# Acute chest pain intensity in a cardiopulmonary emergency unit

## Intensidade da dor torácica aguda em unidade de emergência cardiopulmonar

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## ABSTRACT

**BACKGROUND AND OBJECTIVES**: Pain evaluation at emergency unit admission is vital for the establishment of strategies to manage it and minimize its costs. So, the objective of this study was to evaluate acute chest pain intensity in patients admitted to a cardiopulmonary emergency unit.
**METHODS**: This is a quantitative study carried out in two moments with patients admitted to a chest pain unit of the city of Fortaleza, state of Ceará, in the period from March 2007 to February 2010. Initial sample was made up of 430 patients and, after exclusion, 213 have remained. Visual analog scale was applied in two moments and Wilcoxon and Mann-Whitney U tests were used for analysis of scores, means and standard deviation.
**RESULTS**: There were significant differences between both moments, with higher pain intensity scores in the first moment as compared to the second, at significance level of 5%. There has been no correlation between the presence of cardiac or pulmonary disease and pain intensity.
**CONCLUSION**: Pain evaluation is a challenge for professionals working in emergency units and further studies looking for new evaluation methods are necessary.
**Keywords**: Chest pain, Emergencies, Pain, Pain evaluation, Visual analog scale.

## RESUMO

**JUSTIFICATIVA E OBJETIVOS**: A mensuração da dor no momento do acolhimento em emergência é uma conduta clínica vital para criação de estratégias visando o tratamento e minimizando seus custos. Nesse contexto, o objetivo deste estudo foi mensurar a intensidade da dor torácica aguda de pacientes atendidos em uma unidade de emergência cardiopulmonar.

**MÉTODOS**: Pesquisa de natureza quantitativa realizada em dois momentos com pacientes atendidos em uma unidade de dor torácica do município de Fortaleza no estado do Ceará no período de março de 2007 a fevereiro de 2010. População composta de 430 pacientes que após exclusão formou-se amostra de 213. Aplicou-se a escala analógica visual em dois momentos e a análise dos escores obtidos, das médias e desvio padrão ocorreu por meio do teste de Wilcoxon e U de Mann-Whitney.
**RESULTADOS**: Encontraram-se diferenças significativas entre os valores dos escores obtidos nos dois momentos, apresentando-se maiores escores de intensidade da dor no primeiro momento em relação ao segundo, ao nível de significância de 5%. A intensidade da dor quando associada com a presença de doença cardíaca ou pulmonar demonstrou não haver correlação.
**CONCLUSÃO**: A mensuração da dor é um desafio para os profissionais nas emergências e são necessários estudos que busquem novos métodos para avaliação da dor.
**Descritores**: Dor, Dor no peito, Emergências, Escala analógica visual, Mensuração da dor.

## INTRODUCTION

Acute chest pain is a major complaint of users assisted in Brazilian healthcare units, especially in emergency services where four million consultations are estimated per year[1]; in addition, acute coronary syndrome manifestations are complex and difficult to screen, which requires physicians and nurses' experience with evaluation, measurement and identification of pain and of its possible causes[2].

These professionals need to confirm the presence of angina or coronary disease by thorough physical evaluation and complementary exams, and this requires fast and concise reasoning due to emotional and cultural factors influencing patients' pain perception, as well as to different cardiac and non cardiac causes with clinical characteristics associated to vascular, pulmonary, gastrointestinal, musculoskeletal and psychological systems[3].

Acute chest pain needs accurate clinical evaluation by means of different indicators also common to other types of pain, such as location, onset type, intensity, irradiation, type, duration, recurrence, triggering, worsening or improving factors, associated signs and symptoms, comorbidities, risk factors and personal and family morbid history[4].

In this alarming situation, mortality by circulatory system diseases is high in Brazil. Statistical DATASUS data point to the highest mortality rate of 11.32% for the Southeastern region and to the third highest rate (6.86%) for the Northeast-

ern region in the period from January to December 2015[5]. Many professionals acting in emergency units resist in using hospital assistance protocols, although they are broadly disclosed and recommended by the I Brazilian Guideline of Chest Pain in the Emergency Room. In this sense, the American Agency of Public Health Research and Quality and the American Society of Pain have established guidelines considering pain as the fifth vital sign, thus requiring adequate evaluation, measurement and assistance at the same time that other vital signs are also evaluated[6,7]. In addition to these institutions, the Ministry of Health recommends that health professionals in common situations of assisting spontaneous demands of users with acute chest pain, use clinical and epidemiologic knowledge and subjectivity to identify risks and vulnerabilities[8].

