Evidence of Healthcare Quality Improvement in Acute Myocardial Infarction

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Abstract

Background: The monitoring of healthcare quality indicators (HCQI) is a process of utmost importance in patient healthcare services.

Objective: To evaluate whether the monitoring of HCQI and the root-cause analysis improve the healthcare quality in acute myocardial infarction (AMI).

Methods: A cross-sectional and comparative analysis of HCQI was performed in patients with AMI in the years 2006 and 2007. Of the 1,461 patients admitted with chest pain, 172 (11.7%) had a diagnosis of AMI and were included in the analysis.

Results: The rate of primary angioplasty was 8.47% higher in 2007 (97.3%) when compared to that in 2006 (89.7%), but this difference was not statistically significant (p = 0.35). Moreover, there was no difference regarding the time of hospitalization (4 *vs* 5 days, p = 0.15) and the in-hospital mortality (7.8% *vs* 5.1%, p = 0.67) between 2007 and 2006, respectively. However, the time to the first troponin level was 27% shorter in 2007 (69 min.; 95%CI = 44-94 min.) when compared to 2006 (95 min.; 53-136 min.) (p = 0.025). The door-to-balloon time was 12% shorter (72 ± 29 min. *vs* 109 ± 85 min.; p = 0.03), the rate of ASA prescription at hospital discharge was 35% higher (94.7% *vs* 70.3%; p = 0.002) and the rate of PCA shorter than 90 minutes was 52% higher (78.3 *vs* 51.4%; p = 0.03) in 2007, when compared to 2006.

Conclusion: Our results suggest that the strategy of monitoring the HCQI and the implementation of the root-cause analysis methodology can improve the healthcare process in patients with AMI. (Arq Bras Cardiol 2010;94(6) : 681-684)

Key words: Patient-centered care; quality of health care; myocardial infarction; quality indicators, health care.

Introduction

The research on healthcare quality improvement tries to reduce the distance or establish a bridge between the ideal and the actual healthcare[1]. A decrease of more than 40% in cardiovascular mortality was observed in the USA between 1980 and 2000, due to the improvement in risk factor control and treatment - supported by evidence-based Medicine - of acute myocardial infarction (AMI), coronary artery disease (CAD) and heart failure[2].

In spite of that, many North-Americans do not receive the ideal healthcare. Therefore, the existence of patients' healthcare process indicators is essential for the comparison between healthcare institutions. The monitoring of these indicators provides the institutions with the possibility of analyzing, in the long term, the healthcare process and the establishment of corrective measures to improve it[1].

In Brazil, the routine investigation of whether the diagnostic or therapeutic strategies are improving the population's health and well-being, or if they are being carried out according with the best practices, scientific evidence or guidelines, is still incipient. In developed countries, governmental and non-governmental agencies have been developing healthcare quality indicators (HCQI) for decades, which can be used by the institutions to improve healthcare services[3-5]. In Brazil, where cardiovascular diseases are the main cause of mortality and morbidity, governmental and non-governmental agencies are also promoting institutional accreditation programs, aimed at improving the quality of healthcare services offered to the population[6-8]. Within this context, the AMI is an ideal condition to assess such initiative, due to the actual and potential benefits that diagnostic and therapeutic measures can bring to patients[9].

The objective of the present study is to analyze whether the monitoring of the HCQI and the use of corrective measures based on the root-cause analysis in patients with AMI can improve healthcare quality throughout time.

Methods

In a retrospective assessment, a cross-sectional analysis of

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the HCQI in AMI was carried out during the years 2006 and 2007 and the indicators of the year 2007 were compared to those of 2006. During these two years, of a total of 1,461 consecutive patients admitted with non-traumatic chest pain at the Emergency Department, 172 (11.7%) had a confirmed diagnosis of AMI and were included in the study. Of these 172 patients, 94 (54.7%) were admitted in 2006 and 78 (45.3%) in 2007. The ST-segment elevation myocardial infarction (STEMI) was diagnosed in 94 patients (43%) (Table 1). A total of 112 patients were males and the mean age was 68 ± 14 years (Table 1). Thirteen patients (7.5%) were transferred to other institutions and their data were included in the analysis up to the time of transference. These patients' data did not differ from those who were not transferred (Table 2). Patients with cardiogenic shock were not excluded from the analysis.

The diagnosis of STEMI was established according to the criteria of the European Society of Cardiology and the American Heart Association[10]. For the diagnosis of AMI, the upper limit of the normal range for troponin I was 0.16 ng/dl.

The HCQI used were: rate of primary percutaneous coronary angioplasty (PPCA); door-to-balloon time (DBT) and PPCA > 90 minutes (PPCA < 90) for the STEMI; time until the result of the first troponin level (TTPN) in minutes; time of hospitalization (TH); in-hospital mortality (HM); rate of prescription of acetylsalicylic acid (ASA) at hospital discharge in both STEMI and non-ST segment elevation acute myocardial infarction (NSTEMI).

