Implementing Clinical Guidelines on Acute Myocardial Infarction Care in an Emergency Service

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Abstract

Background: **The implementation of clinical guidelines on acute myocardial infarction (AMI) care produces better results.**

Objective: **To present a multidisciplinary program to implement these guidelines in a large public emergency center and check its impact.**

Methods: **Evaluation study on health services, with "before and after" type design, to assess the indicators of quality of AMI care before and after implementation of training strategies and to facilitate emergency teams' acceptance of clinical guidelines. This includes the development of educational and awareness-raising materials and continued supervision. Relative risk estimate (RR) and confidence intervals (95%).**

Results: **Pre-program group, 78 cases of AMI; post-program group, 66 cases of AMI. Most cases were treated only in the emergency room, due to small number of vacancies in the coronary care unit. We observed a significant increase ($p<0.05$) in the use of various interventions evaluated (process indicators): beta-blockers, 83%; angiotensin-converting enzyme inhibitors, 22%; lipid-lowering agents, 69%; intravenous nitrate, 55%; coronary reperfusion in acute myocardial infarction with ST-segment elevation, 98%. The use of aspirin from the first day of the IAM reached 95.5% of cases. The loss of opportunity of coronary reperfusion in patients with this indication, reduced from 71.4% to 17.6% post-training.**

Conclusion: **The program achieved a significant impact and its propagation to other units may contribute to better assist IAM in the public health system. (Arq Bras Cardiol 2011; 96(1): 18-25)**

Keywords: **Practice guidelines; guidelines; myocardial infarction; emergencies; quality of health care; health management.**

Introduction

Despite the observation of a trend to reduced mortality from cardiovascular diseases (CVD) in Brazil, this group of diseases remains the leading cause of proportional mortality in the country, accounting for approximately 32% of deaths. They have a high impact on health care costs and quality of life. Ischemic heart disease (IHD), which includes acute myocardial infarction (AMI), is the major component of cardiovascular mortality in several cities in the South and Southeast, including the city of Rio de Janeiro[1,2].

Although recent studies reveal that the rate of hospital death has fallen to about 6%, several countries have reported rates ranging from 16.7% to 21%, well above those observed in clinical trials[3-8]. Possible explanations for this variation include the selection criteria adopted in clinical trials, failure to apply optimized treatment in clinical practice, training of health staff, resources, severity and social conditions of patients.

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For AMI care, there is a number of effective treatment options, available through clinical guidelines (CG) by international societies, as well as by the Brazilian Society of Cardiology (SBC)[9-11]. However, there is a great variation in the use of these therapies, which may often serve as evidence to failure to adopt well-establish protocols[12-17].

Today the assumption that the implementation of CG set from the scientific evidence available on the effectiveness of interventions produces better results in the assisted population is internationally accepted[16-20]. There is also the challenge of incorporating the clinical management as a dimension of management in health organizations and the understanding that the initiatives aimed at improving the quality of care need to be integrated and conducted at the organizational level[21-27]. Therefore, this article aims to present an experience of implementing CG for AMI care in a public hospital in Rio de Janeiro, focusing on the strategies employed and the assistance-related results produced.

Methods

The study involves a "before and after" evaluation design, comprising indicators of quality of AMI care before and after the implementation of a program to implement CG in the

emergency room of the *Hospital Geral de Bonsucesso* (HGB) in Rio de Janeiro. The program included training strategies and other strategies to facilitate teams' acceptance to adopt conducts based on scientific evidence, synthetically defined from the III Guidelines on Acute Myocardial Infarction Treatment, issued by SBC[11]. The study team initially promoted a workshop with representatives from the Brazilian Medical Association (AMA), cardiologists from SBC and from the Society of Cardiology of Rio de Janeiro State, to agree on an work agenda concerning the need and feasibility of updating the guidelines. The difficulties in implementing this agenda were incompatible with the schedule of the study. Therefore, we opted for the Guideline published by SBC, which mostly contained current content with recommendations for AMI treatment based on scientific evidence.