Pain intensity is the level of pain experienced by patients and the way to express it is directly related to its subjectivity, which makes difficult to control pain. In light of this difficulty, pain quantification or measurement tools were developed, allowing better analgesic therapy planning and effective pain relief[9].

Pain intensity measurement tools may be divided in unidimensional and multidimensional. Multidimensional pain measurement tools are questionnaires and medical charts about pain perception, while unidimensional tools refer to verbal and numerical scales, especially the visual analog scale (VAS) which allows the follow up of pain and periodic evaluation of proposed therapy[10].

Numerical scales use a score from zero to 10, which represents pain intensity at that moment. In VAS, evaluation may be performed by means of a 10cm or 100mm line where one edge represents "no pain" and the other indicates "worst imaginable pain". VAS has advantages as compared to other scales because there are no pre-established values between edges and this provides percentage differences in pain evaluations of one patient or among them[11].

Pain measurement may also be complemented with body diagrams, where patients indicate tender points. Diagrams allow the correlation of information such as tender sites, nervous distribution and involved muscles, resulting in better understanding of pain and leading to more adequate therapy[12].

Researchers have identified few scientific investigations on pain in emergencies and call the attention to the large number of assisted users, to the time they remain in this sector and to the volume of variables to be studied. So, the objective was to measure acute chest pain intensity in patients assisted by a reference cardiopulmonary emergency unit of the state of Ceará, in two moments, at admission and after analgesic administration, aiming at providing necessary data for satisfactory and individual pain control and relief according to the profile of each respondent.

## METHODS

This is an exploratory study with quantitative approach, where acute chest pain intensity was measured in two mo-

ments. The "first moment" was pain intensity referred by patients at emergency unit admission, and the "second moment" was after analgesic administration.

Sample was made up of 430 patients assisted in a reference cardiovascular emergency unit of the state of Ceará, Brazil, from March 2007 to February 2010, where patients aged 18 to 60 years of both genders were included and those having received analgesics before assistance, with psychiatric disorders, verbal and auditory incongruence and irritation were excluded. Exclusion criteria were established like this due to the need to compare pain intensity in both moments using VAS. First moment data of patients who dropped out or who were not found in the second moment have remained unchanged in the study.

This study is part of the Research Projects for the Single Health System (SUS), being sponsored by the Fundação Cearense de Apoio ao Desenvolvimento Cientifico e Tecnológico (FUNCAP). Ethical aspects of guidelines and standards regulating research with human beings, according to resolution 466/12, were also respected. For such, patients were informed about the possibility of risk to health during interview and pain measurement with VAS, and were assured immediate assistance in case of some worsening event. In addition, secrecy of their identity and of their refusal to participate in the study at any moment was also assured.

Non probabilistic, unintentional sample and by convenience of access of users to the unit was made up of 213 patients. Patients were informed and reaffirmed in the Free and Informed Consent Term (FICT) and interviews were carried out in convenient times for the interviewer after FICT signature.

In the first moment, a questionnaire with questions on identification and previous diseases was applied. Then, patients were introduced to VAS and were asked to mark a perpendicular trace in a horizontal 10cm line with a pencil at the point which would best represent their perceived pain intensity at evaluation moment, being established the left edge as "no pain" and the right edge as "worst imaginable pain".

In the second moment, patients had access to their initial evaluation and the procedure was repeated. Numerical VAS score was extracted by measuring the distance in centimeters from the left edge "no pain" to the point marked by patients, thus obtaining absolute pain intensity score as compared to a 10cm ruler. Pain intensity was classified as mild (0 to 3.9cm), moderate (4.0 to 7.9cm) and severe (8.0 to 10.0cm) according to VAS scores.

### Statistical analysis

Data were organized in spreadsheets and analyzed with the program Estatistica® 6.0. For quantitative variables analysis, minimum and maximum values, means, standard deviation and median were calculated. VAS mean scores were analyzed with Wilcoxon and Mann-Whitney U tests, considering significant $p < 0.05$.

