Original Article

Pain assessment in postoperative cardiac surgery*

Avaliação da dor em pós-operatório de cirurgia cardíaca

Evaluación del dolor en posoperatorio de cirugía cardíaca

Érica Vieira de Andrade[1], Maria Helena Barbosa[2], Elizabeth Barichello[3]

ABSTRACT

Objectives: To evaluate the intensity of pain in patients after cardiac surgery; the study aimed to: 1- identify possible associations between physiological alterations (tachycardia, tachypnea, increased blood pressure, sweating, paleness, nausea and vomiting) and postoperative pain, and 2- describe the used analgesia. **Methods:** This prospective study evaluated 30 patients in a public teaching hospital, from the immediately postoperative period till the 4th postoperative day. To analyze the data was used the software Statistical Package for Social Sciences. **Results:** Most (26/86.7%) patients had pain, being 19 (63.3%) in the 1st postoperative day. It was found a predominance of mild pain during all occasions of evaluation. Also was found a correlation (p<0.001) between pain and the presence of physiological alterations, most frequently, tachypnea and increased blood pressure. The analgesia was treated with drugs, being the opiates and simple analgesics the most prescribed. **Conclusion:** A mild pain was present during all periods which influenced mainly the occurrence of tachypnea and high blood pressure. Only drugs were used for analgesia.

Keywords: Postoperative pain; Cardiac surgical procedures; Pain measurement

RESUMO

Objetivos: Avaliar a intensidade da dor, em pacientes no pós - operatório de cirurgia cardíaca; identificar possíveis associações entre alterações fisiológicas (taquicardia, taquipnéia, elevação da pressão arterial, sudorese, palidez cutânea, náuseas, vômitos) e dor pós-operatória; e descrever a analgesia utilizada. **Métodos:** Estudo prospectivo que avaliou 30 pacientes de um hospital público de ensino, do pós-operatório imediato ao 4° pós-operatório. Utilizou-se o *software Statistical Package for the Social Sciences* para análise dos dados. **Resultados:** A maioria (26 / 86,7%) dos pacientes apresentou dor, sendo 19 (63,3%) no 1º pós-operatório. Verificou-se predominância de dor leve em todos os tempos avaliados. Houve correlação (p<0,001) entre dor e presença de alterações fisiológicas, sendo mais freqüentes, taquipnéia e aumento de pressão arterial. A analgesia utilizada foi medicamentosa, sendo opióides e analgésicos simples os mais prescritos. **Conclusão:** A dor esteve presente em todos os períodos avaliados, de intensidade leve, e influenciou principalmente na ocorrência de taquipnéia e elevação de pressão arterial. Somente fármacos foram utilizados para analgesia.

Descritores: Dor pós-operatória; Procedimentos cirúrgicos cardíacos; Medição da dor

RESUMEN

Objetivos: Evaluar la intensidad del dolor en pacientes en posoperatorio de cirugía cardíaca; identificar posibles asociaciones entre alteraciones fisiológicas (taquicardia, taquipnea, elevación de la presión arterial, sudoresis, palidez cutánea, náuseas, y vómitos) y dolor posoperatorio; y, describir la analgesia utilizada. **Métodos:** se trata de estudio prospectivo que evaluó 30 pacientes de un hospital público de enseñanza, en el posoperatorio inmediato y en los cuatro días siguientes. Se utilizó el *software Statistical Package for the Social Sciences* para analizar los datos. **Resultados:** La mayoría (26/86,7%) de los pacientes presentó dolor, siendo 19 (63,3%) en el 1º posoperatorio. Se verificó la predominancia de dolor moderado en todos los instantes evaluados. Hubo correlación (p<0,001) entre dolor y presencia de alteraciones fisiológicas, siendo más frecuentes la taquipnea y el aumento de presión arterial. La analgesia utilizada fue medicamentosa, siendo opiáceos y analgésicos simples los más prescriptos. **Conclusión:** El dolor estuvo presente en todos los períodos evaluados, fue de intensidad moderada, e influyó principalmente en la ocurrencia de taquipnea y en la elevación de la presión arterial. Solamente fármacos fueron utilizados en la analgesia.

