primary PCI to one much larger Mexican population segment. Control center is a call center equipped with appropriate internet technology to receive not only the call but digital data such as ECG and other laboratory parameters in order to speed up Triage and inter-hospital patient transfer. Factors that favor the development of regional networks include results from recently published clinical trials, a vision of current patterns of treatment of STEMI from observational records, the experience with the current system for trauma in United States of America (USA) and the technological advances.

In addition, since 2004 International STEMI guidelines specified that optimal times of “first medical contact - balloon” should be < 90 minutes, making it a reference point clear for timely reperfusion was established. The achievement of this benchmark will require improvements in the current process of care, as well as greater multidisciplinary cooperation between the emergency medical services, emergency medicine physicians and cardiologists. Two types of regional networks have already begun to evolve in cities around the world, including the pre-hospital cardiac triage and inter-hospital transfer. The regional network coordination is needed to ensure a monitoring of quality and to delineate the ideal reperfusion strategy for a community determined on the basis of available resources and expertise.

Because of cumulative evidence It is now well established that primary Percutaneous Coronary Intervention (PCI) is the reperfusion strategy best for ST-elevation myocardial infarction (STEMI) [1], if done in a timely manner by experienced operators. However, this optimal strategy is limited because < 25% of hospitals in the United States has the ability to perform primary PCI [2]. In Mexico less than 10%, in addition a considerable number of patients with STEMI who are eligible for reperfusion therapy do not receive fibrinolysis or primary PCI [3].

These shortcomings can be addressed by greater attention to organizational problems and a multidisciplinary commitment to improve the consistency of timely reperfusion therapy [4]. therefore, the next process of care for acute STEMI initiative should be the development of regional networks of receiver centers of STEMI, which can reliably provide a rapid and highly rated of primary PCI.

A number of opinion leaders in cardiology have called for a larger organization of STEMI care at the national level but this still has not materialized [5-8]. On the other hand, a huge movement has begun to be developed, in which a variety of Emergency Medical Systems (EMS) across the country have independently started to implement some kind of primary PCI for STEMI regionalized. These have been reported in Boston, Minneapolis and others [9-12]. This brief review will summarize the current rationale for the regionalized care of patients with STEMI in Mexico; it will describe the current evolution of regionalized systems and highlight the key organizational details necessary for a successful implementation.

Rationale

Trauma systems in USA began approximately 30 years ago based on reasonable assumptions and has become a successful organizational development in which patients with critical injuries are preferably transported to designate more hospitals trained to provide specialized care. Although an improvement in survival with the implementation of the system of trauma has been documented, the excess of plot is common. Pre-hospital trauma protocols favor a high sensitivity, while STEMI protocols should promote a high specificity to avoid a major redistribution of patients with chest pain.

As regionalized for the STEMI care is considered, it is comforting to know that the basis of current evidence which supports this effort is much more solid, while recognizing that there is a residual controversy.

Some studies have concluded that patients with STEMI presenting early can benefit similarly with primary PCI than from the fibrinolytic therapy [13,14]. In addition, continued the debate on the use of various facilitated PCI strategies [15,16]. However, scientific opinion is converging on the PCI elementary as the preferred treatment of the STEMI compared with fibrinolytic therapy, provided that each PCI is carried out quickly and expertly by experienced operators [17]. Remaining key step is to improve the accessibility of the PCI elementary within our Mexican health care system [18]. The development in course of regional networks is supported by the recent guidelines, registration data and a series of clinical trials [19].

Other two updates in the international guidelines are particularly relevant. First, the guidelines have been reduced to acceptable FMC-ball time to < 90 minutes for the primary PCI. Secondly, the “zero time” is now defined as the first medical contact. Being realistic, so a patient does a first medical contact to balloon in less than 90 minutes, improved care process must be implemented between EMS, the Department of Emergency (ED) and the Cardiac Catheterization Laboratory (CCL) for patients with primary PCI [4].

Important observations from the “real world” in the large database of the National Registry of Myocardial Infarction (NORMI) provide a second compelling reason for the regionalized primary PCI. In 2003, the average door-to-door time was 100 minutes, which does not reach the goal of 90 minutes in the ACC guidelines / AHA [20]. Other deficiencies of the current attention of the STEMI includes a FMC-ball 116 minutes average time for primary PCI during free hours and 180 minutes (medium) for primary PCI occurring after the transfer between facilities [21,22].

Recently published NORMI analysis provides an additional basis for moving towards a model of “regulator center” dedicated. Hospital

of “specialization”, with emphasis on the primary as the main mode of reperfusion PCI is associated with faster treatment and lower in-hospital mortality and unique high-volume hospitals (primary PCI > 50) have demonstrated the ability of constantly improve the media FMC-balloon times [23,24].

