Ketamine

Self-Learning Package for Community Nurses

DEVELOPED BY WATERLOO WELLINGTON KETAMINE EDUCATION COMMITTEE

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Printed in Canada, March 2015

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Ketamine Self-Learning Package
for Community Nurses

Introduction

This self-learning package has been designed as a comprehensive reference and teaching guide for nursing staff involved in the monitoring of patients receiving Ketamine in the community.

Learning Objectives

By completing this self learning module, the learner will be able to:

1 Describe the anatomy and physiology of pain .

2 List the indications and contraindications for the use of Ketamine.

3 Describe the mechanism of the pain response related to Ketamine use.

4 Describe Ketamine pharmacology .

5 Identify potential side effects of Ketamine.

6 Identify the nursing assessment and documentation required for patients receiving Ketamine for pain control.

7 Identify and be familiar with the **WW HPC Community Ketamine Protocol (see Appendix C).**

Learning Activities and Authorization

The care and monitoring of any patient receiving Ketamine is considered an advanced nursing competency and may only be performed by an RN/RPN who has received initial authorization by the unit educator or delegate.

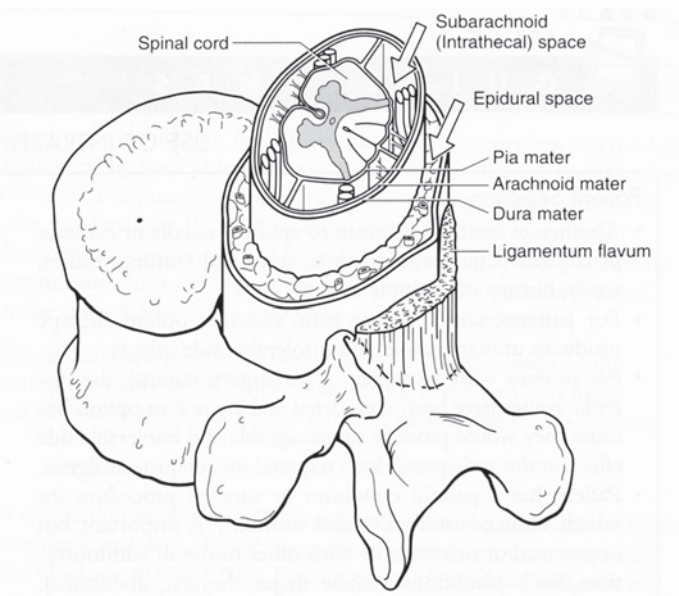
In order to meet the objectives and obtain authorization, you will be required to successfully complete the following:

- Ketamine self learning package
- Demonstrate the appropriate assessment and documentation guidelines for the patient receiving Ketamine; this will be evaluated by your specific organization
- Complete and pass (at least 80% correct) the written quizzes

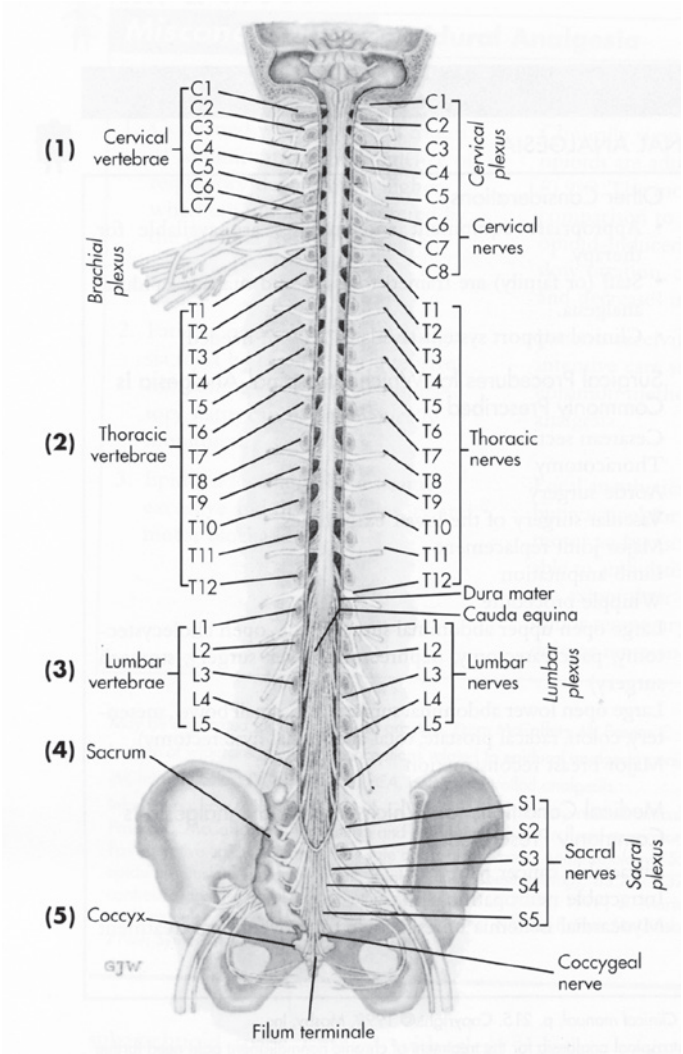
SECTION 1

Anatomy & Physiology

- The vertebral column is the bony outer structure protecting the spinal cord. It consists of 26 vertebrae. These vertebrae are divided into 7 cervical, 12 thoracic, 5 lumbar, 1 sacral and 1 coccygeal.
- The spinal cord is located within the vertebral column and it extends from the brain to the 1st or 2nd lumbar space.
- At each vertebral level there are nerve roots that come off the spinal cord bilaterally and which transmit both sensory and motor function.
- There are 31 pairs of spinal nerves, consisting of motor, sensory and sympathetic nerve fibres.



