

The Influence of Health Insurance Plans on the Long Term Outcome of Patients with Acute Myocardial Infarction

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Summary

Background: Little is known, especially in our country, about the influence of health insurance plans on the long term outcome of patients after acute myocardial infarction (AMI).

Objective: To assess the outcome of patients with AMI who are covered by the National Health System (SUS) or other health insurance plans.

Methods: We analyzed 1,588 patients with AMI (mean age of 63.3 + 12.9 years, 71.7% male) who were included prospectively into a specific database and followed up for up to 7.55 years. Of this total, 1,003 were placed in the "SUS" group and 585 in the "other insurance plans" group. We applied chi-square, log-rank and Cox (stepwise) to the different statistical analyses. The long term multivariate model with mortality as a dependent variable included 18 independent variables.

Results: In-hospital mortality rates in the "other insurance plans" and "SUS" groups were 11.4% and 10.3%, respectively ($p = 0.5$); in the long term, survival chances in the groups were respectively, $70.4\% \pm 2.9$ and $56.4\% \pm 4.0$ ($p = 0.001$, hazard-ratio = 1.43, or a 43% higher chance of death in the "SUS" group). In the adjusted model, the "SUS" group had a significantly higher chance of death (a 36% higher chance, $p = 0.005$). Surgical revascularization and angioplasty improved the prognosis of these patients, whereas age and previous history of infarction, diabetes or heart failure worsened the prognosis.

Conclusions: Relative to patients with other insurance plans, SUS users present similar mortality rates during hospital stay, but their prognosis is worse in the long term, thus reinforcing the need for additional efforts to improve the care provided to these patients after hospital discharge. (Arq Bras Cardiol 2008;91(6):347-351)

Key words: Myocardial infarction; follow-up studies; health plans.

Introduction

According to government data and major Brazilian and international medical specialty societies¹⁻⁴, cardiovascular diseases (CVD) constitute the major cause of morbidity and mortality in the Western hemisphere, including Brazil. Atherosclerotic disease, especially acute myocardial infarction (AMI), is the prevailing condition among CVD.

On the other hand it is known that there is a clear relation between health insurance plans and the socioeconomic status of individuals, and between health insurance plans and access to procedures and therapies which could potentially influence the outcome of patients with AMI⁵⁻¹⁰.

The absolute majority of the publications on the matter, however, analyzed the impact of health insurance plans only during the initial phase of AMI, and there are few publications presenting long term follow up. Additionally, considering the

research carried out so far, specific analyses are lacking in our country about the matter addressed in this paper.

Methods

We analyzed a total of 1,588 patients with acute myocardial infarction (mean age of 63.3 ± 12.9 years, 71.7% male), included prospectively into a specific database between 1998 and 2005. The follow up period was 7.55 years (mean of 2.9 years). Patients were contacted by phone or in person on a yearly basis, and had the option of answering a questionnaire with several questions relating to their outcome after hospital discharge. Upon leaving the hospital, patients were instructed to go for medical follow up visits at the site where they used to go for control visits previously, which means that long term management and therapies after hospital discharge were not standardized.

Statistical analyses: Baseline characteristics, in-hospital procedures (table 1) and long-term information (table 2) were compared between the "SUS" and the "other insurance plans" using the chi-square test or Fisher's exact test. Student's t-test was applied to compare the mean age between both groups. In the long-term follow-up, mortality analyses, the following models were developed:

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Table 1 – Characteristics of the Population