Evaluated hypotheses were: first hypothesis – mean pain intensity scores in the first moment would be different from second moment mean scores, being first moment mean higher than second moment; second hypothesis – mean pain intensity scores in the first moment would not be different from mean scores of the second moment, when correlated to the presence or not of cardiac and/or pulmonary disease.

This study was approved by the Research Ethics Committee, Universidade Estadual do Ceará (Process 431/2007).

## RESULTS

Table 1 shows mean, standard deviation, median, minimum and maximum values of pain intensity used in box-plots, being obtained in the two moments with VAS. Mean pain intensity in the first moment was 5.30±3.75cm and in the second moment it was 1.68±3.02cm.

**Table 1.** Pain intensity in the two moments. Fortaleza/CE, Brazil, 2007-2010

| Pain intensity | Mean | Standard Deviation | Median | Minimum | Maximum |
|---|---|---|---|---|---|
| First moment (n=183) | 5.30 | 3.75 | 5.00 | 0.00 | 10.00 |
| Second moment (n=163) | 1.68 | 3.02 | 0.00 | 0.00 | 10.00 |

Figure 1 is pain intensity box-plot in the two moments. In the first moment, pain scores were concentrated between 2 and 9, while in the second moment scores were from zero to 2. In both moments, minimum and maximum values were zero and 10. According to Wilcoxon test (Table 2) there were significant differences between patients' pain intensity scores in the first moment as compared to the second, with higher pain score in the first moment, with 5% significance.
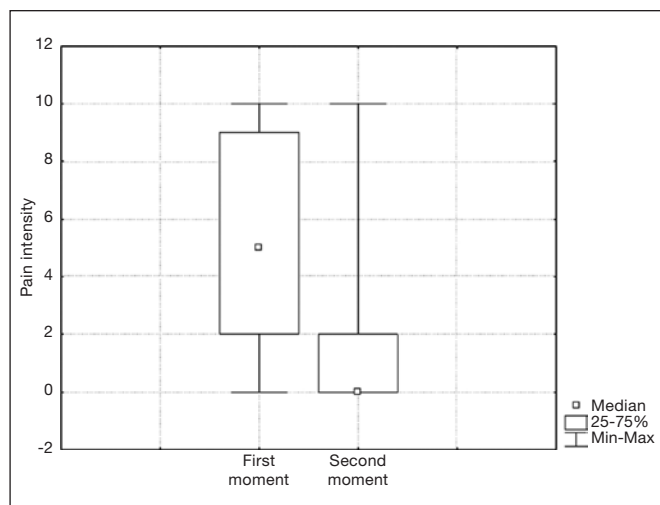