Spinal Anatomy (Pasero & McCaffery 2011, p 407)



Vertebral Column (McCaffery & Pasero 2011, p 216)

Mechanism of Pain

There are two major classifications of pain:

1 **Nociceptive** pain-further divided into somatic and visceral pain. Nociceptive pain is the body's normal response to painful stimuli and is usually responsive to non-opioids and/ or opioids.

Somatic nociceptive pain:

- Found in bones, muscles, connective tissue
- This pain is described as well localized, often described as tender to touch, gnawing, aching and/or sharp

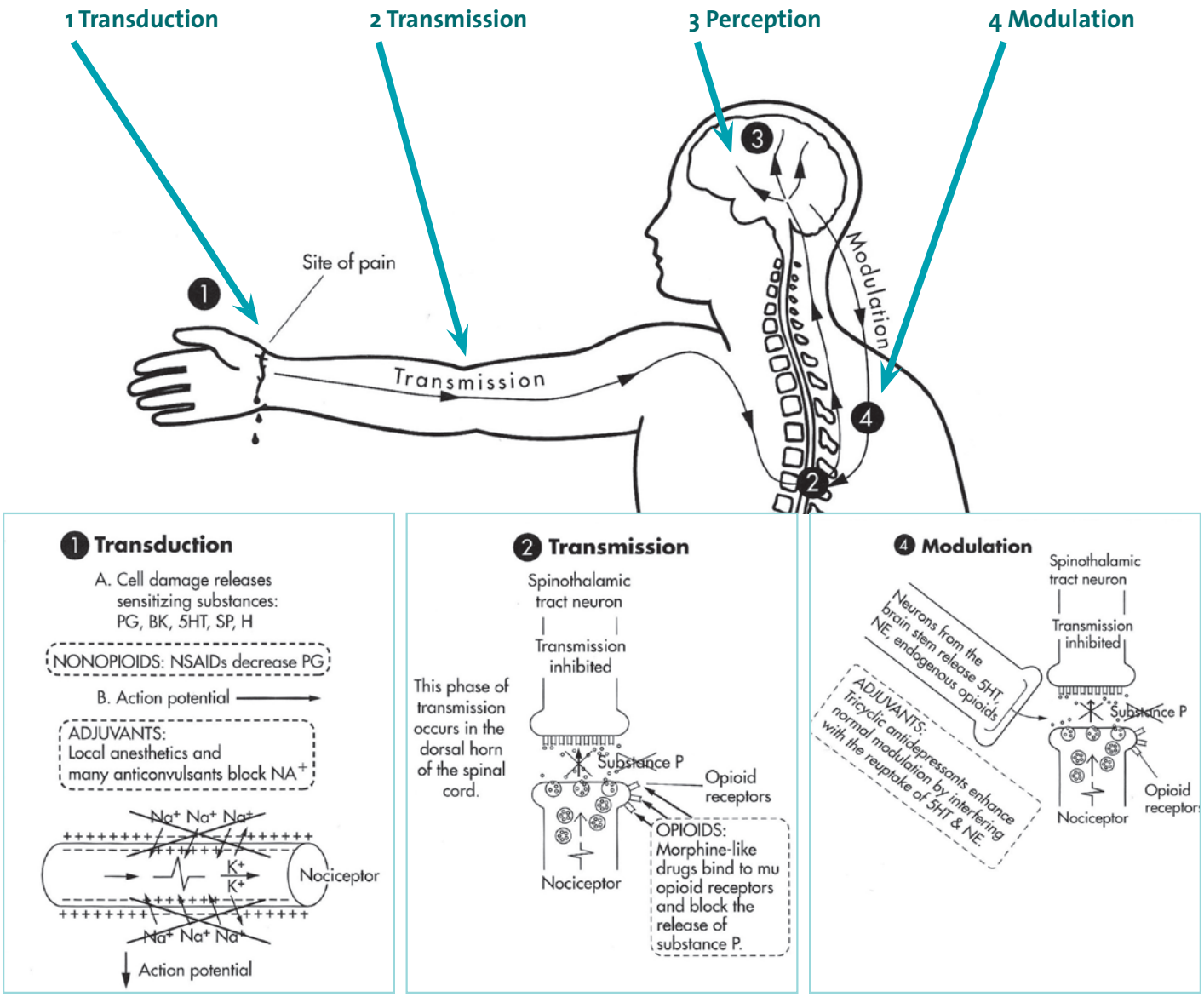
Visceral nociceptive pain:

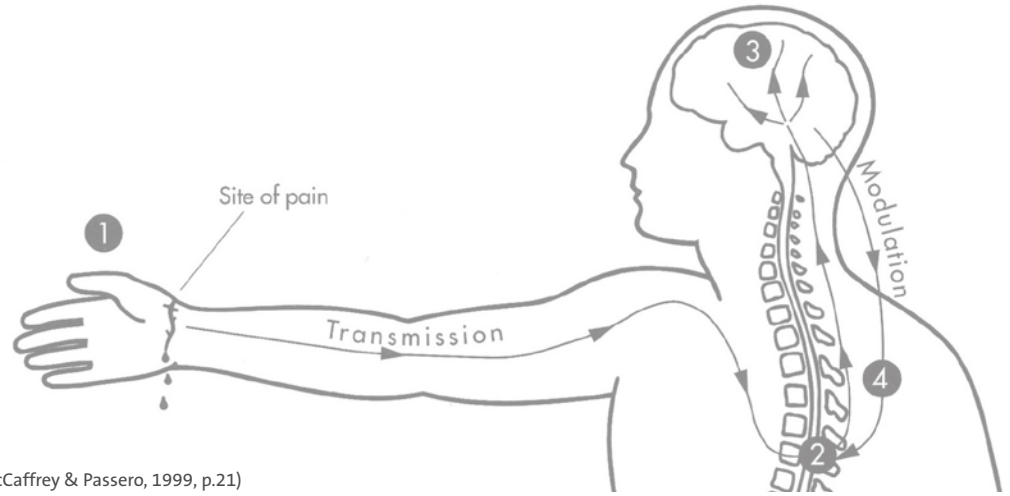
- Found in organs and deep tissue/ viscera
- Originates from stretching or distension of viscera, peritoneum or pleural cavity diffuse pain, hard to localize, often refers to cutaneous areas
- This pain may be described as sharp, aching, cramping, deep and/or dull

2 **Neuropathic** pain is an abnormal processing of sensory input either centrally or peripherally. The treatment of neuropathic pain usually requires the use of adjuvant medications.