With a view to early identify and assist patients with potential diagnosis of AMI, the training and the production of specific educational materials were targeted not only at health professionals (doctors, nurses, nursing technicians, electrocardiogram operators), but also receptionists, stretcher-bearers and guards involved in patient care. The materials produced and used as facilitators of adherence to CG included: a brochure containing a summary of the guidelines distributed to university-level health professionals, particularly doctors; a pocket folder containing a summary of the brochure, with the most relevant therapeutic recommendations and an AMI care flowchart, targeted to physicians; and special badges with content tailored to various professional categories. The badges contained technical information compatible with the level of the function of each professional involved in reception and care of patients with chest pain in the emergency room. We also produced a program pin. Both badges and the pin were tools to encourage and integrate the team. We also incorporated training materials previously developed by the team of cardiologists from the HGB on differential diagnosis of acute coronary syndromes for doctors and nurses.

To monitor adherence to guidelines and assistance-related results from the study, we used the supervision of staffs by leading cardiologists and evaluation of indicators before and after implementation of CG. The evaluation of the effects of the CG implementation program was performed by collecting data from medical records, through questionnaires to set up indicators of AMI care process quality selected and adapted from the studies of the GAP project (Guidelines Applied in Practice)[20,25-27] and the III Guideline of SBC.[11] The indicators selected took into account the effectiveness documented by scientific evidence and the availability of the study onsite. The relative risks (RR) of using the interventions selected post-implementation of CG comparing to the period before it, and their confidence intervals (95%) were estimated.

The criterion for inclusion in the study was documented diagnosis of AMI. Exclusion criteria were records of chest pain not characterizing AMI and AMI case ruled out during follow-up. The definition of AMI diagnosis followed the III Guideline of SBC[8], and contemplated the characteristic increase and gradual decrease in troponin, or faster rise and fall for CK MB fraction (CK-MB) with at least one of the following criteria: ischemic symptoms; development of pathological Q waves on electrocardiogram; or ECG changes indicating ischemia (ST elevation or depression).

The sample was not probabilistic, with operationally limited collection period from August, 2005 to June, 2006, pre-implementation of clinical guidelines (pre-CG), from August 2006 to December 2006, after implementation of clinical guidelines (post-CG). It comprised 78 cases of AMI in the pre-CG group, for which there was information available regarding emergency care, collected retrospectively; and 66 cases in the post-CG group collected prospectively.

Data were entered into an electronic database built in Access and analyzed using the programs EpiInfo 3.2.2. and SAS™. The study was approved by the Ethics Committee of ENSP/FIOCRUZ and HGB.

Results

Table 1 shows the distribution of cases according to demographic and clinical variables in both groups. There was an improvement in filling the data for hypertension, diabetes, smoking and the Killip class upon admission, reflected in a lower percentage of unknown cases. The average length of stay in the emergency room was 6.7 days in the pre-CG group and 8.3 days post-Cg, which is a non-significant difference.

Table 2 presents the use of therapeutic interventions recommended by the CG, and indicates, in general, significant improvement in post-CG adhesion. For the use of acetylsalicylic acid (ASA) since the first day, there was no significant improvement. Among the cases with no recorded use of ASA, only one (post-CG) had a history of allergy outlined in the medical record.

The use of beta-blockers increased significantly post-CG, and it wasn't prescribed in only four of 66 cases of this group, all with explicit contraindication. Some of this increase may be related to the higher proportion of patients in Killip class I upon admission in this group (Table 1). The use was oral in all cases except in one case of intravenous use pre-CG.

The use of angiotensin-converting enzyme inhibitors (ACE) significantly increased in the post-CG group, as well as intravenous nitrate and lipid lowering drugs.

The use of coronary reperfusion significantly increased in the post-CG group. Table 2 examines the indicator firstly for all cases of AMI with ST segment elevation or left bundle branch block (AMI with ST segment elevation/LBBB). Then, it just considers the "ideal patient" for pharmacological thrombolysis, i.e., the referent of the intervention (AMI with ST segment elevation/LBBB, within the time interval of up to 12 hours from the symptom onset and without contraindications)[9-11]. Failure to undergo intervention in this case is referred to as "loss of opportunity."

