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## Pain assessment and management in patients undergoing endovascular procedures in the catheterization laboratory

Avaliação e manejo da dor em pacientes submetidos a procedimentos endovasculares em laboratório de hemodinâmica

Evaluación y tratamiento del dolor en pacientes sometidos a procedimientos endovasculares en el laboratorio de cateterismo

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### ABSTRACT

**Objective:** To describe how pain is assessed (characteristic, location, and intensity) and managed in clinical practice in patients undergoing endovascular procedures in the catheterization laboratory setting. **Method:** Cross-sectional study with retrospective data collection. **Results:** Overall, 345 patients were included; 116 (34%) experienced post-procedural pain; in 107 (92%), pain characteristics were not recorded; the location of pain was reported in 100% of patients, and its intensity in 111 (96%); management was largely pharmacologic; of the patients who received some type of management (n=71), 42 (59%) underwent reassessment of pain. **Conclusion:** The location and intensity of pain are well reported in clinical practice. Pharmacologic pain management is still prevalent. Additional efforts are needed to ensure recording of the characteristics of pain and its reassessment after interventions.

### DESCRIPTORS

Pain; Acute Pain; Pain Management; Endovascular Procedures; Nursing Care.

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## INTRODUCTION

Endovascular procedures involve the insertion of radiopaque catheters, via percutaneous venous or arterial puncture (femoral, brachial, or radial) under fluoroscopy guidance, to arrive at the desired location (heart, peripheral vessels, cerebral vessels). These procedures are carried out in catheterization laboratories ("cath labs") for purposes both diagnostic (evaluation of blood flow) and therapeutic (treatment of obstructions, stenoses, or correction of aneurysmal lesions)<sup>(1)</sup>.

A common complaint of patients undergoing endovascular procedures is acute pain at the vascular access site or discomfort in the chest and lower back area, which may be related to bedrest, restricted movement of the accessed limb, to the trauma of vascular puncture itself, or to the potential vascular complications that may develop during the procedure<sup>(2-4)</sup>. However, other pain complaints, such as back pain or headache, are also very common in this setting<sup>(2-6)</sup>. Considering that the high turnover and dynamics of cath lab work may hinder proper care of pain, staff must pay special attention to assessment, management, and systematic recording of pain levels.

Despite substantial growth of endovascular procedures in recent decades<sup>(3-5)</sup>, assessment of pain in the post-procedural period does not appear to be a major concern of care teams. Few studies have addressed this topic as a primary outcome in this setting<sup>(6-8)</sup>; in others, pain was assessed a secondary or less important outcome<sup>(2)</sup>.

It is known that inadequate management of postoperative pain can prolong hospitalization, increase health-care expenditures, and have several clinical repercussions, including changes in blood pressure and respiratory rate, anxiety, emotional stress, and sleep disorders, among others<sup>(9-10)</sup>. Proper pain management is the patient's right in every health care context, and must include an assessment that addresses pain characteristics and location, management, and re-evaluation after intervention<sup>(11-12)</sup>.

In an attempt to bridge this knowledge gap, this study aims to describe how the pain of patients undergoing endovascular procedures in a cath lab setting is assessed (characteristics, location, and intensity) and managed in daily practice. The relevance of this study is related to the investigation of pain management in a dynamic care context. Data thus generated can be used by providers to improve awareness of pain levels in this patient population, support individualized care, and improve management to relieve pain and increase patient comfort.

## METHOD

This cross-sectional study with retrospective data collection was conducted using data from patients' nursing records (electronic and paper-based). The sample comprised adult patients (aged 18 years or older), of both sexes, who underwent diagnostic or therapeutic endovascular procedures at the catheterization laboratory of Hospital de Clínicas de Porto Alegre (HCPA), state of Rio Grande do Sul, Brazil, from July to December 2013. Patients who recovered at other

units or whose procedures did not involve arterial puncture or venipuncture (e.g., procedures that used dissection or transperitoneal puncture as access route) were excluded.