- This pain is often described as burning, shooting, intermittent electric shocks
- This pain often radiates along a nerve pathway (e.g., sciatica)

There are 4 processes involved in the mechanism of pain:





(McCaffrey & Passero, 1999, p.21)

1 **Transduction:** Conversion of one energy form to another. This process occurs in the periphery when a noxious stimulus causes tissue damage. Sensitizing substances are released by damaged cells and an action potential occurs.

A **Sensitizing substances** released by damaged cells:

- Prostaglandins (PG)
- Bradykinin (BK)
- Serotoinin (5HT)
- Substance P (SP)
- Histamine (H)

Non-opioids: At the site of injury NSAIDs inhibit PG production, causing a decrease in pain.

B An **action potential** results from

- Release of the above sensitizing substances (nociceptive pain) + a change in the charge along the neuronal membrane or
- Abnormal processing of stimuli by the nervous system (neuropathic pain) + a change in the charge along the neuronal membrane

The change in charge occurs when Na+ moves into the cell and other ion transfers occur.

Adjuvants: Local anesthetics and many anticonvulsants reduce pain by blocking Na+, thereby decreasing the action potential.

2 **Transmission:** The action potential continues from the site of damage to the spinal cord and ascends to higher centers. Transmission may be considered in three phases: injury site to spinal cord, spinal cord to brain stem and thalamus, and thalamus to cortex.

- Injury site to spinal cord. Nociceptors terminate in the spinal cord.
- Spinal cord to brain stem and thalamus. Release of SP and other neurotransmitters continues the impulse across the synaptic cleft between the nociceptors and the dorsal horn neurons. From the dorsal horn of the spinal cord, neurons such as the spinothalamic tract ascend to the thalamus. Other tracts carry the message to different centres in the brain.

  Opioids: Morphine-like drugs bind to mu opioid receptors and block the release of SP, preventing the impulse from crossing the synapse.

- Thalamus to cortex. Thalamus acts as a relay station sending the impulse to central structures for processing.

3 **Perception of Pain:** Conscious experience of pain.

4 **Modulation:** Inhibition of nociceptive impulses. Neurons originating in the brain stem descend to the spinal cord and release substances such as endogenous opioids, serotonin, and norepinephrine that inhibit the transmission of nociceptive impulses.

Adjuvants: Tricyclic antidepressants enhance normal modulation by interfering with the reuptake of 5HT and NE.

Ketamine may be effective in management of specific neuropathic syndromes including:

- Neuropathic Pain
- Phantom Pain
- Complex Pain Syndromes
- Tenesmus- defined as especially long-continued, ineffectual and painful straining at stool or urination
- Any pain syndrome with the triad of:
  - **Allodynia** – Pain caused by a stimulus that does not normally provoke pain (such as severe pain from light touch)
  - **Hyperalgesia** – An increased response to a stimulus that is normally painful
  - **Prolongation of Pain Response**
- Ischemic Pain (including peripheral vascular disease)

- The sensory receptors that are responsible for detecting pain are called nociceptors. These nociceptors carry impulses from the periphery to the dorsal horn of the spinal cord. From there the message is carried by neurotransmitters, including glutamate and substance P.
- There are two specific types of nociceptors that play an important role in the pain mechanism. These are the **Delta A and C fibres.**
  - The Delta A fibres are responsible for the transmission of acute, well-localized pain and are less sensitive to opioids.
  - The C fibres transmit poorly-localized, dull, aching pain and are more sensitive to opioids.
  - Prolonged firing of the C fibre nociceptors causes the release of certain neurotransmitters, including glutamate. Glutamate normally binds to the M-methyl-D-aspartate **(NMDA)** receptors in the dorsal horn.
- **Ketamine is an NMDA antagonist.**
- Opioids play an important role in pain control by binding to opioid receptor sites and blocking the release of the neurotransmitters. One of the major types of opioid receptor sites are the mu-receptors.
- **Ketamine, in low doses, increases the action of the mu-receptors, making them more receptive to opioids.**

SECTION 1 - QUIZ

Anatomy and Physiology Quiz

Please answer the following questions.

1 Name the two major classifications of pain.

I. _____

II. _____

2 Neuropathic pain is usually responsive to opioids only.

❍ True

❍ False

3 Name the third step in the transmission of pain:

a. Nociception

b. Modulation

c. Perception

d. Reception

4 The Delta A fibres are responsible for transmitting acute, well-localized pain.

❍ True

❍ False

5 Ketamine acts to increase the receptiveness of opioids at which receptor site:

a. NMDA

b. Mu

c. Delta

d. Alpha

SECTION 2

Pharmacology of Ketamine

Ketamine is a rapid-acting dissociative general anesthetic agent, with analgesic properties in sub-anesthetic doses. Its principle site of action is in the dorsal horn of the spinal cord where it blocks the N-methyl D-aspartate (NMDA) receptor complex.

Ketamine is a controlled substance.

When is Ketamine appropriate?

Ketamine is used in palliative care most often for neuropathic pain that is not responsive to, or elicits a poor response to first line drugs such as opioids, NSAIDS, tricyclic antidepressants or anticonvulsants.