**Figure 1**. Pain intensity box-plot in the two moments. Fortaleza/CE, Brazil, 2007-2010

**Table 2.** Wilcoxon test for pain intensity in the two moments. Fortaleza/CE, Brazil, 2007-2010

| Cases | W | Z | p value |
|---|---|---|---|
| 156 | 5.00 | 8.9214 | 0.0000 |

Figure 2 shows pain intensity box-plots in both moments related to the presence of cardiac and/or pulmonary disease. Pain intensity related to the presence of cardiac and/or pulmonary disease in the first moment was between 2 and 9 and patients without cardiac and/or pulmonary disease had similar scores. In the second moment, patients with or without cardiac and/or pulmonary disease had approximate score of zero to 2. According to Mann-Whitney U test (table 3), there were no significant differences between pain intensity scores of patients having or not cardiac and/or pulmonary disease in the first moment as compared to the second, with 5% significance.
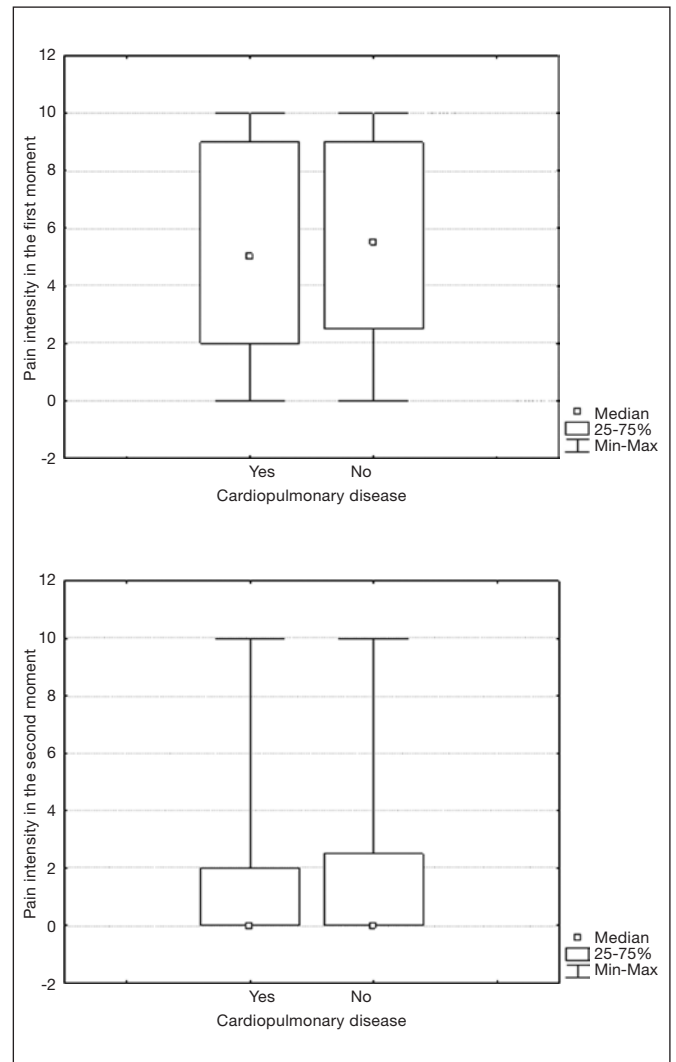


**Figure 2**. Pain intensity box-plot according to the presence of cardiac and/or pulmonary diseases in the two moments. Fortaleza/CE, Brazil, 2007-2010

**Table 3.** Mann-Whitney U test for pain intensity in the two moments according to the presence of cardiac and/or pulmonary disease. Fortaleza/CE, Brazil, 2007-2010

| Cases – Yes | Cases – No | U | Z | p value |
|---|---|---|---|---|
| 111 | 52 | 2782.5 | -0.3685 | 0.7125 |
| 96 | 48 | 2200.00 | -0.4407 | 0.6594 |

## DISCUSSION

The study aimed at evaluating acute chest pain by means of VAS in different moments of assistance in emergencies, such as pre-assistance and post-assistance. In addition, pain intensity was related to cardiac and/or pulmonary disease. Study went on as follows to discuss two relevant ideas for the assistance of acute chest pain patients: patients remained with high pain scores even after assistance; chest pain intensity was not related to cardiac and/or pulmonary disease.

An intervention study has evaluated the efficacy of the numerical visual scale (NVS) in the postoperative period of cardiac surgery. Investigators have trained the nursing team and have observed major acceptance of the scale, in addition to expanding knowledge about pain and the tailoring of analgesia for each type of pain[13]. Numerical scales should be implemented in healthcare services because they are useful tools to guide analgesic therapy, as shown in our study, and have low resistance by health professionals.

Another study has evaluated the applicability of three pain evaluation tools in different assistance units, namely, brief pain inventory and McGill questionnaire as multidimensional tools, and VAS as unidimensional tool. Selected units were ambulatory, ward and emergency. Investigators have observed that multidimensional tools are limited with regard to the time spent to be applied, which makes difficult their applicability in emergency units, while unidimensional tools are recommended due to their fast and noninvasive application[14]. The use of pain evaluation tools does not seem to have disadvantages; however they should be adequately implemented, as in our study which has used VAS in an emergency unit. This way, relevant information was collected with minimum discomfort to patients; on the other hand, extensive tools in emergency, such as the McGill questionnaire, may bring discomfort to patients and a mistaken interpretation of pain perceived at that moment.

A randomized Turkish study has investigated the effects of thoracic epidural and paravertebral analgesia on different parameters, including post-thoracotomy pain intensity. There have been no significant differences between pain intensity under epidural or paravertebral analgesia according to VAS, showing that paravertebral analgesia may be an alternative for post-thoracotomy pain relief. In this study, VAS was critical to define that there are no differences between both analgesic methods with regard to pain intensity; however, there have been less complications with thoracic paravertebral analgesia as compared to epidural analgesia, making it a safer option to patients[15,16].

