A STUDY ON PAIN MANAGEMENT OF RENAL COLIC PATIENT IN EMERGENCY DEPARTMENT: THE ASSOCIATION FACTORS OF PATIENT SATISFACTION

BY:

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LIST OF ABBREVIATIONS

AMP	Adenosine Monophosphate
BPI	Brief Pain Inventory
CGRP	Calcitonin Gene-Related Peptide
CNS	Central Nervous System
CPG	Clinical Practice Guideline
DRG	Dorsal Root Ganglion
ED	Emergency Department
FPS	Facial Pain Scale
HSNZ	Hospital Sultanah Nurzahirah
HUSM	Hospital Universiti Sains Malaysia
IASP	International Association for the Study of Pain
MOH	Ministry Of Health
MPAC	Memorial Pain Assessment Card
MPQ	McGill Pain Questionnaire
MREC	Medical Research Ethics Committee
MVA	Motor Vehicle Accident
NMDA	N-Methyl D-Aspartate
NMRR	National Medical Research Register

NO	Nitric oxide
NRS	Numerating Rating Scale
NSAIDS	Non-Steroidal Anti Inflammatory Drugs
PGE2	Protaglandin E2
SD	Standard Deviation
URTI	Upper Respiratory Tract Infection
VAS	Visual Analog Score
VDS	Verbal Description Scale
WHO	World Health Organization

ABSTRACT

KAJIAN RAWATAN KESAKITAN PESAKIT YANG MENGALAMI KOLIK BUAH PINGGANG DI JABATAN KECEMASAN : FAKTOR YANG MENENTUKAN KEPUASAN PESAKIT

PENGENALAN :. Gejala kolik buah pinggang adalah salah satu penyebab kesakitan yang teruk di jabatan kecemasan. Walau bagaimanapun, tiada kajian sebelumnya dilakukan untuk menentukan keberkesanan rawatan dan faktor-faktor yang menentukan kepuasan pesakit kepada rawatan kesakitan terhadap pesakit yang datang dengan gejala kolik buah pinggang.

OBJEKTIF : Terdapat empat objektif khusus untuk kajian ini. Pertama adalah untuk menentukan faktor sosiodemografik pesakit yang datang dengan kesakitan kolik buah pinggang. Kedua untuk purata skor kesakitan pesakit yang datang dengan gejala kolik buah pinggang. Ketiga untuk menentukan faktor-faktor yang berkaitan untuk menentukan tahap kepuasan pesakit kepada rawatan kesakitan terhadap pesakit yang datang dengan gejala kolik buah pinggang berdasarkan kepada faktor sosiodemografik dan terakhir untuk membandingkan keberkesanan rawatan pesakit kolik buah pinggang di HUSM dan HSNZ

METODOLOGI: Kajian ini dijalankan di jabatan kecemasan Hospital Sultanah Nurzahirah HSNZ Kuala Terengganu dan Hospital Universiti Sains Malaysia HUSM Kubang Kerian dari bulan September 2013 hingga bulan Jun 2014 menggunakan borang yang mengandungi faktor sosiodemografik pesakit berserta beberapa faktor yang lain untuk menentukan purata tahap kesakitan dan tahap kepuasan pesakit. Di dalam borang tersebut juga mengandungi skor kesakitan sebelum dan selepas rawatan. .Ujian yang digunakan adalah chi square, simple dan multiple linear regression dan independent t-test.