Descriptores: Dolor postoperatorio; Procedimientos quirúrgicos cardíacos; Dimensión del dolor

---

** Research performed at the "Universidade Federal do Triângulo Mineiro" (MG), Brazil.*

[1] Nurse graduated from the undergraduate course in nursing of the "Universidade Federal do Triângulo Mineiro (UFTM)", Uberaba (MG), Brazil.

[2] Ph.D in Nursing in Adult Health. Adjunct professor of the nursing course at the UFTM, Uberaba (MG), Brazil.

[3] Ph.D in Fundamental Nursing. Adjunct professor of the Nursing course at the UFTM, Uberaba (MG), Brazil.

Corresponding Author: **Maria Helena Barbosa**
Pça. Manoel Terra, 330 - Abadia - Uberaba (MG), Brazil
Cep: 38015-050 E-mail: mhelena331@hotmail.com

Received article **15/01/2008** and accepted **22/05/2009**

INTRODUCTION

Although the advances in analgesic drugs, the different ways they can be administered and non-pharmacological techniques to relieve pain, this is still considered an important problem in the postoperative period.

Postoperative pain is a common phenomenon, which, in addition to causing suffering, can expose patients to unnecessary risks[1]. It is one of the predominant forms of acute pain and it represents a social, economic and health problem, being relieved in less than 30% to 50% of adult and pediatric patients[2].

Cardiac surgery brings about changes of several physiological mechanisms, contact with drugs and materials that can cause harm to the organism, apart from great organic stress[3]. Although pain is frequent after this type of surgery, between 50% and 75% of patients do not receive appropriate analgesic treatment[4].

It is essential to control pain to provide complete care for the patient, because prolonged painful stimuli probably cause postoperative complications and suffering[5], related to the increase in postoperative morbidity and mortality[2].

In the organism, pain can cause several cardiovascular, respiratory, immunological, gastrointestinal and urinary changes, in addition to harming early movement and deambulation and interrupting sleep, resulting in tiredness, fatigue and less motivation to cooperate with treatment[1].

Postoperative pain is an important indicator to assess physical and psychological damage of patients undergoing cardiac surgery[6]. Thus, analgesia is an a relevant aspect in this period, essential for the patient's well-being and also for obtaining their cooperation[7].

Once postoperative pain can influence the patient's recovery, its control implies analgesic treatment that is adequate to the needs of each individual[8].

For this reason, instruments used to assess pain facilitate communication between patient and professional, enabling the incidence, duration, intensity and relief of pain obtained to be determined, as a result of several analgesic techniques used[9].

Considering the nurse as a member of a multiprofessional team, who has a key role to guarantee quality of care for patients, including the management of postoperative pain, the performance of this study was proposed, aiming to: assess the intensity of pain in patients in the postoperative period of cardiac surgery; identify possible associations between physiological changes (tachycardia, tachypnea, increase in blood pressure, excessive perspiration, skin pallor, nausea and vomit) and postoperative pain; and describe analgesia used.

METHODS

This was a prospective study with a quantitative approach, performed in a public university hospital that cares for high-complexity patients and is situated in the city of Uberaba, MG, Brazil.

After the research project was approved by the *Universidade Federal do Triângulo Mineiro* Research Ethics Committee, under Protocol 995/2007, data collection began.

Data were collected in the *Unidade de Terapia Intensiva Coronariana* (*UTI Coronariana* – Coronary Intensive Care Unit) and *Unidade de Clínica Cirúrgica* (UCC – Surgical Clinic Unit) of the above mentioned institution and location of study.

The target population was comprised of 39 patients who had undergone cardiac surgery, between December 2007 and April 2008. Of these, 30 patients met the inclusion criteria of this study: to be an adult aged 18 years or more; to be in the postoperative period of a cardiac surgery; to be aware and able to speak; to have accepted to participate in the research and signed an Informed Consent Form, thus comprising the study sample.

Data collection was performed using a specific instrument for this purpose, which was comprised of three parts. The first part referred to socio-demographic data; the second, to aspects associated with the anesthetic-surgical procedure; and the third, to the assessment of intensity of pain, physiological changes identified and prescribed analgesic scheme.