In the pre-CG group, in eight out of 53 cases of AMI with ST segment elevation/LBBB there was no information about contraindications for pharmacological reperfusion, and out of these, three received thrombolytics. From the post-CG group, in all 34 cases of AMI with ST segment elevation/LBBB, it was possible to identify whether or not they were referents for pharmacological thrombolysis. The analysis included two cases of primary angioplasty (one pre-CG and another post-

Table 1 - Distribution of AMI cases by demographic and clinical variables before and after the implementation of clinical guidelines (pre and post-CG). Hospital Geral de Bonsucesso, 2005-2006

Variables	Pre-CG (n=78)		Post-CG (n=66)		c2 (p)
	n	%	n	%	
Diagnosis					0.18618
AMI with ST-segment elevation	43	55.1	30	45.5	
AMI without ST-segment elevation	24	30.9	31	47.0	
AMI with LBBB	10	12.8	4	6.1	
AMI with unknown location	1	1.3	1	1.5	
Sex					0.52128
Male	36	46.2	34	51.5	
Female	42	53.8	32	48.5	
Age group*					0.73196
Up to 50	10	13.3	9	14.3	
51 to 60 years	16	21.3	16	25.4	
61 to 70 years	26	34.7	24	38.1	
≥ 71 years	23	30.7	14	22.2	
Hypertension					0.62656
Yes	57	73.1	50	75.8	
No	10	12.8	10	15.2	
Unknown	11	14.1	6	9.1	
Diabetes mellitus					0.01524
Yes	23	29.5	16	24.2	
No	34	43.6	43	65.2	
Unknown	21	26.9	7	10.6	
Dyslipidemia					0.11546
Yes	16	20.5	19	28.8	
No	18	23.1	7	10.6	
Unknown	44	56.4	40	60.6	
Current smoking					0.00088
Yes	16	20.5	18	27.3	
No	36	46.2	43	65.2	
Unknown	26	33.3	5	7.6	
Killip class on admission					0.01282
Killip I	56	71.8	61	92.4	
Killip II	12	15.4	3	4.5	
Killip III	2	2.6	2	3.0	
Killip IV	3	3.8	-	-	
Unknown†	5	6.4	-	-	
Sudden cardiac arrest in the emergency room					0.28922
Yes	6	7.7	2	3.0	
No	72	93.3	64	97.0	
Death in the emergency room					0.21879
Yes	5	6.4	1	1.5	
No	73	93.6	65	98.5	

*AMI - acute myocardial infarction; CG - clinical guidelines; *excluding three cases with unknown age in both groups. † Including one case with unknown IVE and Killip class.*

CG), because this form of reperfusion was the team's decision, not characterized as loss of opportunity. Primary angioplasty was performed outside the initial referent of ST elevation or LBBB pre-CG. In the post-CG group, there was no case with no indication receiving any form of reperfusion therapy.

Table 3 shows the average intervals of time between the onset of AMI symptoms, admission to the emergency and coronary reperfusion, where hospital delay was analyzed until reperfusion. This table included an additional case of coronary angioplasty performed outside the referent in the pre-CG group, because the purpose is to analyze the in-hospital logistics of using resources for coronary reperfusion. This case was excluded from Table 2, which only examined reperfusion in candidates with indication for that. Although the number of cases is small, there was a reduction in the average in-hospital delay until the beginning of reperfusion post-CG after 112 minutes (95% CI=27.9; 196.0). The use of mechanical reperfusion was exceptional, and with a delay greater than that observed for streptokinase.

Other interventions observed, despite not being part of the group of indicators selected were: significant increase in the use of 14.1% clopidogrel pre-CG to 78.8% post-CG (RR=5.59; 95%CI=3.19;9.80), significant increase in the use of cardiac catheterization during hospitalization of AMI, from 19.2% pre-CG to 92.4% post-CG (RR=4.81; 95%CI=3.03;7.61); and nonsignificant increase in the use of coronary care unit from 17.9% pre-CG to 25.6% post-CG (RR=1.41; 95%CI=0.77;2.69).

Chart 1 summarizes the impact of the CG implementation program on the process indicators selected, and shows a substantive and statistically significant improvement.

Discussion

This study presented the results of a multidisciplinary program for implementing CG in AMI care in a major public emergency center in Rio de Janeiro. In general, the process indicators selected documented an expressive and statistically significant performance improvement at the HGB.

