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### Pain in critically ill patients: A concept analysis

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#### Abstract

The purpose of this paper is to expand the understanding of the concept of pain in critically ill patients. The author intends to clarify the defining attributes of pain in critically ill patients and identify antecedents that influence the perception of pain and the possible consequences by using Walker and Avant's 2011 concept analysis. An improved understanding of pain by nurses and other healthcare professionals working in critical care unit will enable proper understanding of individual's experience of recovery process and identify effective support mechanism. A model case demonstrates how pain in a critically ill patient is tied to these critical attributes. A borderline case and a contrary case are presented to differentiate the concept of pain from other concepts. Empirical referents demonstrate the current perspective of the concept of pain.

**Keywords:** pain, critically ill, concept analysis

#### Introduction

Pain is universal of all afflictions. Pain is a complex, multidimensional experience that can cause suffering and decreased quality of life [1]. Despite several decades of research, pain is still a significant problem for critically ill patients throughout their stay in Intensive care unit [2]. American Association of Critical Care Nurses defines a critically ill patient as one who is at high risk for actual or potential life-threatening health problems and who requires intensive and vigilant nursing care [3]. It has been reported that almost 80% of patients experience different intensities of pain during their intensive care unit stay and identify it as one of the greatest source of stress. Critically ill patients may experience pain due to their underlying disease or surgery, but also it may result from various and painful medical procedures such as inserting urinary catheter, nasogastric tube, chest tubes, tracheal suctioning, and invasive lines, (arterial and central venous catheter) suture removal and routine nursing care. Nursing care procedures such as bathing, massage of back and pressure points, sheets change and repositioning are the most common painful procedures in Intensive Care Units (ICU) patients [4].

Managing pain in ICUs may seem daunting due to the patients' serious and often unstable health status, healthcare providers' lack of awareness regarding pain's impact on overall health status, coupled with the physical care demands within the critical care environment. Factors contributing to the overall under-treatment of pain in ICUs include pain assessment challenges for nonverbal patients, staff and family concerns about the consequences of using analgesic medications, and prioritization of complex medical needs [5]. The American College of Critical Care Medicine has emphasised the need for regular pain

assessment along with the use of validated tools, such as the Critical Care Pain Observational Tool (CPOT), and the Behavioural Pain Scale (BPS) [6].

Despite their dissemination, evidence suggests that over half of critically unwell patients do not receive regular pain monitoring in the ICU [7]. Gélinas and coworkers [8] found that of 183 documented pain episodes in intubated patients, use of a pain scale was mentioned in only 1.6% of cases. In a multicentre prospective observational study more than 50% of the included ICUs reported the availability of pain assessment tools and protocols for the management of pain; however their application was rare (pain scale 19.1% and protocol 25.0%) [9].

In addition to health care provider's lack of knowledge, another reason may be due to the unavailability of broadly defined concept of pain. Cheng SF *et al.* [10] used Walker and Avant's method of concept analysis and defined critical attributes for pain as; pain is an unpleasant and distressful experience, an individual human experience, state of feeling, has physical and psychological responses, function of pain and that pain responses are learned and influenced. However the components of pain in a critically ill patient is not yet explored or published. This unclear understanding of pain may affect how health professionals view pain in a critically ill patient. Concept analysis is an effective way to clarify the defining attributes of pain in these patients. Therefore the purpose of this paper is to expand the understanding of the concept of pain in critically ill patients. A common articulation of the concept will heighten the awareness of the components of the phenomenon leading to collaborative exploration efforts of nursing and healthcare technology research to construct evidence-based practice recommendations and policy development to aid in pain

reduction for safe patient outcomes.

The method of Walker and Avant <sup>[11]</sup> (2011) was used as the framework for this concept analysis. According to Walker and Avant, concept analysis allows nursing scholars to examine the attributes or characteristics of a concept. There are eight steps for concept analysis which includes 1) Select a concept 2) determine the aim or purpose of analysis 3) identify all uses of concept 4) determine the defining attributes 5) identify a model case 6) identify a borderline, related, contrary, invented and illegitimate cases 7) identify antecedents and consequences 8) define empirical referents. This method was chosen because it is the easiest to understand and master.

### Identifying uses of concept of pain

According to Medical Dictionary <sup>[12]</sup>, pain is an unpleasant feeling that is conveyed to the brain by sensory neurons. The discomfort signals actual or potential injury to the body. According to Margo Mc Caffery <sup>[13]</sup>, a well-known consultant in the care of patients with pain, "Pain is whatever the experiencing person says it is, existing whenever and wherever the person says it does". As shown in this definition, pain is quite subjective, meaning that pain can be described very differently among patients suffering the same medical condition.