Records of scores of pre-anesthetic clinic assessment from the American Society of Anesthesiologists (ASA), which had been performed by an anesthesiologist in the immediate pre-surgery period, were used. These data, together with those related to the anesthetic-surgical procedure and analgesic scheme used, were obtained from perioperative and medical prescription records found in the medical charts of patients.

Assessment of postoperative pain was performed by the researcher through an interview with the patient, who was asked about the presence of pain at the moment of this assessment. The Verbal Numerical Scale, ranging from 0 to 10 and where 0 means absence of pain and 10, the worst pain ever felt, was used to quantify this symptom. The intensity of pain was then classified in: without pain (0), mild pain (1 to 4), moderate pain (5 to 7) and intense pain (8 to 10)[10].

Location of pain was obtained as it was either shown or verbally reported by the patient. This pain was subsequently classified as surgical incision in the sternum area, surgical incision in a lower limb, anterior thorax, posterior thorax and other areas.

After interview, researcher performed the patient's clinical evaluation to identify physiological changes (tachycardia, tachypnea, increase in arterial pressure, excessive perspiration, skin pallor, nausea and vomit) which may be associated with pain[1,11-12], by observing the presence or not of such changes.

The following parameters were considered to identify the changes: tachycardia (> 100 bpm), tachypnea (>20 bpm)[13] and increase in arterial pressure (value higher than 139 x 89 mmHg), considered to be the threshold, according to the *V Diretrizes Brasileira de Hipertensão Arterial* (5th Brazilian Directives for Arterial Hypertension)[14].

Evaluation of patients was performed once a day, in each of the five times analyzed in this study: immediate postoperative period (IPO) - up to 24 hours after surgery; 1st postoperative period (1stPO) - between 24 and 48 hours after surgery; 2nd postoperative period (2ndPO) - between 48 and 72 hours after surgery; 3rd postoperative period (3rdPO) - between 72 and 96 hours after surgery; and 4th postoperative period (4thPO) - between 96 and 120 hours after surgery.

In all, there were 146 evaluations, considering that, out of

the 30 patients of this study, 4 (13.3%) were not evaluated in the 4thPO, once they were discharged before this period.

Data were inserted into an electronic database, the Excel XP® software program from Microsoft®, and transported to the Statistical Package for the Social Sciences (SPSS) software to be processed and analyzed. Chi-square statistical test was used to verify whether there was an association between physiological changes, identified in the patients evaluated, and the presence of pain. Pearson's correlation coefficient was calculated to analyze the strength of association between these variables. Results were considered significant, with a 5% significance level ($p < 0.05$) and 95% confidence interval. Data are shown in tables and figures.

RESULTS

As regards the socio-demographic variables analyzed, it was observed that 14 (46.7%) patients were retired and 18 (60.0%) were men. Mean age was 58.8 years, varying between 21 and 80 years.

In terms of the evaluation of these patients' clinical status in the preoperative period, 14 (46.7%) showed a score 3, according to the ASA index; 7 (23.3%) showed a score 2, and 9 (30.0%) did not have a record of such information in the anesthetic file.

As regards the surgical procedure, all patients assessed had undergone elective cardiac surgery by longitudinal median sternotomy, with the use of extracorporeal circulation, and there was no record of complications during the intraoperative period, in the files analyzed.

Mean duration of surgeries was 4.9 hours, with a variation between 3.5 and 8.0 hours, and surgeries performed were as follows: 13 (43.3%) myocardial revascularization, 12 (40.1%) valve exchanges, 2 (6.7%) interatrial communication closure, 1 (3.3%) aneurismectomy of left ventricle and 2 (6.6%) valve exchanges associated with other procedures (bypass implant and myocardial revascularization).

In terms of pain, the majority of patients (26 /86.7%) showed this symptom in, at least, one of the times analyzed, whereas only 4 (13.3%) patients did not feel pain, during the postoperative period analyzed in this study. It should be emphasized that, in the 4th PO, 4 (13.3%) patients were not evaluated once they had been discharged before this period.

The majority of patients assessed reported pain between the IPO and the 2nd PO, with a decrease of such complaint after this period. The highest incidence of pain occurred in the 1stPO in 19 (63,3%) patients.

As regards intensity of pain, mean intensity of pain decreased throughout postoperative times evaluated, with a mean score of 2.6 in the IPO and 2.4 in the 1stPO (Figure 1).