At the end of 2005, the goals to be attained for each of the HCQI were established, considering the guidelines of the American Societies of Cardiology for AMI[11]. Each parameter was verified monthly and depending on the results, the implementation of the methodology of the root-cause analysis was triggered for the correction of identified flaws. The goals were: PPCA ≥ 75%; DBT ≤ 70 min.; rate of PPCA ≤ 90 min ≥ 85%; TTPN ≤ 60 min; HM ≤ 8%; TH ≤ 5 days; ASA = 100%.

Table 1 - Clinical and demographic characteristics of the patients

Year	2006	2007	Total
n	94 (54.6%)	78 (45.4%)	172
Males (%)	64.9	65.4	65.1
STEMI (%)	38.2	48.7	43.0
NSTEMI (%)	61.8	51.3	57.0
Age (yrs)	69 ± 12	68 ± 16	68 ± 14

STEMI - ST-segment Elevation Myocardial Infarction; NSTEMI - Non-ST Segment Elevation Myocardial Infarction.

Table 2 - Clinical and demographic characteristics of the transferred and non-transferred patients

	Transferred	Non-transferred
n	13 (7.5%)	159 (92.5%)
Males (%)	69.0	65.0
STEMI (%)*	46.0	43.0
NSTEMI (%)	54.0	57.0
Age (yrs)*	70 ± 12	68 ± 14
PPCA (%)* (95%CI)	89.7 (75.8 - 96.5)	97.3 (85.3 - 99.0)
DBT (min.)* (95%CI)	91 (51 - 115)	75 (63 - 87)
PPCA ≤ 90 (%)* (95%CI)	60 (22 - 88)	69 (57 - 79)
TTPN (min.)* (95%CI)	64 (44 - 84)	75 (59 - 91)
TH (days)† (95%CI)	1 (0 - 2)	5 (3 - 6)
HM (%)	NA	NA
ASA (%)	NA	NA

*PPCA - rate of primary percutaneous coronary angioplasty; DBT - door-to-balloon time; PPCA ≤ 90, PPCA rate ≤ 90 min; TTPN - time to the first troponin level; TH - time of hospitalization; HM - in-hospital mortality; ASA - rate of prescription of ASA at hospital discharge; NA - not applicable. *p = NS; †p < 0.05.*

Statistical analysis

The continuous data were expressed by medians and their respective confidence intervals or by their means and standard deviations. The categorical data were expressed by proportions. The Student's *t* test or Wilcoxon rank-sum test was used to compare the continuous data. Fisher Exact test or Mann-Whitney test was used to compare the categorical data. The two-tailed p values were set at p ≤ 0.05.

Results

The global PPCA rate (considering the years 2006 and 2007 together) was 93.5% (95%CI = 85.3%-97.5%); the door-to-balloon time was 82 ± 54 min.; PPCA rate ≤ 90 minutes was 66.2% (54.6%-76.1%); TTPN was 79 min. (53-104 min.); TH was 5 days (3-6 days); HM was 7% (2.6%-15.8%); the rate of ASA prescription at hospital discharge was 89.2% (81.5%-94%) (Table 3).

The PPCA rate was 8.47% lower in 2007 (97.3%; 95%CI = 85.3%-99%) when compared to 2006 (89.7%; 95%CI = 75.8%-96.5%), but the difference was not statistically significant (p = 0.35). Additionally, there was no statistically significant difference between the TH, which was 4 days (95%CI = 3-6 days) in 2007 and 5 days (95%CI = 3-7 days) in 2006 (p = 0.15); the HM was 7.8% (95%CI = 2.9%-21.5%) in 2007 and 5.1% (95%CI = 0.5%-17.7%) in 2006 (p = 0.67). However, the TTPN was 27% shorter in 2007 (69 min.; 95%CI = 44-94 min.) when compared to 2006 (95 min.; 95%CI = 53-136 min.) (p = 0.025). Similarly, the DBT was 12.7% shorter in 2007 (67 min.; 95%CI = 58-76 min.) when compared to 2006 (76 min.; 95%CI = 40-112 min.) (p = 0.014). The rate of prescription of ASA at hospital discharge was 35% higher (94.7%; 95%CI = 81.8%-99.4% *versus* 70.3%; 95%CI = 51.3%-84.3%; p = 0.002) and the rate of PPCA ≤ 90 was 52% higher (78.3%; 95%CI = 60.5%-87.2% *versus* 51.4%; 95%CI = 36.2%-66.1%; p= 0.03) in 2007, when compared to 2006, respectively (Table 3).