For the selection of quality indicators, we took into consideration the reality of the HGB. The indicators basically covered assistance in the emergency department, and there was no information about the prescription of discharge. Recently published recommendations for the standardization of quality indicators in the context of AMI care emphasize the use of aspirin upon admission and in the prescription of discharge, reperfusion therapy in AMI with ST segment elevation/LBBB up to 12 hours of symptom onset, and delay until fibrinolysis or primary angioplasty[28]. Regarding the use of beta-blockers, statins and ACE inhibitors, the recommendation is to monitor the indicator by prescribing discharge[29]. A comparison of studies evaluating quality involves the need to standardize the indicators, including as to the correct specification of the denominator, which may involve all cases or a particular subgroup.

The quality targets to be achieved in the GAP project were defined by groups of experts and consist of: ASA in the first 24 hours and at discharge (95%); beta-blocker in the first 24 hours (78%) and upon discharge; median delay until

Table 2 - Frequency of use of certain therapeutic interventions in cases of AMI in the pre and post-CG. Hospital Geral de Bonsucesso, 2005-2006

	Pre-CG (78 cases)		Post-CG (66 cases)		RR *	95% CI	p (c2 or Fisher)
	n	%	n	%			
ASA from day one	68	87.2	63	95.5	1.07	0.98; 1.16	0.17657
Beta-blocker †	40	51.3	62	93.9	1.83	1.46; 2.29	0.00000
ACE inhibitor	61	78.2	63	95.4	1.22	1.07; 1.39	0.00286
Intravenous nitrate	45	57.7	59	89.4	1.55	1.26; 1.91	0.00002
Lipid-lowering agents	44	56.4	63	95.4	1.69	1.38; 2.07	0.00000
Coronary reperfusion in AMI with ST-segment elevation/left bundle-branch block	**Pre-CG (53 cases)**		**Post-CG (34 cases)**		**RR ***	**95% CI**	**p (Fisher)**
	n	**%**	**n**	**%**			
Mechanical (primary angioplasty)	1	1.9	1	2.9	2.05	0.13; 31.16	0.81105
Pharmacological (streptokinase)	10	18.9	13	38.2	2.05	1.02; 4.12	0.04142
Any form	11	20.8	14	41.2	1.98	1.02; 3.85	0.03999
Coronary reperfusion in the "ideal patient" for thrombolysis ‡	**Pre-CG (28 cases)**		**Post-CG (17 cases)**		**RR ***	**95% CI**	**p (Fisher)**
	n	**%**	**n**	**%**			
Reperfusion performed	8§	28.6	14§	82.4	2.88	1.54; 5.39	0.00046
Loss of opportunity	20	71.4	3	17.6	0.25	0.09; 0.71	

*AMI - acute myocardial infarction; CG - clinical guidelines; RR - relative risk; IC - confidence interval; *RR post/pre, with reference to non-use of intervention; †pre-CG: 39 oral and one intravenous; post-CG: 57 oral; ‡ use in the referent; excluding eight cases with unknown information pre-CG; § including one case of primary angioplasty at the physician's choice.*

Table 3 - Delay between symptom onset and arrival to the emergency room; symptom onset and reperfusion; and hospital delay until reperfusion in the pre and post-CG group. Hospital Geral de Bonsucesso, 2005-2006

Indicator (time in minutes)	Pre-CG			Post-CG			p*
	n	Average	Standard deviation	n	Average	Standard deviation	
Delta time arrival to the emergency room †							
Any AMI	53	522	769	64	689	755	0.21423
AMI with any reperfusion	9	268	243	13	248	223	0.83534
AMI and streptokinase	7	346	316	12	258	229	0.49036
Myocardial infarction with primary angioplasty ‡	2	517	360	1	119	-	-
Delta time beginning of reperfusion †							
Any reperfusion	9	503	325	13	356	222	0.20119
Streptokinase	7	400	251	12	338	222	0.67846
Primary angioplasty ‡	2	866	363	1	569	-	-
Hospital delay until the beginning of reperfusion †							
Any reperfusion	12	220	128	13	108	115	0.02976
Streptokinase	10	194	125	12	80	54	0.12730
Primary angioplasty ‡	2	349	3	1	450	-	-

*AMI - acute myocardial infarction; CG - clinical guidelines; * unpaired t test; † excluding unknown cases; ‡ including one case of AMI without ST-segment elevation with angioplasty.*