In all times evaluated, there was a predominance of mild pain among patients who felt it. Intense pain, although less frequent, was not observed in the 2ndPO only (Figure 2).

As regards the location of pain, in all times evaluated, surgical incision in the sternum area was the most frequent location reported by patients, except for the 2ndPO, where the anterior thorax was the predominant painful area.

In terms of physiological changes identified, there were changes in the majority of patients assessed between IPO and 2ndPO, with the incidence decreasing after this period of evaluation (Figure 3).

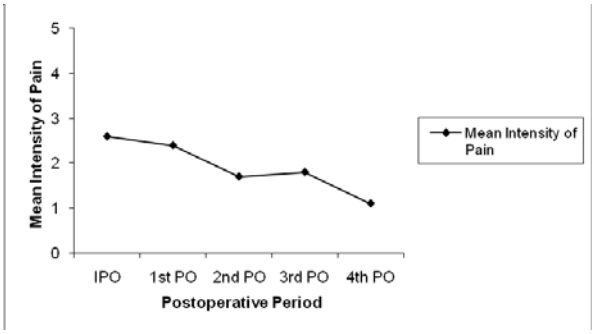

Figure 1. Mean scores of intensity of pain in patients undergoing cardiac surgery, according to postoperative time. Uberaba, MG, Brazil, 2007/2008

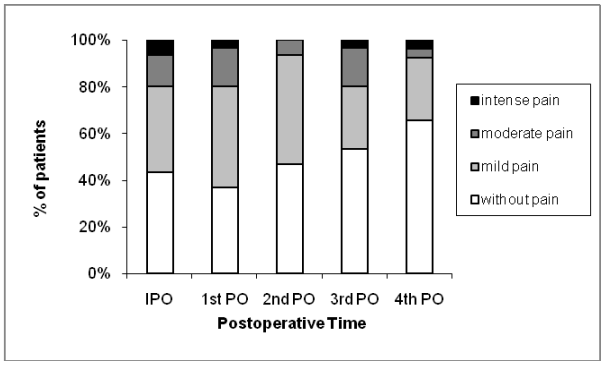

Figure 2. Intensity of pain in the postoperative period of cardiac surgeries, according to postoperative time. Uberaba, MG, Brazil, 2007/2008

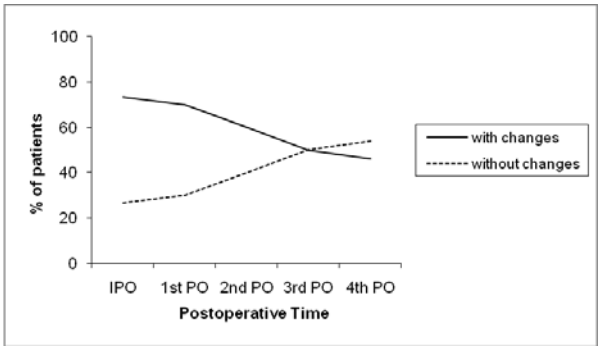

Figure 3. Incidence of physiological changes in patients in the postoperative period of cardiac surgery, according to postoperative time. Uberaba, MG, Brazil, 2007/2008

The most frequent physiological changes were tachypnea and increase in arterial pressure, which represented 45.0% and 24.5% of changes identified, respectively. The mean of changes per patient was higher in the IPO and 1stPO, with 1.6 changes/ patient.

There was a significant association ($p< 0.001$) and positive correlation (Pearson correlation coefficient = 0.90) between pain

and the presence of physiological changes in patients evaluated (Table 1).

Table 1. Association between pain and presence of physiological changes identified in patients in the postoperative period of cardiac surgery. Uberaba, MG, Brazil, 2007/2008

Pain	Physiological changes				Total	
	No		Yes			
	n	%	n	%	n	%
No	33	56.9	38	43.2	71	48.6
Yes	25	43.1	50	56.8	75	51.4
Total	58	100.0	88	100.0	146	100.0

p< 0.001
Pearson's correlation coefficient = 0.90
* A total of 146 assessments were performed between the IPO and 4thPO periods and four patients were not assessed in this last period.

In terms of analgesia, it was observed that this only occurred by administering analgesic drugs.