	SUS N = 1,003	Other Plans N = 585	OR	Value of P
Basal Charact.				
Age (years ± SD)	63.05 ± 12.7	63.6 ± 13.1	0.99	0.379
Male Gender (%)	702 (70)	436 (74.5)	0.78	0.053
H. TCA (%)	98 (9.8)	86 (14.7)	0.63	0.003
H. Sur. (%)	119 (11.9)	97 (16.6)	0.68	0.008
H. CVA (%)	40 (4.0)	17 (2.9)	1.25	0.264
H. hyperchol. (%)	420 (41.9)	412 (53.3)	0.63	<0.001
H. diabetes (%)	287 (28.6)	146 (24.9)	1.20	0.114
H. family (%)	222 (22.1)	199 (34.0)	0.55	<0.001
H. smok. (%)	295 (29.4)	160 (27.3)	1.11	0.381
H. SAH (%)	692 (69.0)	359 (61.4)	1.40	0.002
H. AMI (%)	298 (29.7)	159 (27.2)	1.13	0.282
H. HF (%)	85 (8.5)	32 (5.5)	1.60	0.027
Prev AMI (%)	429 (42.8)	245 (41.9)	1.04	0.729
ST supra	536 (54.8)	334 (57.1)	0.91	0.378
Hospitalization				
Surgery (%)	161 (16.0)	111 (19.0)	0.82	0.143
Non primary TCA (%)	323 (32.2)	196 (33.5)	0.94	0.594
Prim. TCA. (%)	224 (22.3)	120 (20.5)	1.11	0.396
Fibrinol. (%)	194 (19.3)	140 (23.9)	0.76	0.030
Death (%)	104 (10.3)	67 (11.4)	0.89	0.501

SUS - National Health System; PHP - Private Health Plans; OR - odds-ratio; Charact. - Characteristics; Male - Male; H. - History; HR - hazard-ratio; TCA - Transluminal Coronary Angioplasty; Sur. - Surgery; CVA - Cerebrovascular Accident; Hyperchol. - Hypercholesterolemia; Smok. - Smoking Habit; SAH - Systemic Arterial Hypertension; AMI - Acute Myocardial Infarction; HF - Heart Failure; ST supra - acute myocardial infarction with ST-segment elevation; Fibrinol. - Administration of fibrinolytic drug upon admission to hospital.

1) The “SUS” and the “other insurance plans” were compared by univariate analyses; Kaplan-Meier curves were built and the long-rank test was applied.

2) In the adjusted model, Cox’s multivariate analyses (forward stepwise) were developed, with probabilities of 0.10 to enter and 0.10 to remove in each step.

Death for any cause was the dependent variable, and all variables listed in table 1 were included in the initial model as independent variables. The final model (step 9) included the ten variables listed in table 2.

Results

Table 1 summarizes the clinical characteristics of the population taking into account baseline variables and the main procedures adopted during hospital stay. As expected, the “SUS” and “other insurance plans” groups presented some major differences such as significantly different incidences of previous history of angioplasty or surgery, arterial hypertension and heart failure, among others. As regards hospital stay, the “SUS” group had a lower incidence of fibrinolytic utilization and higher incidence of primary angioplasty (which was not significant). When the two

forms of recanalization (primary percutaneous coronary intervention or fibrinolytic drugs) were summed up, no statistically significant differences were observed between the groups (41.7% and 44.4%, respectively, $p = 0.319$). It is important to note that in-hospital mortality in the “SUS” group was lower (10.3%) than in the “other insurance plans” group (11.4%, nonsignificant difference).

Figure 1 shows the long term survival for the two groups analyzed. At the end of the follow-up period, the probability of survival in the “other insurance plans” group was $70.4\% \pm 2.9$, and in the “SUS” group it was $56.4\% \pm 4.0$ ($p = 0.001$, hazard ratio = 1.43, or a 43% higher chance of death in the “SUS” group).

Table 2 shows the variables that correlated significantly and independently with long-term mortality. As can be seen, the “SUS” group showed a significantly higher death probability (a 36% higher chance, $p = 0.005$), even in the adjusted model. Myocardial revascularization and angioplasty during hospital stay improved the prognosis of patients, whereas age and history of previous infarction, diabetes or heart failure worsened the prognosis.