Our results have shown that most patients had acute chest pain decrease after analgesic administration; however some patients still remained with severe pain evidenced by VAS. This illustrates that current therapeutic model is precarious, being unable to promote analgesia to all patients. So, analgesic therapy should be flexible to always reach patients' analgesia and comfort.

For being unspecific, acute chest pain may be related or not to coronary disease and VAS is used to measure pain intensity and to tailor analgesic therapy; however, there are limitations with regard to the involvement of different affective and cultural variables and to multiple dimensions involved with pain, which makes the search for biochemical pain markers a relevant option[17].

A study has evaluated coronary calcium score to rule out the possibility of acute coronary syndrome and has shown that this is a good alternative to rule out most cases of coronary disease; however, it is mandatory tha such information are compared to others, such as clinical evaluation and patient's history[18].

Another study suggests acute chest pain evaluation with more objective methods, such as coronary angiotomography, for example. Based on the literature, authors have gathered consistent data on the use of such technique, which was more effective, of low cost and allowed the improvement of treatments in the emergency room, as well as decreasing patients' hospitalization time[19].

International studies have looked for a faster and more effective evaluation of acute chest pain by means of biochemical parameters and risk scores. Authors recommend the use of heart scores (history, ECG, age, risk factors and troponin) associated to serial ultrasensitive troponin tests 0h and 3h after symptoms manifestations, rather than 6h or 12h as recommended by guidelines[20].

In light of the difficulties to evaluate acute chest pain and of the limitation of pain evaluation scales, new biochemical markers early announcing angina and mimicking pain intensity are needed, as well as the search for more effective pain evaluation scales with low ability to induce tolerance.

A cross-sectional study developed in the emergency room of a cardiologic hospital of the Southern Brazil has compared pain intensity between diabetic and non diabetic patients. Results have shown that pain intensity among diabetic and non diabetic patients is similar when measured by NVS[21]. Similarly, this study has found that pain intensity measured with VAS is similar in both moments of assistance, not being correlated to the presence of cardiac and/or pulmonary disease.

A case study with a female patient, 59 years old, with history of depressive syndrome, dyslipidemia, hiatal hernia and Parkinson's disease with acute chest pain of increasing intensity started by physical effort and relieved after rest, has shown that although symptoms led to the hypothesis of coronary syndrome, patient had recurrent hiatal hernia[22]. So, a literature review has looked for possible causes for non cardiac chest pain and has found that, among causes, there are gastroesophageal reflux disease, visceral hypersensitivity, esophageal

motor disorders and psychological comorbidities[23].

Results of this study have shown that acute chest pain intensity is not related to cardiac and/or pulmonary disease both in the first and in the second moments. These results, together with already mentioned studies, confirm that acute chest pain may have different origins and not be correlated to different factors, even those expected as cardiopulmonary factors. So, acute chest pain of cardiac origin should be early detected and have priority assistance; however chest pain not of cardiac origin cannot be overlooked and should receive adequate attention and treatment.

## CONCLUSION

Pain measurement is a challenge for researchers and health professionals due to its subjectivity and complexity of the painful experience. Pain intensity evaluation at admission and during clinical evolution is critical to guide the most adequate analgesic therapy, and scales should be implemented due to their numerous benefits for patients and the institution. Further studies are needed to explore new methods for systematization and efficiency of the evaluation.