Between the IPO and the 4thPO, there were 344 analgesic prescriptions in all, of which 127 (36.9%) were simple analgesics, 120 (34.9%) were opioids and 97 (28.2%) were non-steroidal anti-inflammatory drugs (NSAIDs).

In addition, there were 181 (52.6%) analgesics under the "at the doctor's discretion" scheme, 122 (35.5%) had a fixed time and 41 (11.9%) were under the "to be administered if necessary" scheme. Mean of analgesics prescribed by patient varied between 2.8 in the 1stPO and 2.0 analgesics/patient in the 4thPO.

Throughout the postoperative period, there was a sharp decrease in the number of opioids prescribed and an increase in the number of NSAIDs (Table 2).

DISCUSSION

Pain is a frequent symptom with high incidence among patients who undergo cardiac surgery[15].

In the present study, there was a high incidence of complaints of pain, once 86.7% of the patients complained about this symptom in at least one of the times assessed (from IPO to 4thPO). In a study with similar methodology, a high incidence of pain at the moment of interview was also observed[16].

In this study, the highest incidence of pain occurred in the 1stPO, identified in 19 (63.3%) of the patients evaluated. These data differ from those found in another study, where a higher incidence of pain in the 2ndPO was found(4). This may be associated with the analgesic scheme adopted in this period, considering the fact that the study found did not mention details about this aspect.

It should be emphasized that, in the present study, only 4 patients (13.3%) did not feel pain during the times evaluated, corroborating another study where a small number of patients did not feel pain during the postoperative period analyzed[4].

It is known that pain in the postoperative period of cardiac surgery can result from innumerable factors, especially those associated with injuries of ribs and the thoracic wall, incisions, drains and sternal edge retraction, which may cause fractures or microfractures of costal arches and intercostals muscle strains[17].

In terms of the intensity of pain, regardless of the time evaluated, a predominance of mild pain among patients who felt pain, in agreement with other authors who state that the majority of patients in the postoperative period of cardiac surgery feel little pain[7]. However, in other studies, the intensity of pain considered moderate[4,6,15] and between mild and moderate[16] were the ones most frequently identified.

This fact points to the need to consider psycho-emotional aspects and individual beliefs. It is known that in certain cases, even when the patient does not have difficulty in verbalizing it, they may not report the presence of pain due to questions associated with their own passive personality, in addition to cultural questions[17], which could be related to findings from this investigation, where the majority of patients reported mild pain.

Another important aspect must be emphasized: the intensity and incidence of pain vary not only according to individual characteristics, but also according to the type of surgery and quality of analgesic treatment[18].

Table 2. Analgesics prescribed to cardiac surgery patients, according to postoperative time. Uberaba, MG, Brazil, 2007-2008.

Analgesic	POI		1stPO		2stPO		3stPO		4stPO	
	n	%	n	%	n	%	n	%	n	%
Opioid	35	54,7	30	35,7	29	37,6	17	25,8	9	17,0
NASIDs*	-	-	25	29,8	23	29,9	28	42,4	21	39,6
Simple analgesics	29	45,3	29	34,5	25	32,5	21	31,8	23	43,4
Total	64	100,0	84	100,0	77	100,0	66	100,0	53	100,0

* Non-steroidal anti-inflammatory drugs.

In terms of the location of pain, this study showed that the surgical incision in the sternum area and anterior thoracic region were the places most frequently mentioned by patients, in agreement with findings from other studies[15]. In another study, pain was also initially situated in the sternotomy area, subsequently extending to the lower limb associated with the saphenoctomy[4].

The pain in the sternotomy area could be associated with the extension of the incision and friction of the sternum, due to thoracic instability[4], and certain surgeries could cause more pain than others, such as those that require thoracic or upper abdomen incisions[15,18]. On the other hand, complaints of pain in the anterior thorax could be attributed to the presence of thoracic drains, frequently used in this type of surgery[15].

In terms of the investigation of possible physiological changes resulting from pain, even with the predominance of mild pain among the patients assessed in this study, there was

an association ($p<0.001$) and correlation ($r=0.90$) between pain and the presence of such changes, which can be explained by its physiology.