Of the surviving patients, at the last contact ($n = 1,193$),

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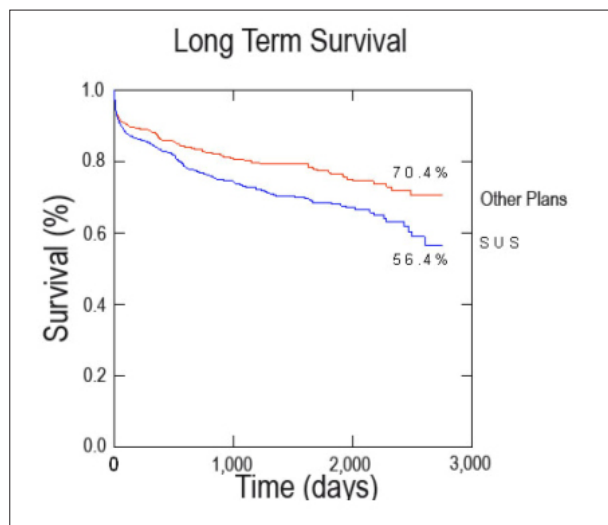


Figure 1 - Long Term Survival. Hazard-ratio SUS/other plans = 1.43 (95% Confidence Interval 1.15 to 1.77); value of $p = 0.001$.

Table 2 – Correlation with long term mortality – final adjusted model*

	HR	95% CI for HR	Value of P
Age	1.054	1.045 to 1.064	<0.001
H. TCA	0.752	0.535 to 1.056	0.099
H. CVA	1.974	1.338 to 2.913	0.001
H. hyperchol.	0.637	0.514 to 0.789	<0.001
H. diabetes	1.451	1.174 to 1.792	0.001
H. AMI	1.416	1.130 to 1.775	0.003
H. HF	1.991	1.477 to 2.685	<0.001
Surgery	0.646	0.480 to 0.869	0.004
Non primary TCA	0.682	0.537 to 0.868	0.002
SUS	1.362	1.098 to 1.689	0.005

*Refer to table 1 for table legend.

1,121 (94%) were willing to answer a specific questionnaire. Of these, 80.8% reported at least one visit to the doctor in the last six months, 77.3% reported having had at least one cholesterol dosage in the same period, and 71.1% were followed up in our institution. Table 3 shows the comparison between the individuals followed up in our institution relative to those followed up in other institutions. As the table shows, patients followed up at InCor went to visits and underwent biochemical control with a significantly higher frequency relative to those treated elsewhere. This observation is valid both for the "SUS" group and for the "other insurance plans" group.

Discussion

Short term results

As mentioned before, most publications on the subject take into account the early post-AMI outcomes. Shen et al³

Table 3 – Follow-up sites and access to visits/tests

Other Health Plans			
	InCor (%)	Other Sites	OR (Value of p)
Visit 6 m	91.3	75	3.48 (<0.001)
Cholesterol 6 m	90.1	78.9	2.48 (0.001)
SUS			
	InCor	Other Sites	OR (Value of p)
Visit 6 m	86.1	59.5	3.49 (<0.001)
Cholesterol 6 m	79.9	60.8	1.96 (0.001)

Visit 6 m - at least one visit with a cardiologist in the last 6 months;
cholesterol 6 m - at least one cholesterol dosage in the last 6 months;
OR - odds-ratio

analyzed > 95,000 patients in eleven North American states, and observed declining in-hospital mortality among non-insured patients, those covered by Medicare (governmental health plan), and those covered by private insurance plans. As expected, the authors demonstrated that there was an inverse correlation between the socioeconomic status and health insurance coverage and between health insurance coverage and access to specialized procedures, which was greater in patients of a higher economic status⁵. In the same direction, they demonstrated that among patients with Medicare, those who had a private supplementary plan had greater access to revascularization procedures and lower mortality⁷. When different health insurance plans were compared, Kreindel et al.¹¹ did not find differences relative to hospital length of stay or mortality, which suggests that other factors may be more important in the prognostic assessment of patients with AMI. Data such as those previously reported prompted the publication of estimates such as those of Cole et al.¹² which suggest a cost of 3.4 million dollars per life saved, if a universal health insurance system is implemented in the State of California. We present below a specific discussion on this subject.