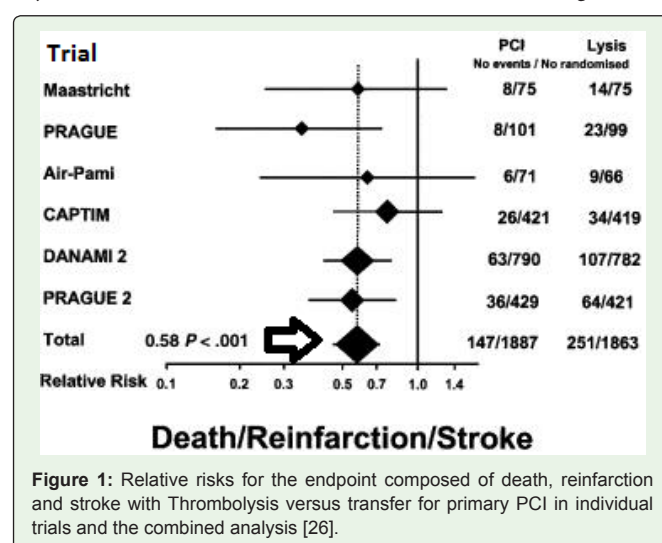
Another big push to create networks of control centers is based on data from recent clinical trials in Europe. The two larger studies, PRAGUE-2, DANAMI-2 demonstrate that a well-organized interagency transfer for PCI in a tertiary center strategy was better than in-situ fibrinolytic therapy in the initial hospital [25-26].

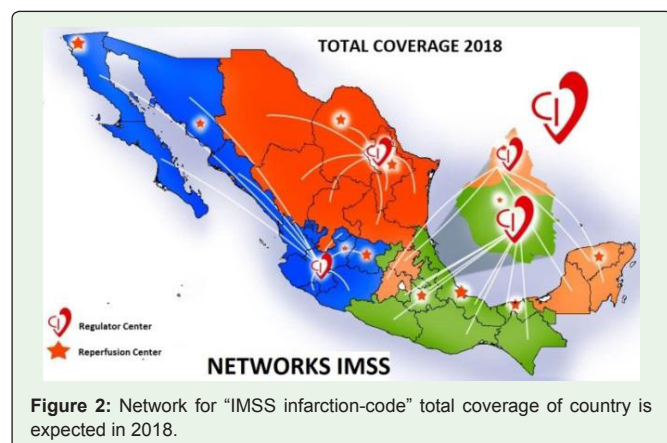
Although these trials had limitations (e.g., under use of revascularization after fibrinolysis and selective enrollment during the day), both studies reported that the time of inflated random ball (median) was < 100 minutes despite the times transportation (median) of approximately 30 to 45 minutes. A meta-analysis recent of 6 clinical trials randomized (3750 patients) comparing the PCI transfer versus the fibrinolytic at the site showed that the combined endpoint of death, reinfarction and stroke to the 30 days was reduced by 42% (95% CI; 29% - 53%; $P < .001$) [27] (Figure 1).

1405 patients with STEMI actually transported in this series, 2 deaths only occurred during the transfer [15]. Ventricular arrhythmias are defibrillated with success on the route. In short, the PCI transfer seems feasible, safe and “worth the wait” if we develop systems in the United States that minimize waiting [28].

The networks must address the existing impediments to timely reperfusion [29-32]. Doctors and paramedics must work within a system that facilitates the expeditious transport of a patient with STEMI to a center that can provide the highest level of care (p. ex., primary PCI). In addition, in parallel with the current system of trauma protocols, hospital diversion status does not avoid the arrival of the patient unless specialized care team to become saturated. Patients with STEMI who reach a State of “diversion” ED still could stabilize, with the expectation that expected early PCI readiness. After the primary PCI, the recovery room can provide ability to rise further if there is a shortage of critical care beds [33-36].

The early activation of the team of “control center” based on the objective identification of STEMI is desirable because the guidelines



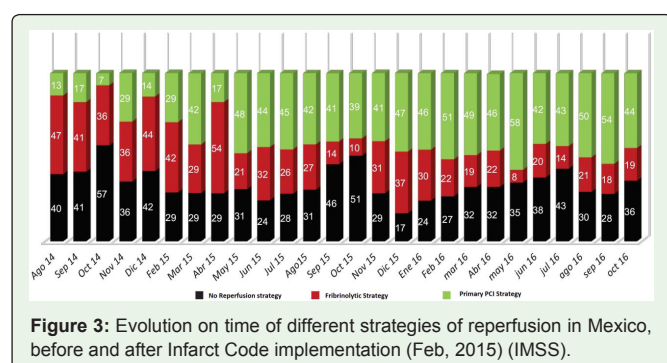


emphasize the reduction of the time to reperfusion [19]. The ideal is that staff check and inform to "control center" begin while the patient is transported (i.e., time is saved when the essential steps in parallel). The "false alarms" concern is mitigated by the high specificity (i.e., low false positive) of the current algorithms of automated 12 lead ECG based on data that evaluate the accuracy of the identification of STEMI by emergency medicine physicians, a control center should expect to tolerate a rate of false positive ECG of 5% [32,37,38].