## REFERENCES

1. Oliveira GN, Silva MF, Araujo IE, Carvalho Filho MA. Perfil da população atendida em uma unidade de emergência referenciada. Rev Latino-Am Enfermagem. 2011;19(3):548-56.
2. Caveião C, Santos RB, Montezeli JH, Visentin A, Brey C, Oliveira VB. Dor torácica: atuação do enfermeiro em um pronto atendimento de um hospital escola. R Enferm Cent O Min. 2014;4(1):921-8.
3. Bassan R, Pimenta L, Leães PE, Timerman A. Sociedade Brasileira de Cardiologia. I Diretriz de Dor Torácica na Sala de Emergência. Arq Bras Cardiol. 2002;79(Suppl 2):1-22.
4. Nicolau JC, Timerman A, Marin-Neto JA, Piegas LS, Barbosa CJ, Franci A, et al. [Guidelines of Sociedade Brasileira de Cardiologia for unstable angina and non-ST--segment elevation myocardial infarction (II ed. 2007) 2013-2014 update]. Arq Bras Cardiol. 2014;102(3Suppl 1):1-61. Portuguese.
5. Brasil. Ministério da Saúde. Banco de dados do Sistema Único de Saúde-DATASUS, Sistema de Informações sobre Mortalidade. [http://www2.datasus.gov.br/DATASUS/].
6. Araujo LC, Romero B. Dor: avaliação do 5° sinal vital. Uma reflexão teórica. Rev Dor. 2015;16(4):291-6.
7. Queiróz DT, Carvalho MA, Carvalho GD, Santos SR, Moreira AS, Silveira MF. Dor - 5º sinal vital: conhecimento de enfermeiros. Rev Enferm UFPE. 2015;9(4):7186-92.
8. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Acolhimento à demanda espontânea: queixas mais comuns na Atenção Básica/ Ministério da Saúde, Secretaria de Atenção à Saúde, Departamento de Atenção Básica. – Brasília: Ministério da Saúde, 2012. 290 p.: il. – (Cadernos de Atenção Básica n. 28, Volume II)[http://www.saude.gov.br/bvs].
9. Pereira LV, Pereira GA, Moura LA, Fernandes RR. Intensidade da dor em idosos institucionalizados: comparação entre as escalas numérica e de descritores verbais. Rev Esc Enferm USP. 2015;49(5):804-10.
10. Salaffi F, Sarzi-Puttini P, Atzeni F. How to measure chronic pain: new concepts. Best Pract Res Clin Rheumatol. 2015;29(1)164-86.
11. Moutte SD, Brudvik C, Morken T. Physicians' use of pain scale and treatment procedures among children and youth in emergency primary care - a cross sectional study. BMC Emerg Med. 2015;15(33):8.
12. Fortunato JG, Furtado MS, Hirabae LF, Oliveira JA. Escalas de dor no paciente crítico: uma revisão integrativa. Rev Hosp Univ Pedro Ernesto. 2013;12(3):110-7.
13. Keller C, Paixão A, Moraes MA, Rabelo ER, Goldmeier S. Escala da dor: implantação para pacientes em pós-operatório imediato de cirurgia cardíaca. Rev Esc Enferm USP. 2013;47(3):621-5.
14. Martinez JE, Grassi DC, Marques LG. Análise da aplicabilidade de três instrumentos de avaliação de dor em distintas unidades de atendimento: ambulatório, enfermaria e urgência. Rev Bras Reumatol. 2011;51(4):299-308.
15. Öztürk T, Topcu İ, Yaldız S, Özbakkaloğlu A, Aşık K, Yentürk A. Comparison of thoracic epidural and paravertebral analgesia for postoperative pain control after thoracotomy. Agri. 2016;28(1):32-8.
16. Yeung JH, Gates S, Naidu BV, Wilson MJ, Gao Smith F. Paravertebral block versus thoracic epidural for patients undergoing thoracotomy. Cochrane Database Syst Rev. 2016;2:CD009121.
17. Van der Woude MCE, Bormans L, Hofhuis JGM, Spronk PE. Current use of pain scores in Dutch intensive care units: a postal survey in the Netherlands. Anesth Analg. 2016;122(2):456-61.
18. Staniak HL, Bittencourt MS, Sharovsky R, Benseñor I, Olmos RD, Lotufo PA. Escore de cálcio para avaliar dor torácica na sala de emergência. Arq Bras Cardiol. 2013;100(1):90-3.
19. Prazeres CE, Cury RC, Carneiro AC, Rochitte CE. [Coronary computed tomography angiography in the assessment of acute chest pain in the emergency room]. Arq Bras Cardiol. 2013;101(6):562-9. English, Portuguese.
20. Dries DJ. Chest pain. Air Med J. 2016;35:107-10
21. Paim CP, Azzolin Kde O, de Moraes MA. [Chest pain in acute myocardial infarction among diabetic and non-diabetic patients]. Rev Bras Enferm. 2012;65(1):77-82. Portuguese.
22. Sousa M, Gatta N. Dor torácica e dispneia de esforço. Galicia Clin. 2015;76(1):41-2.
23. Domingues GR, Moraes-Filho JPP. Dor torácica não-cardiogênica. Arq Gastroenterol. 2009;46(3):233-40.