Pain signals cause an increase in the synthesis of catecholamines and hormones, which, when greatly and continually released, produce changes in the organism such as tachycardia, peripheral vasoconstriction, increase in the consumption of oxygen and arterial pressure, tachypnea, changes in coagulation and reduction in the immune response. In addition, there could be a reduction in the intestinal tone, decrease in gastric emptying and predisposition to nausea and vomit. Pain also decreases early movement and deambulation of the patient, increases the risk of pneumonia and venous thrombosis[1,18].

Although the presence of physiological changes evaluated in this study may be associated with pain, it is known that cardiac surgery causes repercussions on the physiology of the organism that can result in cardiovascular, pulmonary, gastrointestinal and neurological changes, among other things[7].

After the thoracic surgery, considering the individual variation and permanence of thoracic drains, the intensity of pain is greater in the first 48 to 72 hours[19], which can explain the high incidence of pain and changes identified until the 2ndPO, in patients evaluated in this study.

When analgesia is analyzed, only the administration of analgesic drugs was found to be used. In addition to the use of non-hormonal analgesic morphine and anti-inflammatory drugs by different routes, control of postoperative pain can include the following: the use of cognitive-behavioral techniques such as relaxation educational; distraction and guided imagination techniques; and the use of physical therapies such as massage, application of heat or cold and transcutaneous electrical nerve stimulation[1].

In the present study, simple analgesics and opioids represented 71.8% of the analgesics prescribed and NSAIDs, 28.2%, In contrast, in another study that evaluated doses of analgesics administered, NSAIDs comprised the majority, when compared to simple analgesics and opioids[16].

It was observed that the number of opioids prescribed greatly decreased throughout the postoperative time, whereas the prescription of NSAIDs increased, which is in agreement with recommendations for the treatment of acute pain.

It is recommended that the analgesic treatment be performed on three levels, the first corresponding to mild pain; the second, moderate pain; and the third, intense pain. For the first level, the use of NSAIDs is indicated; for the second level, the association between NSAIDs and weak opioids; and for the third level, the association of NSAIDs and strong opioids. As the postoperative pain tends to decrease with time, its treatment must begin from the third level[17].

Furthermore, the majority of analgesics prescribed were under the "at the doctor's discretion" scheme, while only 11.9% were under the "to be administered if necessary" scheme.

It should be emphasized that the highest number of opioids was prescribed between the IPO and the 2ndPO periods, when the majority of patients reported pain. Such fact may be associated with no administration of all drugs prescribed or inadequacy of the scheme, considering that, in this study, it was not evaluated whether a drug was administered in all times prescribed or not.

Analgesic prescriptions should be regular and under a "to be administered if necessary" scheme to maintain a constant plasma level and enable its availability for episodes of pain[5], although there is a trend to give analgesics prescribed under the "to be administered if necessary" scheme less frequently[16]. The prescription under a mixed scheme (fixed time + "to be prescribed if necessary") is more adequate to the patients' needs[1].

CONCLUSION

Results of this study enabled authors to evidence that the intensity of pain was predominantly mild in all times evaluated. In addition, there was an association ($p<0.001$) and positive correlation (correlation coefficient = 0.90) between pain and the presence of physiological changes assessed, the more frequent being tachypnea (45.0%) and increase in arterial pressure (24.5%).

The majority of patients between the IPO and 2ndPO periods reported pain, with the highest incidence occurring in the 1stPO, when 63.3% of patients complained about it.

Mean intensity of pain decreased throughout the times evaluated, with mean scores of 2.6 in the IPO; 2.4 in the 1stPO; 1.7 in the 2ndPO; 1.8 in the 3rdPO and 1.1 in the 4thPO.

As regards analgesia, only the administration of drugs was used, with opioids and simple analgesics representing 71.8% of the analgesics prescribed and the NSAIDSs, 28.2%. In addition, the majority of drugs (52.6%) were under the "at the doctor's discretion" scheme.

Results from the present study point to the need to systematically assess pain in patients in the postoperative period of cardiac surgery, aiming at its control and thus contributing to these patients' immediate recovery.

Finally, it should be emphasized that certain limitations to this study can be pointed out, such as the fact that the sample was comprised of 30 patients and was not probabilistic, which could be considered a reduced number, when compared to great specialized centers. However, such limitations do not compromise the results obtained in this study, because statistical tests adopted guarantee the reliability of findings.