Table 3 - **Outcomes of Healthcare Quality Indicators in AMI**

Year	2006	2007	Total
PPCA (%)* (95%CI)	89.7 (75.8 - 96.5)	97.3 (85.3 - 99.0)	93.5 (85.3 - 97.5)
DBT (min.)* ‡	109 ± 85	72 ± 29	82 ± 54
PPCA ≤ 90 (%)* ‡ (95%CI)	51.4 (36.2 - 66.1)	78.3 (60.5 - 87.2)	66.2 (54.6 - 76.1)
TTPN (min.) †‡ (95%CI)	95 (53 - 136)	69 (44 - 94)	79 (53 - 104)
TH (days) † (95%CI)	5 (3 - 7)	4 (3 - 6)	5 (3 - 6)
HM (%) † (95%CI)	5.1 (0.5 - 17.7)	7.8 (2.0 - 21.5)	7 (2.6 - 15.8)
ASA (%) †‡ (95%CI)	70.3 (51.3 - 84.3)	94.7 (81.8 - 99.4)	89.2 (81.5 - 94)

*PPCA - rate of primary percutaneous coronary angioplasty; DBT= door-to-balloon time; PPCA ≤ 90, PPCA rate ≤ 90 min; TTPN - time to the first troponin level; TH - time of hospitalization; HM - in-hospital mortality; ASA - rate of prescription of ASA at hospital discharge; NA - not applicable. *in AMI with ST-segment elevation (STEMI); †in both STEMI and non-ST segment elevation myocardial infarction (NSTEMI). ‡ p < 0.05 entre 2006 e 2007.*

Discussion

The results of our study on the continuous monitoring of healthcare quality indicators in patients with acute myocardial infarction suggest that there was an improvement in most indicators from 2006 to 2007. There was a significant 12% decrease in door-to-balloon time, a 27% decrease in the time till the first troponin level, a 52% increase in the rate of primary percutaneous coronary angioplasty < 90 minutes and a 35% increase in the rate of prescription of ASA at hospital discharge. An increase in the rate of PPCA was also observed; however, the difference was not statistically significant (Table 3).

The definition of the goals to be attained according to the three quality domains, such as structure, process and results, were essential tools for the successful implementation of this process in our institution. The root-cause analysis methodology was adopted, in which a description of the event or problem is carried out, followed by the elucidation of this root-cause, by implementing corrective measures to improve the existing process and a new assessment of the results, simultaneously closing a cycle and opening a new one[11].

In the USA, an increasing national effort has been carried out by Medicaid, Medicare and the Joint Commission on Accreditation, among other institutions, to monitor and disclose information on the performance of hospitals that treat patients with AMI[5]. According to Bradley et al[12], in a study of 962 hospitals included in the USA national registry of AMI, carried out in 2002 and 2003, the adequate time of reperfusion was attained in only 54.5% of the cases and the rate of prescription of ASA at hospital discharge was 79.6%, with an in-hospital mortality rate of 6.8%[12]. Our results are slightly better when compared to those (Table 3).

In our study, the rate of PPCA < 90 minutes was 78.3%, the rate of prescription of ASA was 94.7% and the in-hospital mortality was 7.8% in the year 2007. However, the fact that our institution has, annually, a small number of patients with a diagnosis of AMI can create the illusion of a similar or better performance, when compared to institutions with a larger number of patients[13,14].

No association was observed between the rate of mortality and the improvement in the healthcare quality process, which can be explained by the small sample size. In fact, Bradley et al[12] did not find a correlation between the hospital performance and the in-hospital mortality or up to 30 days[12]. On the other hand, even though Peterson and cols. demonstrated a significant correlation between those two variables, they excluded patients transferred to other hospitals from the analysis, increasing the estimate of the association[15]. In our study, 7.5% of the patients were transferred to other institutions after the diagnosis of AMI was established. However, the demographic and clinical characteristics of these patients did not differ from those of the other patients (Table 2).

Another study, which included only hospitals with a door-to-balloon time < 90 minutes, demonstrated that this time interval varied from 55.5 to 89 minutes[16]. This time interval in our institution was of 82 minutes, varying from 61 and 87 minutes.

In conclusion, our study suggests that the monitoring of HCQI and the implementation of the root-cause analysis methodology result in the improvement of the healthcare quality process in acute myocardial infarction.

Study limitations

This study was carried out in a single institution, with a trained team that has broad experience in percutaneous coronary intervention, working daily shifts, seven days a week, of which emergency team has more than 10 years of experience in a Chest Pain Unit. For these reasons, all patients admitted at the Emergency Room with a diagnosis of STEMI, eligible for percutaneous coronary reperfusion, are referred to the Interventionist Cardiology Laboratory, a very unusual scenario in Brazil.

Two years are not enough to provide definitive evidence that the process of healthcare quality has really improved. However, our institution was recently accredited by the National Accreditation Organization (ONA)[8], which means that we are intrinsically committed with the healthcare quality process.

Some equally important data, which reflect the healthcare quality in AMI, such as the rate of ASA prescription at hospital admission, rate of beta-blocker administration at hospital admission and discharge, rate of advice to stop smoking and the rate of prescription of angiotensin-converting enzyme inhibitor at hospital discharge, were not assessed.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

This study is not associated with any post-graduation program.

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