KEPUTUSAN: Jumah pesakit yang terlibat di dalam kajian ini adalah 245 pesakit. Purata skor kesakitan berdasarkan semua faktor sosiodemografik adalah 8.09 + 0.974. Berdasarkan analisis multiple linear regression, faktor sosiodemografik yang menunjukkan hubungan dengan layanan yang diterima adalah jantina (p=0.029). Kaum tidak dimasukkan di dalam analisis statistical untuk mengelakkan bias disebabkan melayu adalah kaum majority. Tiada lagi hubungan antara faktor sosiodemografik dengan tanda kepuasan yang lain. Terdapat pebezaan ketara dalam rawatan kesakitan antara HUSM dan HSNZ (p=0.001)

RUMUSAN: Sebelum ini sudah banyak kajian yang menunjukkan sosiodemografik adalah faktor yang lemah dalam menunjukkan kaitan kepada tahap kepuasan pesakit dan berdasarkan kajian itu beberapa faktor sosiodemografik yang menunjukkan kaitan di dalam kajian ini tidak selari dengan keputusan kajian-kajian lain sebelum ini dan sebaliknya. Jadi, adalah satu keperluan untuk meneruskan kajian ini untuk menentukan faktor-faktor yang lain untuk menentukan tahap kepuasan pesakit kepada rawatan kesakitan terhadap pesakit yang datang dengan gejala kolik buah pinggang.

ABSTRACT

A STUDY ON PAIN MANAGEMENT OF RENAL COLIC PATENT IN EMERGENCY DEPARTMENT: THE ASSOCIATION FACTORS OF PATIENT SATISFACTION

INTRODUCTION : Renal colic pain is one of the commonest severe pain that presented to emergency department. However there are no exact studies to determine about the effectiveness of pain management and associated factors of patient satisfaction on pain management of renal colic patients.

OBJECTIVES : There are 4 specific objectives in this study. The first is to determine the sociodemographic factor for suspected acute renal colic patients. The second is to determine the .mean pain score of patient presented to emergency department. The third is to determine the associated factors of patient satisfaction on pain management of renal colic patients precisely on sociodemographic variables and the last is to compare effectiveness of suspected acute renal colic pain management between HUSM and HSNZ

METHODOLOGY : This is a cross-sectional study conducted in emergency department of Hospital Sultanah Nurzahirah, HSNZ Kuala Terengganu and Hospital Universiti Sains Malaysia HUSM Kubang Kerian from September 2013 to June 2014 using a questionnaire comprised of sociodemographic and several dependent variables. The patient were asked about the pain score during arrival and after treatment during management of acute renal colic pain.. The test that was used is chi square, simple and multiple linear regression and independent t-test.

RESULTS: : A total of 245 patients were enrolled in this study. The mean pain score from patients including all variables was 8.09 + 0.974. Based on Multiple Linear Regression analysis, the factors for satisfaction in services received was Sex (p=0.029). Race was not involve in statistical analysis to avoid bias due to malay is the majority participants in this study. No other sociodemographic factors showed correlation with other satisfaction measures. There was a significant difference of pain management between HUSM and HSNZ (p=0.011).

CONCLUSION: Since the sociodemographic variables seems to be weakly related to patient satisfaction, some of the findings are not following the previous study about sociodemographic variables as association factors to patient satisfaction. So, there is a need for further study for evaluation of other association factors of patient satisfaction on pain management of renal colic patients for benefits of the patient.

1. INTRODUCTION

Pain is described as one of the most common symptoms presenting to emergency department (ED) and requires treatment as soon as possible whether pharmacologically or non – pharmacologically (Grant PS 2006). There can be any complain from simple pain like conjunctivitis or upper respiratory tract infection URTI to severe pain like pregnant lady in labour or motor vehicle accident (MVA) with polytrauma. Every single patient may actually be at risk due to oligoanalgesia for many contributing factors but certain subgroups such as ethnicity, age either geriatric or paediatric and those with diminished cognitive function are more at risk for inadequate pain control (Sobel RM, Todd KH 2002).

According to International Association for the Study of Pain (IASP), pain is described as 'unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage'. Therefore although the word pain usually refers to physical pain, it may well involved mental pain as well. Since pain has become the core business in Emergency Department, Malaysian Ministry of Health (MOH) has been implementing pain as the 5^{th} vital sign on top of blood pressure, heart rate, respiratory rate and temperature to all hospitals under MOH since 2011. All staff from all health facilities especially those in emergency department currently are being trained to make sure this implementation is running smoothly.