Ketamine has also been found to be effective for those who have developed significant opioid-tolerance. It is believed that the central nervous system can become desensitized and less responsive to opioids for pain, if the pain has been poorly controlled over a period of time. This opioid tolerance refers to client situations where increasing doses of opioids does not result in better pain management. Clients experiencing increasing side-effects and signs of toxicity, in-spite of not achieving pain control may be candidates for Ketamine.

There is evidence to support the use of Ketamine in the following pain types/syndromes:

- Neuropathic pain
- Phantom pain
- Complex pain syndrome
- Tenesmus – defined as especially long-continued, ineffectual and painful straining, at stool or urination
- Any pain syndrome with the triad of:
  - **Allodynia** – pain caused by a stimulus that does not normally provoke pain (such as severe pain from light touch)
  - **Hyperalgesia** – an increased response to a stimulus that is normally painful
  - **Prolongation of pain response**
- Ischemic pain (including peripheral vascular disease)

Indications for Use

1. Opioid Intolerance
2. Opioid Toxicity
3. Pain poorly responsive to opioids
4. Pain crisis

It is important to note, that all other conventional analgesic combinations should be used prior to considering Ketamine.

Ketamine has also been used for phantom limb and ischemic pain and for intractable incident pain for procedures such as dressing changes.

Ketamine should be avoided for clients with:

- Increased intracranial pressure
- Severe systemic hypertension
- Raised intra-ocular pressure
- Recent history of seizures
- Recent history of psychosis

Use Ketamine with caution for those with:

- Intracranial space occupying lesion
- Cardiac arrhythmias
- On sustained release opioids

Routes of Administration

Ketamine is an anesthetic agent. For pain management, Ketamine can be delivered, **using much lower doses,** by the parenteral, oral, intranasal, transdermal, rectal, and subcutaneous routes.

Patients discharged to the community should be receiving their Ketamine intravenously, due to the site irritation when given subcutaneously. However, in certain circumstances where clinical judgment dictates, it may be more appropriate to deliver this medication subcutaneously.

Ketamine should be administered by a pump delivery system, with **no other medications added,** as per the WW Ketamine Protocol.

Subcutaneous: clients complain of site burning related to medication – assess and re-site frequently as needed. Keep in mind that the subcutaneous route can be used temporarily when a venous access loss has occurred.

Orally or buccally: Ketamine has a 'bad' bitter taste which can be masked by mixing in fruit juice or carbonated cola just prior to administering.

In Waterloo and Wellington Ketamine is administered parentally only (as of 2014).

Rotation and titration, as well as ongoing orders of Ketamine will be managed by the Palliative Care Physician in all care settings .

Action

When administered for pain management, Ketamine is used as a co-analgesic with an opioid. As low dose Ketamine is titrated to effect, remember that the mu receptors actions are increased. Thus, the opioid dose should be carefully assessed and decreased as appropriate.

A breakthrough opioid dose is required during Ketamine use.

NB: Sedation Scales must be done to assess patients carefully during titration periods.

Therapeutic Dose Range:

Usual starting dose – 1 mg/ hr (24 mg/day), titrating up to but not exceeding ceiling dose of 700mg/ 24 hours

Ketamine is titrated very slowly, e.g.: 1mg/ day

Onset of action – 15-30 minutes by subcutaneous or oral routes

Duration of action – 15 minutes to 2 hours when administered by the IV or subcutaneous route, and possibly longer if given PO

Stability – Ketamine is physically stable (and thus safe to have a "Y" connector for central lines) when mixed with the following drugs: Morphine, Dexamethasone, low-dose Haloperidol and Metoclopramide

(In WW, Ketamine is always delivered as a single medication in its own delivery pump)

Drug Interactions

Drugs that may have the potential to affect Ketamine metabolism are Azole Antifungals, Macrolide Antibacterials, HIV Protease Inhibitors, and Cyclosporin.

Metabolism

Ketamine is predominantly metabolized in the liver into nor-Ketamine and then further metabolized via the liver before being excreted by the kidneys. Impaired renal function does not prolong the action of Ketamine.

PUMP Tubing & Marking of Tubing

The Ketamine pump and tubing should be well defined in labeling for safety and minimizing the risk of drug errors.

Ketamine Side-Effects

Common side effects include:

Hallucinations, dysphoria, agitation, vivid dreams, drowsiness, delirium, dizziness, nausea, 'feeling strange', excessive sedation and signs of opioid toxicity.

Other side effects include:

Hypertension, tachycardia, diplopia, nystagmus and pain or erythema at the injection site.

In order to manage these side effects, Haldol or Midazolam should be administered (under the direction of a physician).

Clients must be observed for opioid toxicity.

Symptoms of cystitis, hematuria and supra-pubic pain have been linked to Ketamine.

SECTION 2 - QUIZ

Nursing Monitoring and Documentation Quiz

Please answer the following questions.

1 Ketamine is an anaesthetic agent and is sometimes used in the community to provide aggressive sedation for clients requiring palliative sedation.

a. True

b. False

2 Ketamine has been found to be effective as an adjuvant to opioids, in the case of opioid toxicity or poor pain control using opioids, by being able to reduce the amount of opioid being given because:

a. It is believed that the central nervous system can become desensitized and less responsive to opioids for pain, if the pain has been poorly controlled over a period of time and Ketamine has the ability to enhance this receptiveness

b. It is given intravenously, thus allowing more drug to be used for analgesia

c. It is a much stronger analgesic agent than other opioids

d. All of the above

3 Ketamine is an excellent choice of drug to use with a person suffering pain from brain metastases and increasing intracranial pressure.

