Review of Predictors of Postoperative Pain

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Abstract

Introduction: Pain in the postoperative period reported by the patient (acute or chronic) is an important aspect that must be taken into consideration and widely studied, since it interferes in the patient's acceptance by this method of treatment, prognosis, quality of life, besides being a descriptor of the quality of the service in which the surgery was performed and of the professionals involved. Currently, the patient takes into consideration not only the treatment itself of his illness, but how this will impact his life after the procedure.

Materials and Methods: A review was conducted in the literature in order to describe the main predictors of postoperative pain and its importance. Fifty studies were analyzed between 2002 and 2018, whose objective was to evaluate the impact of postoperative pain on the patient's quality of life.

Results and Discussion: Different types of scores were shown to be used as a predictor of postoperative pain. The psychological and emotional changes, followed by the demographic differences were the most important aspects found in the preoperative period that can measure the risk for postoperative pain.

Conclusion: The perception of quality of life changes according to the study group analyzed in relation to the referred disease and the cultural and social environment in which the individual is inserted, making the analysis often subjective, but as fundamental for the relationship between patient and multi professional team with better outcome treatment.

Keywords: Predictors; Postoperative; Pain

Introduction

Pain, according to the International Association for the Study of Pain (IASP), is described as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage" [1]. About 5% of individuals who undergo any surgical procedure will develop persistent severe pain associated with some chronic physical limitation or psychosocial impairment [2,3], especially those associated with neurological lesions [4]. The study for the management of postoperative pain for more than three decades focused on pharmacology and anesthesiology [5,6], but faced with a modest solving of cases addressed [7,8].

Neural messages ascend through the peripheral nerves to the cortex, generating awareness of the message. These messages can be modulated through these pathways in several places, allowing similar pain stimuli to generate different responses in each individual [9,10].

Painful sensations are a major concern in post-operative multidisciplinary and interdisciplinary care, not only because of the patient's suffering, but also because it influences the recovery process [11].

Tissue trauma generates a mediated inflammatory response that increases sensitivity around the lesion (hyperalgesia) or alteration of pain perception to generally non-harmful stimuli (allodynia). Another mechanism that contributes to these two phenomena includes the sensitization of peripheral pain receptors (primary hyperalgesia) and increased excitability of central nervous system neurons (secondary hyperalgesia) [12-14].

In the literature it is possible to find that pain is not exclusively dependent on the degree of the lesion that generated it (organic), being the intensity and the character directly influenced by previous experiences, memories and the capacity of the human being to understand the causes and consequences [15]. Among the several factors, the psychological, cognitive, affective variables, age, gender, weight and location of the lesion are the most prominent [16-21].

All these aspects, associated with the reason for the injury, generate a series of postoperative

Table 1: Predictors of Pain Testing.

A. Psychological Measures	B. Pain Threshold Measures
Mental Health Inventory	Quantitative Sensory Testing
26-Items Stress Scale	Pressure Pain threshold
Anxiety and Depression Hospital Scale	Supralimilar Pain Scale
Self-Assessment Questionnaire for Depression	Inhibitory Control Harmful Diffuse
Pain Catastrophization Scale	Generalized Anxiety Disorder 7-Item Scale
Montgomery-Asberg Depression Rating Scale	Diffuse Noxious Inhibitory Control
Anxiety Trait Inventory	**C. Measures of Pain Outcome**
Hamilton Depression and Anxiety Assessment Scale	Mcgill's Pain Questionnaire
Emotional Functional Evaluation Scale in Cancer Treatment	Visual Analogue Scale
Somatosensory Amplification Scale	Numerical Pain Score
Minnesota Multiphasic Personality Inventory	Brief Pain Inventory
Eysenck Personality Questionnaire	5-point Likert scale and 6-point Likert scale
Multidimensional Scale of Health Control Locus	
Scale of Impact Events	
Scale of Confrontation	

complications, such as cardiopulmonary, thromboembolic, immunological and endocrinological disorders [22-25]. The adequate management of postoperative pain is a fundamental item of preoperative care to avoid the problems already mentioned, improving recovery of the patient, quality of life, prognosis, and it can be considered for the patient, hospital and the care team also a predictor of quality and satisfaction of the service provided [26-31].

Due to the importance presented and the great divergence of predictors of postoperative pain in published studies, we reviewed the literature search in major predictors and how they have proved important.