Original Article

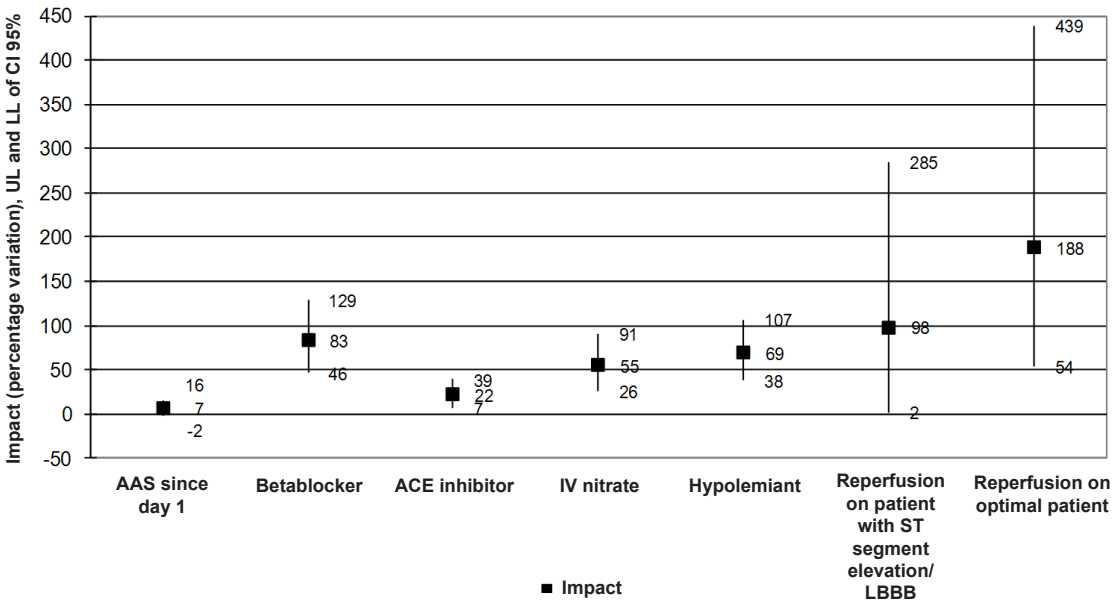

Chart 1 - Impact of training program for AMI care on selected process indicators (use of interventions). Hospital Geral de Bonsucesso, 2005-2006. * Estimated from Tables 2 and 3, expressed as percentage increase in use. AMI - acute myocardial infarction, CI - confidence interval; UL - upper limit, LL - lower limit; ASA - acetylsalicylic acid; ACE - angiotensinogen-converting enzyme; LBBB - left bundle branch block.*

thrombolysis (30 minutes); median delay until angioplasty (80 to 120 minutes); ACE inhibitor upon discharge (78%); smoking cessation counseling (78%)[25-27].

Our study reached the target of the GAP project for the use of ASA within 24 hours, but other indicators of use of interventions cannot be directly compared, because the moments of measurement differ. Average hospital delay until reperfusion with streptokinase was 80 minutes, and median, 66 minutes, more than twice the GAP target.

In the pre-CG group, there was significant underutilization of coronary reperfusion, characterizing a 71.4% loss of opportunity. After the implementation of the guidelines, reperfusion in the referent increased almost threefold and the loss of opportunity was reduced to 17.6% (Table 2), which is smaller than the 25.8% reported in the expanded Grace multi-center study. In this study, 74.4% of cases of AMI with ST-segment elevation/LBBB were admitted within 12 hours from symptom onset, in which 74.2% received some reperfusion therapy[17].

Median in-hospital delay until the start of pharmacological reperfusion reported in the Grace study was 32 minutes, which is shorter than the delay for primary angioplasty (median=110 minutes)[17]. Delays in HGB were higher, but declined post-CG; there was also a higher in-hospital delay with primary angioplasty.

Another national[30] study reported the impact of adopting institutional protocols of AMI care at a tertiary university hospital, and pointed out to improved doctors' adhesion to scientific evidence-based conducts and reduced hospital mortality. The authors compared two series of cases admitted to the intensive care unit, and the second one was in the period in which there was incorporation of clinical protocols for AMI care. The strategies were not specified, but for the wording of the protocol weekly meetings were held with staff from the emergency and intensive care units, and a restructuring of the emergency rooms to speed up emergency care for patients with chest pain. There was an increase in the use of thrombolytic agents from 39% to 61.5%; ASA from 70.9% to 96.5%; beta-blockers from 34.9% to 67.8%; ACE inhibitors from 45.9% to 74.8%; nitrates from 61% to 85%. Direct comparison of these percentages with the HGB is limited because the article does not describe the proportion of cases in the referent.