a. True

b. False

4 The onset and duration of action of Ketamine is approximately 15 minutes, when given subcutaneously.

a. True

b. False

5 Common side effects of Ketamine include all of the symptoms below except:

a. Hallucinations

b. Agitation

c. Vivid dreams

d. Delirium

e. Constipation

f. Excessive sedation

6 Medications shown to be very effective in managing the aforementioned side effects of Ketamine are:

a. Ativan

b. Haldol

c. Midazolam

d. All of the above

SECTION 3

Monitoring a Patient Receiving Ketamine

Recommended for in hospital:

- First 12 - 24 hours most important
- Pain Score
- Sedation Score (refer to Analgesia Flow Sheet see on page 16)
- Blood pressure, pulse and respiratory rate at time of initiation
  - Then in 60 minutes and then q4h for 24 hours then q8h
  - If dose rate is increased revert to 60 minutes then q4h for 24 hours

Recommended Monitoring in Community:

- BID nursing visits x 48 hours with VS monitored every visit
- Assess pain every visit – perform a thorough pain assessment
- VS - Blood Pressure, Pulse and Respirations every visit – initially BID
- Assess level of sedation every visit
- Monitor for side effects listed above and report to physician providing palliative care
- Report all changes to physician providing palliative care

What you should monitor for:

1. Pain
2. Vital signs
3. Respiratory function & Sedation Level
4. Side effects/complications

1 Pain Scale

Pain severity needs to be performed frequently and consistently. Use either:

- ESAS
- Verbal Rating Scale (VRS)
- Other validated tool appropriate to patient need

A full pain assessment using a validated pain assessment tool should be implemented and used whenever there is a change in the severity or type of pain or behavior.

The assessment should then be reported to the physician to update the care plan and orders.

2 Vital Signs (VS)

- BP and pulse, and respirations should be recorded on the agency flow sheet each visit

3 Respiratory/Sedation Assessment

- Record the respiratory rate and sedation scale each visit, and report a sedation score of 3 or more.
- Analgesia should provide pain relief only, not sedation (not to be confused with drowsiness)
- Notify the palliative care physician for a respiratory rate <8 or sedation scale of >3
- Sedation scales should be taught to families in the home

Sedation scale

S = sleep, arouses easily

1 = awake, alert

2 = occasionally drowsy

3 = frequently drowsy, drifts off to sleep during conversation

4 = somnolent, minimal or no response to stimulus

Why such careful monitoring?

- Ketamine may increase opioid effectiveness as well as reverse opioid tolerance, resulting in sedation and possibly respiratory depression, so careful monitoring is required.
- A breakthrough opioid dose is required during Ketamine use
- Consider haloperidol 1 mg po BID for prevention and/or management of emergence phenomena (vivid dreams, hallucinations, delirium, agitation, excess sedation).
- Opioid doses often need to be adjusted (lowered). The risk of sedation and opioid toxicity is much higher with a patient receiving Ketamine.

Documentation

Below is a sample flow sheet that demonstrates the required elements for a nursing assessment in a non-acute care setting.

The fields include:

- Date and time of the assessment
- Vital signs
- Level of consciousness
- Signs of confusion or delirium
- Any medications being used to control the signs and symptoms of confusion
- Pain assessment
- Ketamine dose and pump bag or cassette changes

Sample Flow Sheet

Date & TIme	Vital Signs BP, Pulse & Resp.	LOC – Alert & Orientated, Confused, Drowsiness, Arousable, etc.	Confusion, Delirium, Aggression, Dreams, Hallucinations	Meds to manage psychosis – eg Haldol, Versed, Etc.	Pain Assessment q, visit – review analgesic use Report to MD PRN	Ketamine Dose Pump bag or cassette changes	See PN RTC	Inisials & Designation

SECTION 3 - QUIZ

Nursing Monitoring and Documentation Quiz

Please answer the following questions.

1 When a patient is receiving Ketamine in the community, the pump delivering the Ketamine should:

a. Should be set for boluses q 1 hr

b. Be clearly labeled, as well as the tubing as the Ketamine pump/tubing

c. Have a cassette mixed with compatible drugs to reduce administration sites required

d. All of the above

2 When assessing pain of a patient receiving Ketamine, there needs to be daily documentation of:

a. The severity of the pain

b. The quality of the pain

c. Side effects

d. Bolus doses taken of opioids in past 24 hours

e. All of the above

3 Your patient's sedation score yesterday was 2. This means your patient was:

a. Occasionally drowsy

b. Somnolent, minimal or no response to stimulus

c. Frequently drowsy, drifts off to sleep during conversation

d. Awake, alert

4 Today, when you visit your patient, he tells you he has been having wild dreams. His sedation score is 3. You do a full pain assessment, and document on your agency flow sheet. Given this assessment, you should also:

a. Open the Symptom Response Kit, and administer Haldol for mild delirium

b. Nothing: continue to monitor as you suspect he might be starting to show side effects

c. Call the physician to receive orders

d. None of the above

e. All of the above.

5 Your patient has been on Haldol 1 mg po bid for 4 weeks now, and is not experiencing any psychomimetic side effects. At this time, you should:

a. Continue the Haldol as ordered. as part of the Ketamine/ opioid protocol

b. Recommend decreasing the dose to the patient and physician

c. Hold Haldol for a few days to assess if this medication is still needed, or if the patient has developed tolerance to the side effects

d. Recommend increasing the dose of Haldol, due to expected tolerance to this low dose

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Appendix A

CLINICAL POLICY | GRAND RIVER HOSPITAL

POLICY NO.

Freeport Health Centre X
Kitchener Waterloo Health Centre X

Developed By: Name: Dr Andre Moolman and Heather Gross
Title: Palliative Care/Pain and Symptom Management Physician and Palliative Care Coordinator

Date Originated: May 2009

Date of Review or Revision:

Approval by:

Approval Date: July 2009

Approval verification signatures: Name: Susan Robertson **Title:** VP Clinical Services & chief Nursing Officer

Date July 2009

KETAMINE IN PALLIATIVE CARE

Ketamine is a rapid-acting dissociative anesthetic agent, with analgesic properties in sub-anesthetic doses. It is handled as a controlled substance. Its principal site of action is in the dorsal horn of the spinal cord where it blocks the N-methyl D-aspartate (NMDA) receptor complex.