Materials and Methods

A review was conducted in the literature in order to describe the main predictors of postoperative pain and its importance. Fifty studies were analyzed between 2002 and 2018 (PubMed, SunSearch and Scielo), whose objective was to evaluate the impact of postoperative pain on the patient's quality of life. The descriptors analyzed were Predictors, Postoperative, Pain, and Postoperative Pain.

Results and Discussion

In several studies, preoperative tests were used and compared with the postoperative response. Among these tests, the Quantitative Sensory Testing (QST) [32] defined based on mechanical quantifiable (pressure, local puncture, vibration and light touch), thermal (painful cold, refreshing, warm and painful heat) or electrical stimulation. In one study, the preoperative pain tests were predictors of 4% to 54% of the postoperative pain experience (varying between the methods used) [33]. Other results (divergent from the present study using QST) have shown that factors such as demographic (age and sex [34-37]) and psychological factors (depression [38-42], anxiety [43-45] and vulnerability [46]) are of great importance in the prediction of postoperative pain [33].

In another research [4], which was based on the Diffuse Noxious Inhibitory Control (DNIC), new results were obtained. DNIC is calculated as the difference in pain rating between two identical pain tests, applied first at the baseline and then concomitantly with another

distressing stimulus at distant [47]. Decreased DNIC efficiency is associated with an increased history of pain in healthy patients [48]. Thus, it was suggested that DNIC was also a good predictor of chronic postoperative pain. Such research has resulted in the evidence that DNIC is efficient for evaluation of pain modulation, not as a statistical parameter of pain threshold or to estimate the supralimilar magnitude of the noxious stimulus; thus being a predictor of postoperative pain for this purpose [4].

The Visual Analogue Scale (VAS) can be used to measure pain, ranging from 0 mm to 100 mm. Its use requires the patient to score the intensity of their pain represented by a point between the extremes "without any pain" and "worse imagined pain". In addition to being simple, this validated test is a great tool for describing pain in severity and intensity [49]. For these reasons, VAS was used in a research to determine whether preoperative pain expectancy could be correlated with post-operative pain experience [50]. Psychological factors (anxiety and/or depression) were considered as important predictors of POD [39,40,51] as well as age, especially in the lower extremities [39]. In this particular case, the researchers were nurses, which value the research, since they spend an extended time with each patient to better evaluate them [52]. Patients with an efficient and more collaborative analgesia had a faster recovery and were discharged earlier, even with a reduced risk of postoperative pain [53].

In this same analysis [39], the Multidimensional Health Locus of Control (MHLC) was used. This scale measures expectation about patient control and was developed for the prediction of health-related behaviors [54]. In the study, no correlation was found between the MHLC and the intensity of the pain [50], confronting the literature, where correlations can be found between these two [54].

As already described, analgesia has an important credit to prevent postoperative pain. Some studies [55,56] have shown that inadequate analgesia [55], gender, age, body weight, presence of cancer and the variety of the surgical site are important variables for evaluating postoperative pain [56]. These results, in one of them, were obtained from the study between Intravenous Patient-Controlled Analgesia (IVPCA) with narcotic and postoperative pain. Body weight was the most relevant item when compared to the other factors evaluated and

the presence of cancer was the least relevant [56].

The psychological evaluation of the patient in the preoperative period is a fundamental criterion, described in several studies. In one, VAS was used again to evaluate patients who underwent surgery in the oral, pharyngeal, laryngeal, neck and salivary glands regions. In this study, it was found that the variables age, sex, preoperative pain, expected pain, short-term fear, and catastrophic pain have a predictive value for postoperative pain [57]. This last variable was the differential of this study when compared with others, since most do not use catastrophic pain as a criterion, placing pain expectation and anxiety as independent predictors [58-60], while in this it is shown that there are several other points to be the patient's evaluation [57].

Still regarding pain catastrophizing, a study of patients who underwent arthroplasty knee showed that psychological disorders such as depression, anxiety, panic or beliefs related to health, such as belief in themselves, pain catastrophizing and instability to the movement are related with predictions reserved after this surgery [61], based on previous research [62-65].

The anxiety was present in almost all the works analyzed and the items on which these works were based. In multidisciplinary aspects, research in the dentistry area showed that anxiety is a predictor of acute pain in patients submitted to outpatient exodontia. In this case, the history of tooth extraction and pain are intimately fixed, since it was from these points that the study of anesthesia was developed. The parameters analyzed were collected through a multiparametric oximeter (heart rate, oxygen saturation and blood pressure) during and after the procedure, besides the use of VAS and repeated after 48 hrs and 7 days. Through vital signs, no significant differences were found, but with VAS there were such differences [66]. The use of analgesic drugs in the postoperative period was also a predictor of postoperative pain, based on a study that analyzed the consumption and variables: pain, anxiety, age and kind of surgery [67]. In this case, the patients analyzed by gynecologists and obstetricians in the post-cesarean period [68,69] revealed that the perception of pain or analgesia has a correlation with postoperative pain [59,60,70] and consumption of analgesics [71].