In Canada, where the universal health insurance system was implemented a long time ago thus providing coverage to all the population, access to hemodynamic study was demonstrated to be directly proportional to the patient's socioeconomic status⁶, which suggests that even a system with universal characteristics fails to supply equal access to procedures. In our study, there was no significant difference relative to mortality (which was 1.1% lower in absolute terms for the "SUS" group) or relative to access to procedures such as angioplasty or surgery, when patients with governmental coverage were compared with patients with private coverage. This can be explained by the characteristics of our institution where patients receive the same treatment irrespective of their health insurance plan. These data endorse the results of a multicentric publication which included 14 Chinese institutions⁹, where no difference in mortality was demonstrated relative to different types of health coverage. As concerns the procedures, in our study the utilization of surgery or angioplasty was also similar between the groups, which can be explained by the characteristics of the institution that were mentioned above.

Long term results

Few studies analyzed the impact of socioeconomic status/health insurance plan on the long term outcome of patients with coronary disease. Alter et al.⁸ when they studied an unselected population of Ontario (Canada), did not find a correlation between socioeconomic level and mortality within one year after AMI, although there was greater use of resources for the higher income population. Conversely, a recent publication analyzed a population of chronic patients who were included in a study about the risk of atherosclerosis and followed up for 12 years, and demonstrated a significant increase in death rate of the groups with no health insurance plan relative to those covered by health insurance¹³. In our study, we demonstrated that, as concerns the long term outcome, the mortality rate for patients covered by government insurance was higher than for patients covered by private health insurance. This may be related to the type of follow-up: in our study, we demonstrated clearly that those who were followed up at InCor had a better level of disease control relative to those who were followed up elsewhere, considering the percentage of visits and laboratory tests in the last six months (table 3).

The chronic use of specific medication can significantly alter the prognosis of patients postinfarction, which allows thinking that those patients covered by government health insurance have less access to such medication. However, this could not be assessed in this study. Interestingly, there are demonstration in the literature that the use of medication with proven efficacy in patients with cardiopathies is low, even in those communities that have free access to such drugs¹⁴⁻¹⁶.

The debate about universal coverage

Universal coverage is being debated in different countries. As has been seen, even in countries with universal health coverage (where the medication is provided free of charge), such as Canada, treatments differ according to the patient's socioeconomic level. In the United States, there are wide-ranging discussions going on about how to deal with the growing number of citizens who have no private insurance or who depend directly on the government health insurance for the underprivileged. Some states, such as Massachusetts, have implemented universal coverage whereas others, such as California, are holding advanced discussions to implement it. At the federal government level, plans are being discussed with the purpose of extending this coverage to all American citizens. There are different proposals at the state and federal levels which range from incentives to individuals to make it easy for them to pay private health plans, to incentives to legal entities, designed to somehow force them to hire private health insurance plans. At the federal level, a proposal is being debated which provides for an electronic file containing all the information on the patient. This file would be made available to physicians and hospitals where the patient seeks treatment. The justification for this proposal is that it would greatly decrease the number of tests requested and would increase the degree of safety in the care provided to patients^{17,18}.

In Brazil, there is a mixed system whereby health care is an obligation of the government and a right of the citizen; so, from a constitutional point of view, health care is universal in our

country. However, in view of the shortcomings that are widely publicized by the media, the upper classes seek supplementary health care is na obligation of the government and a right of the citizen; so, from a constitutional standpoint, health care. The results of our study suggest that, within this system, care provided in hospitals with the characteristics of InCor provides outcomes that are comparable in both populations. However, regarding the long-term outcome, the procedures adopted for the population covered by government health insurance, including access to medication, are not as good as those adopted for patients covered by private health insurance plans.

Limitations of the study

The main limitation of our study is that the follow-up of patients was carried out in different sites and by different professionals, which means that there was no standardization set for the follow-up. On the other hand, we could speculate whether this characteristic supports the results obtained, since it mirrors the real world where patients receive different types of guidance.

And last but not least, another limitation is the fact that the data relative to follow-up sites and access to visits and tests (such as cholesterol dosage) were obtained only for patients who survived the last contact, which precludes any conclusion on any prospective impact of such information on patients' prognosis.

It is important to remember that the initial treatment was carried out in a single center, which restricts the extrapolation of results to the country as a whole, or even to the city or state of São Paulo. And despite the fact that during follow-up the patients were followed up by different professionals in several institutions, the procedures implemented at first may have had some influence on the late outcome of individuals.