HCPA is a public, university-affiliated hospital specializing in high-complexity care. Its cath lab has three procedure suites and performs an average of 300 procedures/month, divided into the following fields of expertise: cardiology (cardiac catheterization, percutaneous coronary intervention); cardiac electrophysiology (electrophysiologic study with or without ablation); cardiovascular surgery (definitive pacemaker, endovascular correction of aneurysm); vascular surgery (arteriography and arterioplasty); neurosurgery (arteriography, embolization of malformations); and interventional radiology (arteriography, cholangiography, embolization of vessels, and nephrostomy).

The sample size was calculated in the WinPepi 11.25 software environment, taking into account a 95% confidence level, a 5% margin of error, and a proportion of 50%, on the basis of the existing literature<sup>(2,6-7)</sup>. The sample size was thus estimated at 385 patient records.

From July to December 2013, 1758 procedures were carried out at the catheterization laboratory where the study was conducted. This period was stipulated as a result of the work process, safety standards, and nursing and medical charts readjustment, necessary for international certification by the International Joint Commission, which took place at the hospital. After this survey, we excluded all patients who had undergone procedures using dissection or transperitoneal puncture (n=161) and those subjected to procedures who did not recover in the cath lab (62). After these exclusions, with the remaining sample of 1535 procedures, a randomization proportional to the distribution of procedures in the study period was performed; 385 charts were selected, taking into account a 20% attrition rate. Overall, 10% of records were lost during the review stage (patients who did not recover in the cath lab observation room and charts that could not be retrieved). With this percentage of loss, 345 medical records were included in the study.

A specific instrument was developed by the researchers to collect data on demographic and clinical variables: age, sex, comorbidities (diabetes mellitus, hypertension, smoking), type and duration of procedure, and information about pain felt by the patient after the endovascular procedure.

The institution that hosted the study recommends that pain be recorded as the fifth vital sign, and that assessment of pain address its characteristics (as described by the patient, e.g., clenching, twinge, burning...), location, and intensity (through a visual numeric scale or verbal rating scale)<sup>(12)</sup>.

Statistical analyses were carried out in SPSS 19.0 (Chicago, Illinois, USA). Continuous variables were expressed as mean and standard deviation. Categorical variables were expressed as absolute and relative frequencies. Permission to conduct this study was obtained from the Research Ethics Committees of the Universidade Federal do Rio Grande do Sul School of Nursing (no. 140119) and of Hospital de Clínicas de Porto Alegre (no. 27195914200005327). Before using medical record data, investigators signed a Data Use Agreement form, as required by the study facility.

## RESULTS

### DEMOGRAPHIC AND CLINICAL CHARACTERISTICS

The sample included 385 patients who had undergone endovascular procedures in a catheterization laboratory setting. The patients' mean age was  $61 \pm 13$  years. Most were male, and hypertension was the most common comorbidity; 40% were former smokers. Table 1 describes the sample characteristics.

**Table 1** – Demographic and clinical characteristics of patients undergoing interventional procedures at a catheterization laboratory – Porto Alegre, Rio Grande do Sul, Brazil, 2013.

Characteristics	n=345
Age, years*	61±13
Male sex <sup>†</sup>	188 (54.5)
Hypertension <sup>†</sup>	254 (74)
Dyslipidemia <sup>†</sup>	183 (53)
Diabetes mellitus <sup>†</sup>	106 (31)
Former smokers <sup>†</sup>	137 (40)
Current smokers <sup>†</sup>	45 (13)

\*Continuous variable expressed as mean ± standard deviation; <sup>†</sup>Categorical variable expressed as n (%).

Assessment, management, and reassessment of pain after endovascular procedures

Of the 345 patients included, 116 (34%) experienced at least one recorded instance of pain after the procedure. Table 2 illustrates the characteristics, location, and intensity of post-procedural pain as recorded in the sample.

Overall, 67 patients (58%) received pharmacologic treatment, 45 (39%) received no intervention for pain, and four (3%) received non-pharmacologic treatment (turning and positioning in bed). In 42 cases (59%), pain was reassessed within 1 hour of the intervention.