Since the implementation of pain as the 5^{th} vital sign, pain is assessed early at the primary triage by asking the pain score ranging from 1 to 10. This is one type of numerating rating scale (NRS) and there are also many other scales in evaluate pain such as visual analogue score (VAS) and adjective rating scale. Initial pain assessment

should be used as a guide for the selection of appropriate type and route of medication as evaluation of a painful condition should not delay treatment (Ducharme 2000).

In managing pain, usually there are 2 types modality of treatment. There are non-pharmacological and pharmacological treatments. The former involves good communication between doctors and patients, empathy and sympathy to patient's pain condition and some procedures in pain management such as traditional treatment as for example acupuncture. Traditional treatment or alternative medication has already been approved by MOH as one of the modalities in managing patient in hospitals in Malaysia.

The study in pain management is widely done nowadays, focusing on chronic pain such as in burn and cancer patients and acute pain such as in post-operative and fracture patients. This study is purposely done to focus on one type of acute pain that presented to ED frequently that is renal colic pain.

Based on the pain complaints that presented to ED, most root from renal colic which usually occurs secondary to stone production. The first episode of renal stone usually occurs at a mean of age 30 years old ranging from 20-50 years old and patients usually presented with common manifestation of one sided abdominal pain and flank pain followed by radiation to groin area (Safdar B, *et al* 2006).

The main approach in managing renal colic is pain management by using pharmacological approach. In previous approach to patients with renal colic pain, those who come to ED, received the painkillers and would either be discharged if their pain reduced or subsided or admitted for further pain management if the pain persisted. However there is no study in Malaysia to determine the association factors on patient satisfaction in receiving treatment in ED regardless patient being discharged

or admitted after the treatment. So this study is initiated to determine the factors that contribute to the patient satisfaction in acute pain management of renal colic patient in ED based on their sociodemographic factors.

Besides pain, patient satisfaction is also a big issue encircling the local health care, not only in hospitals but also in primary care facilities. Patient satisfaction is important to determine the managing efficacy of the centre. Forms and questionnaires have been distributed to customers or patients in order to evaluate the satisfaction so that the system in managing patients can be improved.

This study is very important to understand the contributing factors of patient satisfaction in renal colic patient so that we can improve the way of the treatment for a certain category of patient. There are some subgroups such as certain ethnicity and age that are at risk of receiving inadequate pain treatment which may contribute to patient satisfaction too (Sobel RM, Todd KH 2002).

There is still no exact guideline on how to treat renal colic patient by pharmacological approach. In MOH, there is no clinical practice guideline (CPG) being published to state the exact management of renal colic patient. Each centre uses different drugs to manage the renal colic pain. Some centres use opiods while others use non-steroidal anti-inflammatory drugs (NSAIDs). Therefore, many studies have been done to see what is the best drug or pharmacological approach in managing the renal colic patient. In this study the drugs of choice used in managing the pain are based on the familiarity of the centre to the drugs itself.

Theoretically, opiod is a good analgesia (Ducharme 2000). However theoretically opiods does not focus on the cause of the pain in relation to renal colic pain. Generally the renal colic pain occurs due to obstruction of ureter. Rising pressure

in the renal pelvis stimulates the local synthesis and release of prostaglandins, and subsequent vasodilation induces diuresis which further increases intrarenal pressure (Ducharme 2000). Prostaglandins also act directly on the ureter to induce spasm of the smooth muscle.