POLICY

The management of Ketamine involves the administration of this medication using via gemstar pump for continuous subcutaneous (SC) or intravenous (IV) infusion.

Ketamine can be administered at both K-W Health Centre on the Impatient Oncology Unit and Freeport Health Centre on the Palliative Care Unit, where the staff have been specifically trained for the administration of Ketamine. The Palliative/Pain and Symptom Management physician) PSM physician) will write the orders for the infusion and will oversee the management of its titration, along with the other medications used in conjunction with Ketamine. The PSM physician will be on the unit for the first hour of administration and will be available (on-call) for the duration of the infusion.

The pharmacist will prepare the loading dose and the continuous infusion of Ketamine using Normal Saline or 5% Dextrose in Water solutions with 1 mg./ml. concentration.

PROCESS/PROCEDURE

- Patient monitoring and assessment are indicated for all patients receiving Ketamine.
- Consent is received from patient and orders written by PSM physician
- Infusion is initiated by RN using administration route and dose schedule as written in order.
- The RN/RPN will be present attending the patient for the initial hour of its infusion and will continue to monitor and assess the patient as per guidelines.
- Intolerance at the infusion site when given subcutaneously. If site intolerance develops, the site should be changed for both the narcotic and Ketamine. Ketamine can be given by Y-connection into a single injection site, with morphine or hydromorphone or midazolam. Ketamine has also been given in a combination with fentanyl and midazolam.
- Intermittent bolus doses of Ketamine for breakthrough pain are not recommended. Breakthrough pain should be managed with opioid bolus doses.
- An infusion pump, such as a gemstar pump, must be used to administer the infusion of Ketamine.

EDUCATIONAL REQUIREMENT:

Each RN will have verified their competency in administering medications by PCA gemstar infusion pumps by completing check-list through education practice.

Each RN will verify his/her competency to administer Ketamine by attending Ketamine inservice provided by GRH Inpatient Oncology PSM physician, education practice lead or palliative care coordinator.

Each RN will review written protocol for GRH Ketamine Policy before beginning infusion.

Ketamine in Palliative Care: Clinical Policy Grand River Hospital 2009

DRUG	INDICATIONS	*CONTRAINDICATIONS	CONSIDERATIONS
Ketamine	*Indications are same regardless of code status.* • Patients who have had poor response to first line drugs for pain management such as opioids, NSAIDS, trycilic antidepressants or anticonvulsants • Patients with opioid tolerance where increasing doses of opioids have not improved pain management • Patients in pain crisis with consistent ESAS pain scores rates as 8 out of 10 or higher	**ABSOLUTE:** • Patients under 18 • Patients with uncontrolled seizures • Patients with signs of uncontrolled intracranial hypertension (radiological evidence of ICP) *Not contraindicated in uncomplicated intracranial metastases* • Allergy to Ketamine **Relative Contraindications:** • Uncontrolled hypertension (systolic greater than 160mmhg) • Severe cardiac failure • History of CVA/severe neurological	**Responsibilities:** Pain symptom physician: • Provide patient (family) drug pros/cons and alternatives • Obtain informed consent • Order Ketamine infusion • Orders for opioid reduction • Orders for prophylactic benzodiazepine to be administered either prior to or concurrently to Ketamine • Be present on unit first hour of administration and on call throughout infusion **Nurses:** • Complete independent double check according to hospital policy #_____ • Monitor vital signs, mental status, pain score, sedation levels, monitor increased intracranial pressure, document titrate dosage according to template (appendix A)

Side Effects Of Ketamine Infusion

SIDE EFFECT	CAUSE	MEDICAL MANAGEMENT	NURSING IMPLICATIONS
Vivid dreams, depersonalization, hallucinations, delirium, agitation	Pyschomimetic emergence phenomena	Notify PSM physician who will advise re adjustment of Ketamine infusion, opioids, and accompanying prophylactic benzodiazines Haldol Continue to monitor using increased vigilance and standard assessments as deemed clinically necessary	Evidence of pyschomimetic emergence phenomena will require decrease or cessation of Ketamine depending on severity
Painful indurations at sc injection site	Localized intolerance of the drug Ketamine at the SC site	Change site of infusion as needed. Switch to IV if SC is not tolerated very well by patient Equianalgesic dose of IV:SC Ketamine is 1:1	Close observation of site used decreases risk of tissue damage Education patient prepares him/her for initial discomfort felt at injection site.
Excessive sedation Decreased BP, decreased respirations Diplopia, nystagmus, eye pain	Depression of the respiratory centre by opioid toxicity-by less opioids required by patient during Ketamine infusion Notify PSM Narcan as required Continue to monitor	Notify PSM physician who will advise re reduction or cessation of Ketamine depending on severity of side effects, and reduction of opioids. If sedation score greater than 2 and respirations less than 8/minute notify PSM physician and give narcan as required-Narcan 0.04 ml in small increments until sedation score decreased and respirations increasing **(see pharmacy order sheet)**	Close monitoring of sedation scale and respiratory status will help to identify if patient is at risk for respiratory depression. Have narcan available for administration for when needed.
Hypersalivation		Order glycopyrrolate 0.2 mg. SC every 4-8 hours PRN Or scopolamine 0.4 – 0.6 mg. SC every 4 hours PRN	Administration of medication will increase comfort of patient

Routine Orders for Palliative Care Ketamine Infusion

Date:_____ **Time:**_____
year/month/day

Patient Weight:_____ Allergies: ❍ None ❍ Specify:_____

PALLIATIVE CARE PHYSICIAN:

1. B/P, respiratory rate, heart rate, Sa02, temperature, sedation score, pain rating (ESAS scale) mental status and observe for signs of intracranial pressure q 4hr

   AND

2. Every 15 min for first hour after initiation infusion and thereafter q 4 hrs for first 24 hrs, after each dose titration, AND if route changes from continuous SC infusion to IV or dose increased by more than 1 mg/kg or 100 mg/day.