**Table 2** – Characteristics, location, and intensity of post-procedural pain as recorded in the sample – Porto Alegre, Rio Grande do Sul, Brazil, 2013.

	n=116 n (%)
<b>Pain characteristics</b>	
Not recorded	107 (92)
Crushing	3 (2.6)
Catching	2 (1.7)
Shooting	1 (0.9)
Stabbing	1 (0.9)
Cramping	1 (0.9)
Burning	1 (0.9)
<b>Location of pain</b>	
Head	30 (26)
Vascular access site	21 (18)
Accessed limb	19 (16.5)
Lumbar area/Back	18 (15.5)
Other locations	16 (14)
Sternum	12 (10)

continued...

...continuation

	n=116 n (%)
<b>Pain severity</b>	
Moderate (4-7)	60 (52)
Mild (1-3)	39 (34)
Intense (8-10)	12 (10)
Not recorded	5 (4)
<b>Pain treatment</b>	
Pharmacologic	67 (58)
None	45 (39)
Non-pharmacologic	4 (3)
<b>Provider responsible for recording pain</b>	
Nurse technician	107 (92)
Nurse	9 (8)

## DISCUSSION

This was the first study conducted in a cath lab setting that sought to describe pain evaluation and management in patients undergoing endovascular procedures.

We identified that, among patients who felt pain after the procedure (n=116), in the majority of charts, the characteristics of pain were not recorded; conversely, the location of pain was present in all records, and the intensity of pain was assessed in over 90% of cases. Pharmacologic treatment was the mainstay of care, and not all patients who received a pain relief intervention underwent reassessment of pain within 1 hour of said intervention.

The low rate of pain in cath lab patients may be associated with the nature of percutaneous procedures, which are less invasive and noninjurious to deeper tissues<sup>(3-5)</sup>. In addition, underreporting of pain may be influenced by high patient turnover and short recovery times in this setting, thus jeopardizing a more systematic approach to pain assessment. It bears noting that mandatory inclusion of pain parameters in medical prescriptions is a recent practice. Pain assessment is underestimated by the health care team, mainly in contexts of dynamic health care, i.e., units in which patients stay for a short period of time. The dynamic nature of care in such units may create barriers for patients to request support. This behavior fails to consider the potential limitations imposed by pain, which include increased rates of secondary complications, prolonged hospital stay, neurovegetative changes, and risk of chronification<sup>(9,13-14)</sup>.

In most of the cases, pain characteristics were not recorded; thus, we infer that attempts were rarely made to collect this information. This implies that, of all recommended aspects, this was the one providers had the greatest difficulty measuring. Merely asking patients how they characterize their pain may appear simple; however, countless challenges are involved. The first is providers' perception of pain, including their awareness of the relevance of characterizing pain. On the other hand, patients also exhibit difficulties in comprehension – particularly older adults, those with barriers to communication, and those with low educational attainment<sup>(15)</sup>. In a study conducted with nurse technicians

and nurse's aides, a lack of patient comprehension was reported as the primary challenge to pain measurement in 77.6% of cases<sup>(15)</sup>. It is believed that, for patients to be able to describe their pain, they must feel comfortable expressing what they are feeling in their own words, and must understand that this information will help the staff treat them.

In the present study, pharmacologic treatment was the main approach used in patients who complained of pain. However, a substantial portion of these patients did not receive any intervention for pain relief. The literature suggests that insufficient knowledge about mechanism of action, half-life, drug-drug interactions, and dosage often leads to undertreatment of pain<sup>(16-17)</sup>. Although physicians are responsible for prescribing analgesic agents, pain management per se is performed by the nursing staff. On the other hand, cath lab staff must also ascribe due importance to the occurrence of post-procedural pain, particularly with proactive use of standing orders for pain management that take pain levels into account.

In this study, non-pharmacological pain treatment – which consisted in relocating the bed so the patient would feel more comfortable – was described in only one case. As non-pharmacological practices may also contribute to relieve pain, the cath lab care team may use other methods, such as cold application to reduce the inflammatory process of acute tissue injury and thus improve swelling and local pain<sup>(18)</sup>. Other methods, such as music therapy and massage, have been widely studied, mainly for the treatment of chronic pain; these methods can be used in different contexts as they reduce pain and improve patient satisfaction<sup>(19-20)</sup>.