It means until now by theoretically NSAIDs is superior due to the effect of the drugs focus on the cause of pain in relation to renal colic pain. NSAIDS inhibit the activity of both cyclooxygenase 1 and 2 and thereby the synthesis of prostaglandins. There are many types of NSAIDs used in emergency department for managing renal colic pain such as diclofenac sodium or voltaren which is available in oral, suppository and intramuscular injection

The other choice for NSAIDS is ketorolac. Ketorolac is in NSAIDs group and the advantage of using ketorolac is it can be administered intravenously. Ketorolac inhibit prostaglandin synthesis by decreasing the activity of the cyclooxygenase enzyme. There are also studies that has been carried out in efficacy of combining opiod and NSAIDs compare to use opiod or NSAIDs alone

This study is mainly to see about the factors that contribute to patient satisfaction of acute pain management in renal colic patient in the ED based on sociodemographic data. It is expected to provide the impetus for future studies related to patient satisfaction based on other factors in other categories such as in services received, waiting time, doctor-patient communication and others.

2. LITERATURE REVIEW

2.1 Overview of Pain

2.1.1 Definition of Pain

Pain by itself is not a diagnosis, it is a symptom. Generally it is a feeling of discomfort or hurt which can be affected physically, mentally and emotionally. Pain is defined as ‘unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage’ by IASP (McQuay H.J 1991). If pain is not controlled for a certain period, one may become more sensitive to pain stimulus (Pappagallo 2005).

A myriad of terminologies are used to describe the different conditions of pain. Hyperalgesia is a condition in which a normal pain stimulus causes an abnormal or exaggerated pain reaction. Whereas allodynia occurs when non painful stimulus induces pain. Oligoanalgesia is a condition in which patients do not receive enough pharmacological treatment for the pain.

Pain can be divided into many categories. Usually it is divided into nociceptive and neuropathic pain. Nociceptive pain results from tissue injury such as in renal colic, burns and long bone fracture that induces inflammatory pain. Neuropathic pain occurs due to activation of either sensory nerves or central ganglia as a result of injury, disease or surgical damage. These will be described later in pathophysiology of pain topic.

Pain can also be classified as either acute or chronic (Portenoy RK., Kanner RM. 1985). Our study emphasizes on the acute type of pain. Description for this type

of pain is important in the selection of effective analgesics. Acute pain is defined as recent onset of pain with a relatively short duration and lasting no more than days or weeks. Chronic pain ensues if it is persistent for more than three to six months.

Table 2.1: Differences Acute and Chronic Pain

Characteristics	**Acute Pain**	**Chronic Pain**
Temporal features	Recent onset and expected to last no longer than days or weeks	Remote, often ill-defined onset; duration unknown
Intensity	Variable	Variable
Associated effects	Anxiety may be prominent when pain is severe or cause is unknown; sometimes irritability	Irritability or depression
Associated pain-related behaviours	Pain behaviours (e.g., moaning, rubbing, splinting)may be prominent when pain is severe	May or may not give any indication of pain; specific behaviours (e.g., assuming a comfortable position) may occur
Associated features	May have signs of sympathetic hyperactivity when pain is severe (e.g., tachycardia, hyper tension, sweating, mydriasis).	May or may not have vegetative signs such as: lassitude, anorexia, weight loss, insomnia loss of libido; these signs may be difficult to distinguish from other disease-related effects.

2.1.2 Pathophysiology of Pain

In order to improve or excel in managing pain, one must understand the pathophysiology of pain transmission. In nociceptive pain, the pain perception is induced by the stimulation of one or more types of peripheral ionic channels. There are three fibres that carry pain signals to the brain cortex which are A-beta, A-delta and C-fibres (Boswell M, B. Elliot Cole 2006). Perception is defined as localization and qualification by the central or signals from A-delta and C-fibres pain pathway.

The diameters of myelinated A-fibres measure from 1-20 um. They can transmit signals between 5-120 m/s. On the other hand C-fibres are unmyelinated and their diameter ranging from 0.2-1.5 um with speed of signal transmission between 0.5-2.0 m/s (Boswell, M, B. Elliot Cole 2006) Due to this nature, the A-fibres transmit sharp, fast and localized pain while C-fibres transmit dull, slow and poorly localized pain. Neural signals are delivered by sodium and potassium ions activity moving out into neurons through voltage–gated channels so that they can form a slow moving wave of information from and to central nervous system. In A-fibres, these channels are concentrated in the nodes of Ranvier but are more distributed in C-fibres.