Post-surgical recovery was the main focus in many studies. One of them dealt with the redistribution of immune cells induced by surgical stress and postoperative recovery, being this an important predictor, adding other variables as sex (little relevant, with discrete worse results for the female sex) [72]. Another showed that demographic factors such as age, body mass index, and gender (this is more relevant in females) has a potential impact on recovery [73]. Endorsing this predictor, there was a work with cancer patients with esophageal disease and quality of life, which included post-operative pain [74,75] in addition to using different scales such as the Social Functioning Scale, Pain Scale and the expected Global Activity Level [74].

Only two studies [76,78] aimed the pediatric patient for post-operative pain predictors. The first questioned whether the presence of the parents in the post-anesthesia recovery room would have a positive effect on pain, crying and recovery. In the case of crying, there was no significant evidence, but there was a decrease in the negative response two weeks after surgery. In addition, it was pointed out that anxiety is related to high levels of pain, sleep disorders and behavior problems [77]. In the second, the question was whether the introduction of Professional Clown Doctors during the period of anesthesia in children would have some positive effect on the reduction of anxiety and, consequently, improvements in the postoperative period, including decreased crying, pain and acceleration recovery [78]. The result was that health professionals indicated that there was an expected benefit, reducing the anxiety rates of pediatric patients, but most of the professionals objected to the implantation of this system, warning that there was a negative interference in the procedures in the surgical center [78] (which contrasts, in part, with the literature [79,80]).

Some hospitals use tools to measure their quality through analysis of patient satisfaction, which includes the response to postoperative pain. One of the studies used the 5-point Likert scale and the 6-point Likert scale to discover that the overall satisfaction level was moderate (56.5%) with their anesthetic care due to different reasons. Nausea and vomiting control (35.6%) was the most common postoperative reasons for dissatisfaction followed by pain control (31.7%) [81].

The Generalized Anxiety Disorder 7-Item Scale (GAD-7) measured 42.5% of anxiety on 106 patients with lumbar disc herniation, corroborating with the literature [82].

Conclusion

Many clinical trials have used tests and scores as predictors of postoperative pain both in the pre-surgical and postoperative periods, with large and important results (Table 1). It has been shown that, in addition to the correct management of medications to relieve pain resulting from surgery, demographic and psychological factors are closely related.

It has been shown in previous research that in humans, the "pain" factor is not only dependent on the degree of the organic lesion, but also on several other factors, such as intensity and previous memories, as well as understanding the consequences that the lesion can generate [15,16], showing that the psychological factor is present and should be investigated to differentiate patients at risk for postoperative pain. According to some authors [83,84], fear can be considered a primary emotion related to a specific object or situation and the individual reacts with a set of behavioral and neurovegetative responses. When associated with a non-obvious danger, but which presents itself in a vague and persistent way, a picture of apprehension, called anxiety, can be seen. Anxiety, along with other psychological aspects, proved to be a strong predictor of postoperative pain and easy measurement by tests such as VAS [66] and MLHC [50].

The combination of psychosocial and psychological aspect of dor [4,59,61,85] including pain catastrophizing [57] should not be considered separately. A broad approach should also be taken in the whole picture, including the kind of surgery the patient will undergo [67,86], the kind of anesthesia to be administered [67] and the patient's response to all preoperative management [87], both for adults and for children [78].

A mutation in the μ-opioid receptor gene has been shown to increase β-endorphin binding affinity, resulting in a reduction in pain sensitivity in healthy adults [88]. This shows that, in addition to the approach focused on this study, other biomolecular aspects can be used as predictors of pain.

The recovery of the patient after surgery, as well as their satisfaction [76] with the service provided is related to the adequate management of pain [26-30]. This adequate regulation not only can be seen macroscopically, but immunological data can be analyzed to

collaborate with the research89 and predict what kind of response the patient will present and what help we can provide [72].

It is expected that in the future, based on researches such as this one, the health team can routinely find patients at greater risk for developing postoperative pain and use predictive criteria for their management.

Acknowledgment

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