The International Association for the Study of Pain <sup>[14]</sup> defines "pain" as an "unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage". Accordingly pain is a multidimensional issue with both emotional and physical components that are characterized as pain distress and pain severity respectively. As it is a frequent and unpleasant symptom in critically ill patients it is considered a risk factor for several psychological and physiological complications, some of which are potentially fatal <sup>[15]</sup>.

The gate control theory of pain explains the transmission of pain within the central nervous system. A gating mechanism in the substantia gelatinosa of the Central Nervous System balances the impulse large diameter, non-pain fibres and smaller diameter pain fibres. The mechanism can block or modulate the pain sensation from the periphery to the central nervous system. It can also modify the cerebral processes in the thalamus and cerebral cortex and can decrease the noxious stimuli at the level of spinal cord. This theory is applicable to many pain management interventions for the critically ill patient <sup>[16]</sup>.

Certain physiologic signs are commonly anticipated in patients when the pain is not controlled properly. While patient's subjective descriptions of pain characteristics are required for accurate assessment of their pain, many patients in the ICU have impaired communication ability, meaning that they may be unable to express their pain experience although their critical physical and mental conditions amplify their pain. Thus accurate pain assessment can be difficult when patients are impaired in their ability to communicate. In fact, it is known that adult ICU patients experience pain on a daily basis even during routine care. Procedural pain is also common in the ICU <sup>[17]</sup>. Therefore, accurate understanding of their chronic and severe pain should be the first step in managing pain effectively.

### Distinguishing the concept of pain from other closely related concepts

Suffering often accompanies pain. In a study of suffering, Ferrel and Coyle in 2008 reported that 'Pain that persist without meaning becomes suffering'. Suffering can often be relieved if patients believe that their pain can be relieved<sup>18</sup>. Rey in 1993 stated that suffering refers more to the subjective and pain is more the objective of this suffering. He considered suffering a moral issue. Thus pain may induce suffering; however not all pain will induce suffering <sup>[10]</sup>. Cassell defines pain not only as a sensation, but also "as an experience embedded in beliefs about causes and diseases and their consequences", and suffering as "the state of severe distress associated with events that threaten the intactness of person". According to Cassell, suffering starts when "the sick person will believe that his or her intactness as a person is in danger". So pain does not necessarily entail suffering, and suffering (a threat against the "intactness of a person") can be caused by other experiences <sup>[19]</sup>.

Another concept that is closely related to pain in critically ill patient is agony. According to Dictionary agony as a noun is violent contest or striving while pain is an ache or bodily suffering or an instance of this; an unpleasant sensation resulting from derangement of functions, disease or injury by violence, hurt <sup>[20]</sup>. Thus agony is different from pain, in that it is a hyponym of pain – when severe or extreme. Discomfort is another concept related to pain. Rhoten in 1982 defined discomfort as an unpleasant sensation in muscles. Hence discomfort is a sensation of unpleasant pain; it is linked to the intensity of pain. Thus though some attributes of pain, suffering, agony and discomfort overlap, the major difference in these concepts is that pain involves both physical and emotional components. Although there is a physiological component, the psychological aspect is more predominant in suffering. Level of discomfort and agony is viewed as a part of the pain based on the intensity. Still the differences between them can be distinguished <sup>[10]</sup>. Though these concepts are interrelated it is not essential that these concepts appear at the same time or are related.

### Defining attributes

Attributes are those characteristics of a concept that appear over and over again in the literature and they are most frequently associated with the concept allowing the broadest insight into it <sup>[11]</sup>. The critical attributes of the concept of pain in critically ill patient include: 1) unpleasant and distressful experiences; 2) associated with actual or potential tissue damage; 3) influenced by contributing variables – invasive, non-invasive or nursing procedures; 4) individual human experience; 5) physical and psychological responses; 6) exhibited in components that include self-report and/or behavioural and/or physiological.

### Constructing a model case and analysis

A model case is an example of the concept that exhibits all of its defining attributes and qualities. Walker and Avant in 2011 describe a model case as, "a pure case of the concept, a paradigmatic example, or a pure exemplar". In other words, the model case is a "real-world" extraction of the concept <sup>[11]</sup>.