Finally, adherence to drug treatment can have a major influence on patients' outcome post-AMI, and this parameter could not be assessed in this survey.

Conclusion

As compared with patients covered by other health insurance plans, patients covered by government insurance present a similar mortality rate during hospital stay, but have a worse prognosis for the long term, which stressed the need for additional policies with the purpose of improving the level of care provided to these patients after hospital discharge.

Potential Conflict of Interest

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

Sources of Funding

There were no external funding sources for this study.

Study Association

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

References

1. Ministério da Saúde. Datasus. Morbidade e mortalidade no Brasil por doenças cardiovasculares (on line). [acesso em 2007 dez 19]. Disponível em <http://www.datasus.gov.br>.
2. Informações sobre as doenças cardiovasculares: morbidade e mortalidade (on line). [acesso em 2007 nov 12]. Disponível em <http://www.cardiol.br>.
3. American Heart Association. Cardiovascular diseases: morbidity and mortality (on line). [acesso em 2007 nov 12]. Disponível em <http://www.americanheart.org>.
4. Doenças cardiovasculares: morbidade e mortalidade (on line). [acesso 2007 out 19]. Disponível em <http://www.escardio.org>.
5. Shen JJ, Wan TT, Perlin JB. An exploration of the complex relationship of socioecologic factors in the treatment and outcomes of acute myocardial infarction in disadvantaged populations. *Health Serv Res.* 2001; 36 (4): 711-32.
6. Pilote L, Joseph L, Belisle P, Penrod J. Universal health insurance coverage does not eliminate inequities in access to cardiac procedures after acute myocardial infarction. *Am Heart J.* 2003; 146 (6): 1030-7.
7. Fang J, Alderman MH. Does supplemental private insurance affect care of nhujkand perceptions of care among survivors of acute myocardial infarction in Canada. *JAMA.* 2004; 291 (9): 1100-7.
8. Alter DA, Chong A, Austin PC, Mustard C, Iron K, Williams JI. Socioeconomic status and mortality after acute myocardial infarction. *Ann Intern Med.* 2006; 144 (2): 82-93.
9. Yu BR. Influences of health insurance status on clinical treatments and outcomes for 4,714 patients after acute myocardial infarction in 14 Chinese general hospitals. *J Med Dent Sci.* 2005; 52 (2): 143-51.
10. Shishehbor MH, Litaker D, Pothier CE, Lauer MS. Association of socioeconomic status with functional capacity, heart rate recovery, and all-cause mortality. *JAMA.* 2006; 295 (7): 784-92.
11. Kreindel S, Rosetti R, Goldberg R, Savageau J, Yarzebski J, Gore J, et al. Health insurance coverage and outcome following acute myocardial infarction: a community-wide perspective. *Arch Intern Med.* 1997; 157 (7): 758-62.
12. Cole BL, Shimkhada R, Morgenstern H, Kominski G, Fielding JE, Wu S. Projected health impact of the Los Angeles City living wage ordinance. *J Epidemiol Community Health.* 2005; 59 (8): 645-50.
13. Fowler-Brown A, Corbie-Smith C, Garrett J, Lurie N. Risk of cardiovascular events and death--does insurance matter? *J Gen Intern Med.* 2007; 22 (4): 502-7.
14. Romain TM, Patel RP, Heaberlin AM, Zarowitz BJ. Assessment of factors influencing blood pressure control in a managed care population. *Pharmacotherapy.* 2003; 23 (8):1060-70.
15. Brown AF, Gross AG, Gutierrez PR, Jiang L, Shapiro MF, Mangione CM. Income-related differences in the use of evidence-based therapies in older persons with diabetes mellitus in for-profit managed care. *J Am Geriatr Soc.* 2003; 51 (5): 665-70.
16. Kramer JM, Hammill B, Anstrom KJ, Fetterolf D, Snyder R, Charde JP, et al. National evaluation of adherence to beta-blocker therapy for 1 year after acute myocardial infarction in patients with commercial health insurance. *Am Heart J.* 2006; 152 (3): 454-8.
17. www.nytimes.com. 2007.
18. www.msnbc.msn.com. 2007.