For some indicators, the HGB reached percentages close to or higher than those reported by several recent studies. The percentage of use of effective interventions in the post-CG group are well above those reported in a U.S. study that compared states that implement continuing medical education policies or not[31]. The use of ASA was 79.4% and 79.9% respectively in states with and without an official program of continuing medical education; beta-blockers - 63.3% and 61.6%; use of thrombolytic therapy in the ideal patient - 42.6% and 47.2%; use of thrombolytic therapy or primary angioplasty (any strategy) - 52.8% and 58.2%.

From 2001 to 2007, the expanded Grace study documented, for patients with AMI with ST-segment elevation/LBBB, a small increase in the uses of ASA within the first 24 hours, of beta-blockers and ACE inhibitors; in 2007, the use of ASA upon admission reached 90.0%, beta-blockers 75% and ACE

inhibitors, 60%. From 2001 to 2007, the use of any reperfusion strategy in cases admitted up to 12 hours from symptom onset was equal to 74.2%[17].

A recent report from a U.S. institution that, in addition to adopting the GAP, has implemented a system of ongoing monitoring of quality and documented hospital use in acute coronary syndrome of: ACE inhibitors - 72.7%; beta-blockers - 93.0%; ASA - 96.2% and statins 81.2%[16].

The determination of LDL cholesterol in the first 24 hours of admission of AMI is proposed by some studies as a process indicator[25,26]. From the consideration that this determination not available in the emergence room of HGB and that recent studies have recommended the use of statins in all patients[28,10], the medical team responsible for implementing the CG decided to recommend use in all cases of AMI.

As for cardiac catheterization, the increase in its use in the post-CG group may have been excessive. One explanation is the limited availability of testing for risk stratification in HGB, which led the team to opt for catheterization for this purpose. The Grace study also reported an increased use of catheterization from 2001 to 2007, reaching 60% this year for AMI with ST-segment elevation or LBBB[17]. The use of coronary care unit was reduced, probably reflecting limited vacancies.

Regarding the strategies used, some were adapted from the experience of the GAP project[16,21], which was launched to incorporate national guidelines for the assistance process. This project focused on health professionals and patients through tools that systematically promote adhesion to evidence-based interventions that are considered strategic. The GAP was designed like a multifaceted intervention, and included the training of professionals; identification of local medical and nursing leaders; broad and general visits to hospital units; and measurement of indicators before and after the intervention. The identification of leaders and the training program were important factors[15,21-23]. Also in the HGB, the existence of leading cardiologists at the hospital was fundamental. These were directly responsible for training and supervising various medical teams, and raising the awareness of other health professionals.

The proposed use of CG based on scientific evidence coincided with the perception of the team of cardiologists of the emergency room of HGB regarding the need for training professionals for the differential diagnosis of acute chest pain. The choice of HGB as a venue for this study was more comprehensive as it incorporated the entire spectrum of acute coronary syndrome, but did not include raising awareness for the use of CG. Thus, this study helped to expand and facilitate the proposed location of the participating hospital. Using this methodology in other public emergency rooms requires adaptation to specific characteristics of each unit.

The limitations of this study relate to the before and after design, to the retrospective portion of data collection and sample size. The study did not cover strategies focused on patient adhesion. In addition, discussion about the need for updating the guidelines is relevant and should be object of specific studies.

Conclusion

In conclusion, the program of implementation of clinical guidelines for AMI care in the emergency room of HGB had a positive impact on improving short-term adhesion to evidence-based conducts. Relevant factors to this result included works performed by a multidisciplinary team, the commitment of professionals and managers to the process of improving the quality of care and involvement of local leaders.

Maintaining the adhesion reached must be evaluated by monitoring process indicators and supervision strategies. Supervision and monitoring methodologies to ensure the preservation of satisfactory results need to be developed and tested.

The propagation of these strategies for other emergency units, albeit with local adaptations, may help improve AMI care in our fields.