❍ CBC ❍ Creatinine ❍ Electrolytes ❍ Bilirubin, AST, ALT, ALP

❍ Ketamine Bolus Dose (concentration 1 mg/ml)

Ketamine_____ mg over_____ minutes Route SC_____ IV_____

❍ Ketamine Continuous Infusion: Start infusion at mg/hr ❍ IV or ❍ SC

3. If systolic B/P drops greater than 30%, respiratory rate less than 8 per/min, or profound sedation occurs stop Ketamine and notify PSM physician immediately

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Prophylaxis of Psychomimetic side effects:

❍ Lorazepam 0.5-1.0 mg BID PO, SC, SL

❍ Midazolam infusion_____ mg/per hour SC

❍ Haldol 1-2 mg BID orally or SC

Naloxone (Narcan) Administration

If respiratory rate is < or equal to 8/min:

- STOP Ketamine infusion
- Initiate oxygen and support respirations as needed
- Naloxone (Narcan) 0.04 mg IV push (preferred)_ or sc q 1 minute until respirations > 6/minutes *(Dilute 1 cc Naloxone 0.4mg/ml with 9 cc NS final concentration of 0.04mg/ml)*
- Notify PSM/Palliative Care Physician immediately

Physician's Signature: _____

Transcriber's Signature: _____

Date: _____

Reverse-Routine Orders

Ketamine can be effective as an adjuvant in treating patients in palliative care. It is most often considered for patients with neuropathic pain with limited response to first line drugs such as opioids, NSAIDS, tricyclic antidepressants or anticonvulsants. If there has not been a significant analgesic effect before reaching an infusion rate of MAXIMUM 700 mg/day, then it is unlikely to occur.

The following pain types/syndromes are most likely to respond:

- Neuropathic, inflammatory, ischemic pain (including peripheral vascular disease), phantom limb pain, tenesmus
- Pain syndrome with the triad of: allodynia, hyperalgesia, prolongation of pain response

Usual concentration would be 1 mg/ml mixed in Normal Saline or 5% Dextrose in Water solution

KETAMINE	ROUTINE INITIATION SCHEDULE		
Loading dose	10 mg Subcutaneous (sc) or 2.5 mg intravenous (IV) infusion over 30 minutes	Use of loading dose depends on acuity of the pain syndrome **Explain to patient that there may be painful duration at site of loading dose, if it is by SC route.** SC-preferred route*	
Infusion Rate Subcutaneously/ Intravenously	**Start** @ 1-4 mg/hr (range 25-100 mg per 24hrs) Usual: 50mg/24hr (2mg/hr)	**Titration:** Adjust dose every 24 hours based on patient response	**Titration rate:** Increase by 1mg/hr 124hr until @4mg/hr thereafter increase by 1-2mg/hr 1 24hr up to a maximum daily dose of 700mg/day.

Sedation scale

S = sleep, easily aroused

1 = awake and alert

2 = occasionally drowsy, easily aroused

3 = frequently drowsy, arousable, drifts off to sleep during conversation

4 = somnolent, minimal or no response to stimuli

Prophylaxis of Pscychomimetic Side Effects:

Start either a benzodiazepine or haloperidol prior to or concurrently with Ketamine:

- lorazepam 0.5 mg-1 mg twice daily (BID) either orally or SC or sublingually
- Midazolam 5-20 mg subcutaneously over 24 hours
- Haloperidol 1-2 mg BID, orally or subcutaneously

Reassess need for continued prophylaxis after 5 days of Ketamine infusion.

Management of opioids during Ketamine infusion

*subject to clinical judgement and patient response

Total opioid dose for 24 hours equal regular opioid dose given in 24 hours plus total breakthrough (BT) doses for 24 hours.

- Based upon patient response to Ketamine, opioids may be gradually reduced.
- Stable opioid dose less than 3 BT per 24 hours, reduce by 25-50%
- Between 3-6 BT per 24 hours reduce by 20%
- Greater than 6 BT per 24 hours reduce by 10%
- Continue with prior BT opioid PRN

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Appendix B

Competency Assessment Checklist

Ketamine Administration

Competency Statement:

The registered nurse will demonstrate the ability to set up and program the PCA pump, as well as ongoing monitoring and assessment for therapeutic effect and potential complications.

Instructional Strategies include:

- Self Learning Package
- Instructional class
- Review of the GRH policy and procedures
- Written test

Date: _____ RN Name: _____ Unit: _____

Initial Authorization Overall Performance:

Satisfactory Unsatisfactory Reschedule

Manager/Educator or Delegate: _____

Ketamine Competency Checklist

Performance Criteria – Knowledge	Initial selfassessment of competency (Level 1-6)	Preceptor or educator initials verifying competence	Maintenance of Competency (using self assessment tool Level 1-6)
1 Discuss the purpose and indications for using Ketamine.			
3 Describe the anatomy, physiology and mechanism for Ketamine action.			
4 Discuss the nursing assessment and documentation for a patient receiving Ketamine.			
6 Describe the potential complications seen in patients given Ketamine and the nursing actions for these complications.			
7 Discuss the patient teaching for a patient receiving Ketamine.			
8 Describe the nursing actions for patients with sedation score of 3 and 4.			
9 Written Ketamine test score.			