An example model case is presented here. Mr W. aged 24 years experienced a serious Traumatic Brain Injury due to a

car accident. An emergency decompression craniotomy was performed to reduce intracranial pressure by removing parts of the cranium. He was mechanically intubated. On waking from sedation, the patient had a dense left-sided hemiplegia and aphasia. His GCS off all sedation was 11 (eyes 4; verbal 1; motor 6). On the second post-operative day after routine nursing procedures and suctioning procedure, it was found that his muscles and facial muscles were highly tensed, restless and exhibited ventilator dysynchrony (hypercapnea, hypoxemia, inspiratory intercostal retractions). His eyes were filled with tears and his pulse rate increased from 78 to 120 per minute. He had irregular respiration and identified 8 as the pain score in numerical pain rating scale.

This model case illustrates all attributes of pain. Pain was perceived as an unpleasant and distressful experience by the patient Mr. W. As his Glasgow coma scale was 11 he was able to identify the score in numerical rating scale to express his pain. This pain was associated with the actual tissue damage which includes traumatic brain injury followed by the surgical incision. The pain was aggravated by suctioning and other routine nursing procedures. The score of '8' identified by the patient is individualized as it may not be the same for other patients who experience the same clinical scenario. He exhibited responses in both physical and psychological as evidenced by tearing from the eyes and muscle tightening. The experienced pain was evident in all the three components specified in the defining attribute namely self-report (pain score 8); behavioural (restlessness, tightened muscles, ventilator dyssynchrony) and physiological (Irregular respiration, hypercapnoea, hypoxemia, inspiratory intercostal retractions, increased pulse rate).

### Borderline case and analysis

A borderline case has many of the same elements as a model case however one or more of the defining attributes differs in some way. It is closely connected to the case, but has some dissimilarity that makes it inherently distinguishable from the concept being studied<sup>[11]</sup>.

Mrs. Y, a 70 year old lady got admitted to ICU at 10 AM with a history of fall while she was walking in the road. She had temporary loss of consciousness. She was found to be a known hypertensive. She had giddiness and her BP was found to be 90/60 mm of Hg. She had taken her morning medicines. She moves all her limbs. CT scan showed no hemorrhage but diffuse cerebral atrophy due to ageing. On examination, she was conscious, oriented and afebrile. Her GCS was 15/15. She had a small deep wound in the occipital area for which suturing was done. She expressed mild pain in the sutured area. Her pain score is 4. Her vitals were found to be within normal limits.

Mrs. Y's story exemplifies a borderline case where only few of the attributes of pain in critically ill are present. Her pain was an unpleasant experience as she verbalized it as having a pain score of 4. It was due to suturing of the wound which is actual tissue damage. There are no other contributing variables which aggravated her pain. It was a subjective and an individual experience. There are no other physical or psychological responses as she was able to tolerate her mild pain. She verbalized her pain. There were no other behavioural or psychological components.

### Contrary case and analysis

The final contrary case is the example which presents "not the concept". People can easily recognize this concept as not the main concept<sup>[11]</sup>. Mrs. J is a 60 year old female who reports experiencing chest pain 10 days ago while she was out walking. Her chest and left shoulder felt tight. She stopped walking and the pain ceased. She did not seek medical help. She then experienced the same pain while out walking 3 days ago, which stopped when she sat down. She verbalised that she doesn't have pain at present. She is conscious, oriented, afebrile and well groomed. Her vitals are found to be stable.

The final case reflects an absence of the defining attributes of pain. Mrs. J had a history of chest pain that subsided with rest. She has come for medical help as she found it to be recurrent. On examination of the patient at present, she doesn't have any defining attributes of pain. She doesn't experience any distress and doesn't exhibit any physical or psychological responses. Her behavioural and psychological components are found to be within normal, as she doesn't experience pain in the present. She only has a history of pain, but doesn't suffer from pain in the current scenario.

### Identifying antecedents and consequences

Walker and Avant define antecedents as, "events or incidents that must occur or be in place prior to the occurrence of the concept, which can help elucidate social contexts in which the concept occurs in"<sup>[11]</sup>.

Most ICU patients experience moderate to severe pain from sources such as acute and chronic illness, surgery, trauma, burn injuries, pancreatitis, cancer, comorbidities (e.g., arthritis, chronic pain syndromes), immobility, invasive medical and monitoring devices, and routine ICU care (e.g., procedures that include turning and repositioning, obtaining peripheral blood or intravenous and arterial line insertions, endotracheal and tracheal suctioning, chest tube and wound drain placement or removal, mobilization and respiratory exercises and wound care). Add in features of the critically ill population (e.g., immobility, impaired communication, altered mental status, sleep deprivation, mechanical ventilation, procedures and interventions) increases the perception of pain<sup>[21]</sup>.