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Potential Conflict of Interest

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

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Study Association

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References

1. Oliveira GMM, Klein CH, Souza e Silva NA. Mortalidade por doenças cardiovasculares em três estados do Brasil de 1980 a 2002. Rev Panam Salud Publica. 2006; 19 (2): 85-93.

2. Mansur AP, Lopes AIA, Favarato D, Avakian SD, César LAM, Ramires JAF. Transição epidemiológica da mortalidade por doenças circulatórias no Brasil. Arq Bras Cardiol. 2009; 93 (5): 506-10.

3. Fox KAA, Steg PG, Eagle KA, Goodman SG, Anderson Jr FA, Granger CB, et al for the GRACE Investigators. Decline in rates of death and heart failure in acute coronary syndromes, 1999-2006. JAMA. 2007; 297 (17): 1892-900.

4. Bourquin MG, Wietlisbach C, Rickenbach M, Perret F, Paccaud F. Time trends in the treatment of acute myocadial infarction in Switzerland from 1986 to 1993: do they reflect the advances in scientific evidence from clinical trials? J Clin Epidemiol. 1998; 51 (9): 723-32.

5. Escosteguy CC, Portela MC, Vasconcellos MTL, Medronho RA. Pharmacological management of acute myocardial infarction in the municipal district of Rio de Janeiro. Rev Paul Med. 2001; 119 (6): 193-9.

6. O'Connor GT, Quinton HB, Traven ND, Ramunno LD, Dodds TA, Marciniak TA, et al. Geographic variation in the treatment of acute myocardial infarction: the Cooperative Cardiovascular Project. JAMA. 1999; 281 (7): 627-33.

7. Oliveira GMM, Klein CH, Souza e Silva NA, Godoy PH, Fonseca TMP. Letalidade por doenças isquêmicas do coração no estado do Rio de Janeiro no período de 1999 a 2003. Arq Bras Cardiol. 2006; 86 (2): 131-7.

8. Heidenreich PA, Lewis WR, LaBresh KA, Schwamm LH, Fonarow GC. Hospital performance recognition with the Get With The Guidelines Program and mortality for acute myocardial infarction and heart failure. Am Heart J. 2009; 158 (4): 543-53.

9. ACC/AHA (American College of Cardiology/American Heart Association) Task Force Report on Practice Guidelines. Guidelines for the Management of Patients with ST-Elevation Myocardial Infarction - Executive Summary. A Report of the ACC/AHA Task Force on Practice Guidelines (Writing Committee to Revise the 1999 Guidelines for the Management of Patients With Acute Myocardial Infarction). Circulation. 2004; 110 (5): 588-636.

10. Antman EM, Hand M, Armstrong PW, Bates ER, Green LA, Halasyamani LK, et al. 2007 focused update of the ACC/AHA 2004 Guidelines for the Management of Patients With ST-Elevation Myocardial Infarction: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Writing Group toReview New Evidence and Update the ACC/AHA 2004 Guidelines for the Management of Patients With ST-Elevation Myocardial Infarction). J Am Coll Cardiol. 2008; 51 (2): 210-47.

11. Piegas LS, Timerman A, Nicolau JC, Mattos LA, Rossi Neto JM, Feitosa G, et al/Sociedade Brasileira de Cardiologia. III Diretriz sobre tratamento do infarto agudo do miocárdio. Arq Bras Cardiol. 2004; 83 (supl. 4): 9-86.

12. Becker RC, Burns M, Gore JM, Lambrew C, French W, Rogers WJ. Early and predischarge aspirin administration among patients with acute myocardial infarction: current clinical practice and trends in the United States. J Thromb Thrombolysis. 2000; 9 (3): 207-15.

13. Scott IA, Eyeson-Annan ML, Huxley SL, West MJ. Optimising care of acute myocardial infarction: results of a regional quality improvement project. J Qual Clin Pract. 2000; 20 (1): 12-9.

14. Venturini F, Romero M, Tognoni G. Patterns of practice for acute myocardial infarction in a population from ten countries. Eur J Clinical Pharmacol. 1999; 54 (11): 877-86.

15. Zornoff LAM, Paiva SAR, Assalin VM, Pola PMS, Becker LE, Okoshi MP, et al. Perfil clínico, preditores de mortalidade e tratamento de pacientes após infarto agudo do miocárdio, em hospital terciário universitário. Arq Bras Cardiol. 2002; 78 (4): 396-405.