REFERENCES

1- Pimenta CAM, Santos EMM, Chaves LD, Martins LM, Gutierrez BAO. Controle da dor no pós-operatório**.** Rev Esc Enferm USP. 2001;35(2):180-3.

2- Chaves LD. Dor pós-operatória: aspectos éticos e assistência de enfermagem. In: Leão ER, Chaves LD, organizadoras. Dor 5° sinal vital: reflexões e intervenções de enfermagem. 2a ed. São Paulo: Martinari; 2007. p. 184-211.

3- Vasconcelos Filho PO, Carmona MJC, Auler Júnior JOC. Peculiaridades no pós-operatório de cirurgia cardíaca no paciente idoso. Rev Bras Anestesiol. 2004;54(5):707-27.

4- Giacomazzi CM, Lagni VB, Monteiro MB. A dor pós-operatória como contribuinte do prejuízo na função pulmonar em pacientes submetidos à cirurgia cardíaca. Rev Bras Cir Cardiovasc. 2006;21(4):386-92.

5- Chaves LD, Pimenta CAM. Controle da dor pós-operatória: comparação entre métodos analgésicos. Rev Latinoam Enferm. 2003;11(2):215-9.

6- Borges JBC, Ferreira DLMP, Carvalho SMR, Martins AS, Andrade RR, Silva MAM. Avaliação da intensidade de dor e da funcionalidade no pós-operatório recente de cirurgia cardíaca. Rev Bras Cir Cardiovasc. 2006;21(4):393-402.

7- Senra DF, Iasbech JA, Oliveira SA. Pós-operatório em cirurgia cardíaca de adultos. Rev Soc Cardiol Estado de São Paulo. 1998;8(3):446-54.

8- Martínez Flores FE. Evaluación analgésica posquirúrgica con Ketorolaco vs. Diclofenaco vs. Metamizol [Internet]. Lima: Universidad Nacional Mayor de San Marcos; 2002. [citado 2007 Jun 10]. Disponível em: http://sisbib.unmsm.edu.pe/bibvirtualdata/Tesis/Salud/Martinez_F_F/T_completo.pdf

9- Pereira LV, Sousa FAEF. Mensuração e avaliação da dor pós-operatória: uma breve revisão. Rev Latinoam Enferm. 1998;6(3):77-84.

10- Calil AM, Pimenta CAM. Intensidade da dor e adequação de analgesia. Rev Latinoam Enferm. 2005;13(5):692-9.

11- Drummond JP. Neurofisiologia. In: Drummond JP. Dor aguda: fisiopatologia, clínica e terapêutica. São Paulo: Atheneu; 2000. p. 1-25.

12- Teixeira MJ. Fisiopatologia da dor. Rev Med (São Paulo). 1995;74(2):55-64.

13- Barros E, Albuquerque GC, Pinheiro CTS, Czepielewski MA. Exame clínico: consulta rápida. 2a. ed. Porto Alegre: Artmed; 2004.

14- Sociedade Brasileira de Cardiologia; Sociedade Brasileira de Hipertensão; Sociedade Brasileira de Nefrologia. V Diretrizes Brasileiras de Hipertensão Arterial. São Paulo; 2006.

15- Corrêa CG. Dor: validação clínica no pós-operatório de cirurgia cardíaca [dissertação]. São Paulo: Escola de Enfermagem da Universidade de São Paulo; 1997.

16- Pimenta CAM, Koizumi MS, Ferreira MTC, Pimentel ILC. Dor: ocorrência e evolução no pós-operatório de cirurgia cardíaca e abdominal. Rev Paul Enferm. 1992;11(1):3-10.

17- Silva MAS. Efeitos da intervenção treinamento, avaliação e registro sistematizado no controle da dor pós-operatória de cirurgia cardíaca [dissertação]. São Paulo: Escola de Enfermagem da Universidade de São Paulo; 2007.

18- Bassanezi BSB, Oliveira Filho AG. Analgesia pós-operatória. Rev Col Bras Cir. 2006;33(2):116-22.

19- Fonseca NM, Mandim BL, Amorim CG. Analgesia pós-toracotomia com associação de morfina por via peridural e venosa. Rev Bras Anestesiol. 2002;52(5):549-61.