Reassessment of pain is essential to ascertain whether pain relief has been achieved. The literature points out that reassessment of pain after analgesia must occur from 30 min to 1 hour after the intervention<sup>(21)</sup>. However, in this study, 41% of patients who received a pain management intervention never had their pain levels reassessed. This may be associated with achievement of pain relief within 1 hour rather than failure to incorporate reassessment into routine practice at the catheterization laboratory.

Data from a study that sought to characterize the perceptions and challenges of the nursing staff regarding certain

aspects of pain assessment and provide training in this respect revealed that 84.3% of providers had knowledge of this topic and that 54.9% had acquired such knowledge in the hospital environment<sup>(22)</sup>. This highlights the importance of institutions in training their providers, so that relevant information is known by all. One study showed that pain management can provide more effective relief when the nursing staff is properly trained to identify and treat pain in a systematic manner<sup>(23)</sup>.

Despite the relevance of these findings, the lack of records may in itself have been a limiting factor in our attempt to relate them directly to clinical practice. Greater efforts are warranted in terms of recording pain and implementing pain management. Training efforts that provide for the entire multidisciplinary team may be helpful, as proper pain management requires that all providers do their part to relieve pain within the care of the patient as a whole.

We are not aware of any previous investigations into this topic conducted in the catheterization laboratory setting. Therefore, the results of the present study may contribute to the improvement of pain management in cath lab patients by providing valuable knowledge on the occurrence of pain in this population.

## LIMITATIONS

The limitations of this study include the fact that, in an environment as dynamic such as a catheterization laboratory, evaluation of records without direct observation of the facts does not provide a complete picture of the care provided.

## CONCLUSION

The results of this study demonstrate that a significant percentage of patients experience pain after endovascular procedures. In this sample, pain location and intensity were often recorded in clinical practice and pharmacological treatment was the predominant method of pain management. Additional efforts must be made to ensure better recording and assessment of pain characteristics, as well as to ensure reassessment of pain after analgesic interventions.

## RESUMEN

**Objetivo:** Describir cómo se evalúa el dolor (características, localización e intensidad) y su manejo en la práctica clínica en pacientes sometidos a procedimientos endovasculares en el laboratorio de cateterización. **Método:** Estudio transversal con recolección retrospectiva de datos. **Resultados:** En total, se incluyeron 345 pacientes; 116 (34%) experimentaron dolor post-procedimiento; en 107 (92%), no se registraron las características del dolor; la localización del dolor se informó en el 100% de los pacientes, y su intensidad en 111 (96%); el manejo fue en gran medida farmacológico; de los pacientes que recibieron algún tipo de tratamiento (n=71), 42 (59%) fueron sometidos a reevaluación del dolor. **Conclusión:** La ubicación y la intensidad del dolor se informan bien en la práctica clínica. El manejo farmacológico del dolor sigue siendo frecuente. Se necesitan esfuerzos adicionales para asegurar el registro de las características del dolor y su reevaluación después de las intervenciones.

## DESCRIPTORES

Dolor; Dolor Agudo; Manejo del Dolor; Procedimientos Endovasculares; Atención de Enfermería.

## RESUMO

**Objetivo:** Descrever como se dá na prática clínica a avaliação (característica, localização e intensidade) e o tratamento da dor em pacientes submetidos a procedimentos endovasculares em Laboratório de Hemodinâmica. **Método:** Estudo transversal com coleta de

dados retrospectiva. **Resultados:** Foram incluídos 345 pacientes; 116 (34%) apresentaram dor após o procedimento; em 107 (92%), as características da dor não foram registradas; a localização foi registrada em 100% dos pacientes, e a intensidade da dor em 111 (96%); o principal manejo foi o farmacológico; dos pacientes que receberam algum manejo (n=71), 42 (59%) tiveram sua dor reavaliada. **Conclusão:** A localização e a intensidade da dor estão bem documentadas na prática clínica. O tratamento farmacológico foi prevalente. Mais esforços são necessários para que as características da dor sejam registradas, assim como sua reavaliação após intervenção.

## DESCRIPTORIOS

Dor; Dor Aguda; Manejo da Dor; Procedimentos Endovasculares; Cuidados de Enfermagem.

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