16. Vasaiwala S, Nolan E, Ramanath VS, Fanga J, Kearly G, Van Riper S, et al. A quality guarantee in acute coronary syndromes: the American College of Cardiology's Guidelines Applied in Practice program taken real-time. Am Heart J. 2007; 153 (1): 16-21.

17. Goodman SG, Huang Wei, Yan AT, Budaj A, Kennelly BM, Gore JM, et al for the Expanded Global Registry of Acute Coronary Events (GRACE2) Investigators. The expanded global registry of acute coronary events: baseline characteristics, management practices, and hospital outcomes of patients with acute coronary syndromes. Am Heart J. 2009; 158 (2): 193-201.

18. Bodenheimer T, Wagner EH, Grumbach K. Improving primary care for patients with chronic illness. JAMA. 2002; 288 (14): 1775-9.

19. Halligan A, Donaldson L. Implementing clinical governance: turning vision into reality. BMJ. 2001; 322 (7299): 1413-7.

20. Mehta RH, Montoye CK, Gallogly M, Baker P, Blount A, Faul J, et al. Improving quality of care for acute myocardial infarction. The guidelines applied in practice (GAP) initiative. JAMA. 2002; 287 (10): 1269-76.

21. Dijkstra R, Wensing M, Thomas R, Akkermans R, Braspenning J, Grimshaw J, et al. The relationship between organizational characteristics and the effects of clinical guidelines on medical performance in hospitals: a meta-analysis. BMC Health Serv Res. 2006; 6: 53.

22. Field MJ, Lohr KN (editors). Guidelines for Clinical Practice: From Development to Use. Washington, DC: Institute of Medicine; Committee on Clinical Practice Guidelines; 1992.

23. Mason A, Ingham J, Parnham J. Making clinical governance work. Clin Med. 2005; 5 (2): 122-5.

24. Nicholls S, Cullen R, O'Neill S, Halligan A. Clinical governance: its origin and its foundations. Clin Perform Qual Health Care. 2000; 8 (3): 172-8.

25. Montoye CK, Mehta RH, Baker PL, Orza M, Elma MS, Parrish R, et al pelo GAP Steering Committee and Investigators. A rapid-cycle collaborative model to promote guidelines for acute myocardial infarction. Jt Comm J Qual Patient Saf. 2003; 29 (9): 468-78.

26. Mehta RH, Montoye CK, Faul J, Nagle DJ, Kure J, Raj E, et al. Enhancing quality of care for acute myocardial infarction: shifting the focus of improvement from key indicators to process of care and tool use the American College of Cardiology Acute Myocardial Infarction Guidelines Applied in Practice Project in Michigan: Flint and Saginaw Expansion. J Am Coll Cardiol. 2004; 43 (12): 2166-73.

27. Eagle K, Gallogly M, Mehta RH, Baker PL, Blount A, Freundl M, et al. Taking the National Guideline for care of acute myocardial infarction to the bedside: developing the Guideline Applied in Practice (GAP) Initiative in Southeast Michigan. Jt Comm J Qual Improv. 2002; 28 (1): 5-19.

28. Morrissey RP, Diamond GA, Kaul S. Statins in acute coronary syndromes: do the guideline recommendations match the evidence? J Am Coll Cardiol. 2009; 54 (15): 1425-33.

29. Krumholz HM, Anderson JL, Bachelder BL, Fesmire FM, Fihn SD, Foody JM, et al. ACC/AHA 2008 performance measures for adults with ST-elevation and non–ST-elevation myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Performance Measures (Writing Committee to Develop Performance Measures for ST-Elevation and Non–ST-Elevation Myocardial Infarction). J Am Coll Cardiol. 2008; 52 (24): 2046-99.

30. Bordon JG, Paiva SAR, Matsubara LS, Inoue RMT, Matsui M, Gut AL, et al. Redução da mortalidade após implementação de condutas consensuais em IAM (Botucatu, SP). Arq Bras Cardiol. 2004; 82 (4): 370-3.

31. Patel MR, Meine TJ, Radeva J, Curtis L, Rao SV, Schulman KA, et al. State-mandated continuing medical education and the use of proven therapies in patients with acute myocardial infarction. J Am Coll Cardiol. 2004; 44 (1): 192-8.