A cross-sectional, multicenter, multinational study was conducted in 2014 to examine the pain intensity differences across procedures and to identify the risk factors for procedural pain intensity among 3,851 patients who underwent 4,812 procedures in 192 ICUs in 28 countries. Chest tube removal, wound drain removal, and arterial line insertion were the three most painful procedures, with median pain scores of 5 (3-7), 4.5 (2-7), and 4 (2-6), respectively<sup>[22]</sup>.

Heightened anxiety can lead to agitation and associated with uncontrolled pain in the ICU patients. In combination with all, it can lead to patient ventilator asynchrony and difficulty in weaning from the ventilator. Sleep deprivation is an important contributing factor for increased pain response in ICU patients. In burns patients, it is a well-realized fact that if these patients do not have proper night sleep, the intensity of pain during the day time is higher<sup>[23]</sup>. Furthermore, many of these patients have a history of chronic pain, which complicates their course and treatment<sup>[15]</sup>.

### Consequences

Walker and Avant described consequences as defining outcomes as a result of the concept<sup>[11]</sup>.

Pain is an unpleasant experience for all patients including intensive care patients; if it is not treated properly, it has deleterious effects on patients' acute and chronic well-being. In ICU patients, it causes sympathetic stimulation leading to adverse hemodynamic effects and after discharge; these patients are at the higher risk for developing chronic pain and post-traumatic stress disorders. The adverse psychological and physiologic effects of inadequate pain control in critically ill patients are long lasting and significant<sup>[23]</sup>.

The stress response from painful stimuli activates the autonomic nervous system, causing the release of catecholamines and stress hormones (e.g., glucagon, cortisol), which can result in vasoconstriction and interfere with tissue perfusion and oxygen delivery. These factors may lead to hypercatabolic states, tachypnea, tachycardia, increased oxygen demand, ischemic injury, impaired wound healing and response to infections, and hyperglycemia. Pain also interferes with sleep, may hinder effective pulmonary toilet, impedes mobility and physical therapy efforts, and, if it persists, may lead to long-term issues such as chronic pain, reduced quality of life, and development of post-traumatic stress disorder<sup>[21]</sup>.

Granja and colleagues found that 17% of patients recollect experiencing severe pain 6 months after discharge and 18% were at the risk for developing posttraumatic stress disorder. Schelling and colleagues in their follow-up study found that the patients with acute respiratory distress syndrome compared the non-ARDS patients who experience pain and other traumatic situations when they are in the intensive care unit and had a higher occurrence of chronic pain and posttraumatic stress disorders and inferior quality of life. Pain also suppresses natural killer cell activity and results in a decrease in the number of cytotoxic T cells, leading to a reduced neutrophil phagocytic activity. Acute pain in ICU patients is a greatest risk factor for developing debilitating chronic, persistent, and neuropathic pain<sup>[23]</sup>.

Acute pain can be the major risk factor for developing delirium and persistent pain is often neuropathic. If pain is not effectively detected or alleviated, the patient's recovery can be delayed by presenting physiological, psychological, and behavioural alterations. Moreover, it hinders patients from properly collaborating their rehabilitation, which can lead to complications that extend their hospital stay and increase health cost<sup>[15]</sup>.

### Empirical referents

According to Walker and Avant, empirical referents are not tools to measure the concept", but rather "the means by which you can recognize or measure the defining characteristics or attributes<sup>[11]</sup>.

There are many self-report pain scales and behavioural pain scales developed for use in intensive care unit adult patients, which unfortunately are not always routinely used in the ICU. This self-reporting of their pain is the gold standard of pain assessment and provides the valid measurement of pain. The commonly used pain intensity scales are the Numeric Rating Scale and Visual Analogue Scale while Behavioural Pain Scale is considered to be an alternative

tool for assessing pain in sedated and mechanically ventilated patients. The BPS assesses pain through the evaluation of facial expression, upper limb movements and compliance with mechanical ventilation. Another behavioural scale called the Critical-Care Pain Observation Tool may also be used. In SUPPORT study, it is concluded that surrogates can identify the patient's pain 73% of the time and accurately estimate its severity of pain 53% of the times<sup>[23]</sup>.

### Conclusion

Using Walker and Avant's eight steps for concept analysis, the author attempted to bring a clear understanding of the concept 'pain in critically ill patients'. Using a deliberate search of the literature, this concept analysis has identified the antecedents, defining attributes and consequences of pain in critically ill patients. It is the desire of the author that this concept analysis is beneficial to nurses and other health care providers in gaining a better understanding of the concept of pain in critically ill patients and implement nursing interventions to alleviate patient's pain.

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