The precursor to start any pain signal transmission comes from one or various pain stimulus for example from local injury or wound. This incident will trigger local cellular releases of bradykinin, prostaglandin E2 (PGE2), histamine and cyclic adenosine monophosphate (AMP) which act on the sodium-mediated channels in C-fibres. Although any one of these agents is enough to induce action potential, the combination is much more potent. Glutamate is released from dorsal root ganglion (DRG) after the channel activation. Glutamate will stimulate spinal cord activation of N-methyl D- aspartate (NMDA) and also provide positive feedback loop to DRG to

release more glutamate (Ducharme 2000).The calcium-medium channels at C-fibres are stimulated by heat or low pH. These releases substance P from DRG. Substance P and glutamate will activate central spinothalamic tract then to central nervous system (CNS) recruitment and stimulation.

In the A-fibres with the same stimulator, a second type of calcium-mediated channel is present. These stimulation release nitric oxide (NO) as well as calcitonin gene-related peptide (CGRP). NO increases sympathetic activity and induces vasodilatation and endothelial permeability causing tissue swelling (Ducharme 2000). Stimulation of NMDA and glutamate leads to activation of more C-fibres peripherally increasing the perceived area of pain. They also induce central nervous system CNS to cease the activation of further mu receptors and increase central activity leading to hyperalgesia and allodynia (Ducharme 2000). Mu receptors are the place of activation of opiods that will lead to decrease calcium channel conduction consequently suppressing pain stimulation (Ducharme 2000). The importance of understanding these pathophysiology of pain is to aid the selection of the right pharmacological treatment to manage the pain.

2.1.3 Assessment of Pain

After understanding the definition and pathophysiology of pain**,** assessment of pain is essential to decide on the best treatment for the pain. In order to provide adequate pain relief, severity of the pain must be determined (Silka PA *et al* 2004). The main purposes of pain assessment are to understand the cause of pain and to give the effective pain management plan. The initial pain assessment is to determine the dimension of the pain experience and the subsequent assessment focuses on determining whether the intensity of the pain has decreased as a results of pharmacological and non-pharmacological intervention (Pappagallo 2005)

However, to date there is still no test that can measure the severity of patients' pain. Vital signs such as blood pressure and heart rate have been showed to be inconsistent with the severity of pain. To infer severity, the verbal or visual analogue scale has become widely accepted now (Boswell M, B. Elliot Cole 2006).

Currently pain scales are divided into categories that is unidimensional or multidimensional, self-report or observational. The unidimensional scales measure only pain severity and by their nature are self-reported. They are reasonable for use in acute pain when the aetiology is clear for example the renal colic pain. The assessments are easy to understand and do not burden the patients to answer. Pain scales tend to focus only on pain intensity with increased risk of oversimplification of the experience (Afilalo *et al* 1996).

Examples of unidimensional pain measurement tools are VAS, NRS, facial pain scale (FPS) and verbal descriptive pain. In NRS, patients rate their pain from 1-10 from no pain to very severe pain whilst in verbal descriptive pain, it only involves verbal description of pain whether it is mild, moderate, severe, or very severe.

The multidimensional (Kendrick and Strout 2005) scales measure not only the intensity of pain but also take into account other factors that influence its perception. These factors include quality and temporal sequence of pain and the affective contributions. These are excellent tools in the setting of persisting acute and chronic pain when intensity as well as social support, interference with activity daily living and relationship to depression may need to be assessed. Most of these are developed as a self-report but maybe completed with the assistance of an interviewer. The McGill Pain Questionnaire (MPQ) is one of the example of multidimensional scale but the length of time required to complete the evaluations which may take up more than 30 minutes makes it impractical in the emergency care setting (Ducharme 2005).