Protocols must exist to ensure timely pharmacological reperfusion for various situations that may arise in hospitals with and without ability to primary PCI. For example, the possibility arises an unexpected delay in the mechanical reperfusion planned and recommended by current guidelines (class IB) that fibrinolytic therapy may be preferable if the duration of the symptoms is < 3 hours and the delay of the PCI You can exceed 60 minutes [19]. Similarly, since weather or transportation problems can affect the feasibility in real time from IHT, hospital radio stations must always be able to provide on-site fibrinolytic [39-41].

Mexican Network-IMSS for STEMI

In Mexico as the rest of the world the first cause of death is Ischemic Heart Disease [42]. In February 2015 began the code infarction strategy in the Mexican Institute of Social Security (IMSS), even though the concept of permeable artery as soon as possible is not a new concept, the standardization of processes in the prompt medical attention to reduce time and select the best reperfusion strategy either thrombolytic plus PCI after or primary PCI is what characterizes this strategy.



Today it boasts 13 centers of reperfusion with hemodynamic room for ICP and the goal is to cover the 23 centers nationwide. However she has trained to 194 units of health care in three levels of 25 IMSS delegations (Figure 2).

The greatest impact of the strategy was quickly in the reduction of mortality as a basal rate of 26% was down 8.5%. Figure 3 shows the evolution in time of the different strategies, being the most notorious finding the remarkable increase in primary angioplasty (Figure 3).

Regulatory Center

Another important development was the integration of regulatory centers that automated consultation and management services. Using telemedicine the cases are selected and transferred in a more efficient manner (Figure 4).

Since its implementation the number of cases seen in the regulatory centers has increased significantly as shown in the table 1.

Thus, the overall time to identify a STEMI changes from more than 20 minutes to less than 10 minutes (Table 1).

Table 1: Example of representative regulator center of IMSS-México.

IMSS Infraction code in Cardiology hospital Mexico				
Month	Calls	Cases with real STEMI	% STEMI	Time to solve
Mar-16	211	45	21.33	0:08:45
abr-16	299	212	70.9	0:09:13
May-16	263	155	58.94	0:09:26
Jun-16	345	194	56.23	0:09:41
Jul-16	331	183	55.29	0:08:13
aug-16	403	243	60.3	0:10:49
sep-16	367	219	59.67	0:09:51
oct-16	394	201	51.02	0:07:09
nov-16	429	184	42.89	0:08:05
dec-16	440	191	43.41	0:08:00
ene-17	525	230	43.81	0:07:40
feb-17	438	170	38.81	0:06:58
mar-17	622	213	34.24	0:07:45
abr-17	525	179	34.1	0:07:46
may-17	530	199	37.55	0:08:01
jun-17	615	190	30.89	0:07:14
jul-17	681	193	28.34	0:05:08
aug-17	803	180	22.42	0:04:50
sep-17	624	183	29.33	0:05:31
oct-17	737	202	27.41	0:05:49

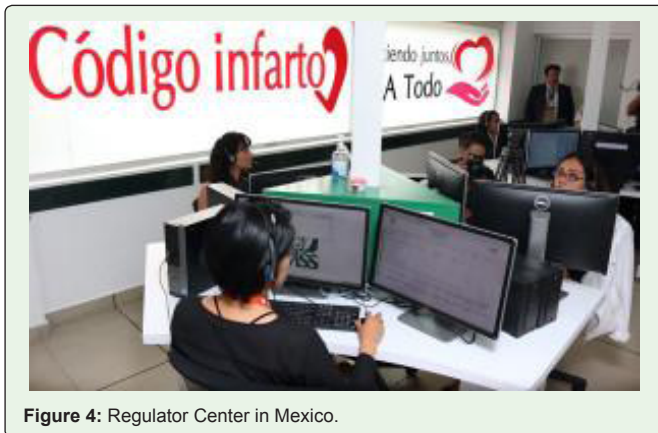


Figure 4: Regulator Center in Mexico.

Conclusions

The Organization of the regional SRC networks is an initiative of important and evidence-based care. It is expected that improving access to rapid mechanical reperfusion in centers of large volume with proven experience in the primary PCI will improve the quality and the general consistency of the care of patients with STEMI. Principles of regionalization include the success of our current trauma, the technological advances that have automated interpretation of defibrillation and ECG of 12 derivations, ESC 2017 guides, recent clinical trials and the existence of cities 'model'. Ideally, regulatory center network could be implemented successfully within each Emergency Room system. Continuous monitoring of quality is an essential component for the successful implementation of a network. The Organization of the regional networks is an initiative of important and evidence-based care. IMSS is an institution that emerges as a leader into the STEMI treatment around the world.

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