Table 2.2: Pain Assessment Tools

Unidimensional			
Scale	**Administration**	**Validated in**	**Comments**
Visual Analogue Score (VAS)	Visual	Chronic pain Rheumatic pain Children >5	Poor reproducibility with cognitive dysfunction, post-op or dementia.
Numeric Rating Scale (NRS)	Verbal or visual	Rheumatic disease Chronic pain Trauma Cancer Illiterate	Detects treatment effects, decreased reliability at extremes of age, pre verbal, visual, auditory, or cognitive dysfunction.
Verbal Description Scale (VDS)	Verbal or visual.	Chronic pain	4 to 5 points scale preferred by some patients to VAS or NRS Literacy/ language dependent Less sensitive for pain changes.
Facial Pain Scale (FPS)	Visual	Bieri: adult and children	Felt easier than VAS or NRS

		Wong & Baker: children.	No influence on culture, gender, or ethnicity.
Brief Pain Inventory (BPI)	Verbal	Cancer Arthritis English, Italian and Japanese	Assess location, intensity, pattern, report medication, pain relief, patient belief, interference in quality of life.
McGill Pain Questionnaire (MPQ)	Verbal	English, French, Norwegian	Long form can take 30 min; short form 2-3 mins. Measure intensity, location, effective effects, pattern, and other miscellaneous.
Memorial Pain Assessment Card (MPAC)	Verbal	Chronic pain	Assess location intensity, and pattern.

2.2 Overview of Renal Colic

2.2.1 Definition of Renal Colic

Renal colic usually occurs due to the present of stone in the kidney (nephrolithiasis). The classic symptom is cramp colicky abdominal pain originating in the right or left flank with radiation to the groin. People are typically restless, find the pain excruciating, and describe it as the worst pain ever experienced. Patients usually writhe in pain and unable to find comfort position to ease themselves. Pain is usually accompanied with nausea and vomiting. Haematuria present in approximately 85% of renal colic patients. However some patients will come with additional symptoms like rebound tenderness, abdominal guarding and rigidity (Eskelinen M *et al* 1998). Diagnosis usually supported by physical examination and investigations.

The first episode of urinary calculi in male is at an average age of 30 years old, ranging from 20-50 years old. It rarely occurs for the first time after age of 60 years

old. However women develop stones in bimodal distribution around age 35 and 55 years old. Children less than 16 years old account for approximately 7% of all cases. Renal colic is one of the most severe pain presented in emergency department. This is not a local problem but in fact worldwide; like a study done in Turkey noted that Turkey is one of the countries in Europe has high incidence of renal colic.

2.2.2 Pathophysiology of renal colic

There are two main mechanisms that cause pain in renal colic patient. One is stone formation and the other is how the stone reacts to the kidney and cause the pain. Stone is usually formed in three steps combination which are super saturation of the urine with solutes, lack of inhibitory substance and urinary stasis. Increase in urine volume with decrease in solute such as calcium and uric acid can prevent the formation of stone (Asplin JR *et al* 1997). One small study showed lower concentration of inhibitors in stone formation (Asplin JR 2002). Examples of inhibitory substances are citrate, magnesium and Tamm Horsfall mucoprotein. Stasis of urine is the last element in production of stone and it can be due to neurogenic bladder, anatomic abnormality and presence of foreign body.

Pain associated with kidney stones is due to obstruction of hollow viscus organ (ureter) and subsequent hydronephrosis creates pressure against Gerota Fascia, causing flank pain. On the other hand, isolated small stones in renal pelvis will not cause pain until they cause intermittent obstruction to the ureter. Rising pressure in the renal pelvis stimulates the local synthesis and release of prostaglandins, and subsequent vasodilation induces diuresis which further increases intrarenal pressure (Ducharme 2000). Prostaglandins also act directly on the ureter to induce spasm of the