Performance Criteria – Skill	Initial self assessment of competency (Level 1-6)	Preceptor or educator initials verifying competence	Maintenance of Competency (using self assessment tool Level 1-6)
1 Demonstrate the assessment of a patient receiving Ketamine.			
2 Demonstrates the programming and set-up of the Ketamine infusion pump, including maintaining appropriate safety precautions.			
3 Documents accurately the patient assessment and response to therapy using the Ketamine flow sheet.			
4 Monitors patient parameters regularly in order to assess effectiveness and complications.			

Self-Assessment Tool for Advanced Nursing Competency (ANC)

According to the College of Nurses Standards, you are responsible to assess your competence for all the generic competencies and the unit specific competencies that pertain to your area of practice. Use the scoring tool below as the guide. Competent independent practice, which is a score of 4 or greater, indicates that you have the knowledge, skill and judgment for the ANC and can practice according to this regional policy. Competency checklists have been included in your package to assist you in determining the level of knowledge and skill required to perform the skill, you will need to individually reflect on your judgment ability. In addition, you are asked to identify whether you require a theoretical review on the identified competency.

1 Limited or no experience

2 Have theoretical knowledge only

3 Have practiced successfully in the clinical setting with supervision

4 Competent independent practice

5 Competent independent practice with advanced trouble shooting

6 Competent independent practice with advanced trouble shooting and can teach the skill to others

Appendix C

Waterloo Wellington Palliative Care Community Protocol for Ketamine Administration

Developed by Waterloo Wellington Ketamine Education Committee

Working group members:

Carol Kopp, Clinical Educator, Bayshore Home Health

Cathy Joy, Palliative Nurse Consultant, HPC Consultation Services, Waterloo Region

Charlotte Koso, Manager, Clinical Practice and Special Projects, CarePartners

Christine Bigelow, Palliative Nurse Consultant, HPC Consultation Services, Wellington County

Deb Dalton, Clinical Resource Nurse, Hospice Palliative Care Community Team, Waterloo Region

Grace Egberts, Education Coordinator, Lisaard House Hospice

Heather Gross, Supportive Care Coordinator, Grand River Regional Cancer Centre

Heather Vomberg, RN, CarePartners

Stephanie Doran, RN Supervisor, Paramed

Dr. Andrè Moolman, Palliative Care Physician

Formal review of this protocol to be undertaken in 2 years (2012)
Reviewed April 2012 with revisions.

Revision Membership:

Carol Kopp, Clinical Educator, Bayshore Home Health
Cathy Joy, Palliative Nurse Consultant, HPC Consultation Services, Waterloo Region
Christine Bigelow, Palliative Nurse Consultant, HPC Consultation Services, Wellington County
Deb Dalton, Clinical Resource Nurse, Hospice Palliative Care Community Team, Waterloo Region
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Michelle DeGloria, Clinical Educator, Professional Practice Medicine, Guelph General Hospital
Sheila Gallinger, Nurse Practitioner, KW Hospice Palliative Care Team

Pilot initiative to include 5 case studies for review/evaluation purposes prior to adoption of final draft

Only 1 home case: full evaluation incomplete as of May 16, 2012

KETAMINE PROTOCOL

Overriding Expectation and Understanding

- Ketamine will be initiated, titrated and stabilized in hospital prior to client being discharged into the community with a Ketamine infusion.
- The preferred route of administration is via central intravenous (IV) access, however, subcutaneous (subcut) port delivery may be considered on a case by case basis.
- The concurrent opioid dose will also be established in hospital.
- The client must have 24/7 access to Palliative Care Services, including coverage by a Pain & Symptom management MD, when clients are receiving Ketamine.
- Community agencies require a minimum of 48 hours notice prior to sending client home on Ketamine.

Educational Requirement

Each nurse will have verified their competency in managing the pump chosen for the administration of Ketamine (ie: CADD or other etc.) Each nurse will have verified their competency in managing the pump chosen for the administration of Ketamine (i.e.: Gemstar, CADD, etc.). Additional pump information can be found within the Waterloo Wellington Pain Management Infusion Pump Information at http://www.hpcconnection.ca/painpump.

Each nurse will ensure his/her competency to administer Ketamine by having previously attended an educational session on the administration of Ketamine, demonstrating the knowledge, skill and judgment to do so. Each nurse will review the written P&P prior to caring for a client receiving Ketamine and successfully complete the nursing self-learning package.

Purpose

Ketamine is used in low doses (sub-dissociative anaesthetic dose) as a co-analgesic for pain in palliative care. Ketamine is a potent non-competitive N-methyl D-asparate (NMDA) receptor antagonist. Hyperactivity of the NMDA receptors may be involved in the induction and maintenance of certain pain states such as neuropathic pain and hyperalgesia.

There is evidence to support the use of Ketamine in the following pain types/syndromes:

- Neuropathic pain
- Phantom pain
- Complex pain syndrome
- Tenesmus – defined as especially long-continued, ineffectual and painful straining, at stool or urination
- Any pain syndrome with the triad of:
  - Allodynia
  - Hyperalgesia
  - Prolongation of pain response
- Ischemic pain (including peripheral vascular disease)

Indications for Use

1. Opioid Intolerance
2. Opioid Toxicity
3. Pain poorly responsive to opioids
4. Pain crisis

Contraindications

Absolute:

Patients under 18

Allergy to Ketamine

Uncontrolled seizures

Symptomatic raised intracranial pressure (ICP) – for example clinical signs of uncontrolled headaches with nausea & vomiting

Not-contraindicated in uncomplicated intracranial metastases

Relative:

Uncontrolled hypertension – systolic > 160mmhg

Severe Cardiac Failure

Previous Cerebral Vascular Accident (CVA) /
Severe Neurological Impairment

Special Considerations for Administration of Ketamine[1]

- Ketamine will always be initiated in hospital.
- At this time Ketamine will only be administered IV or subcut via pump.
- Pumps must be clearly labeled; preferably using a different type of pump than the one used for the opioid. (e.g. CADD or other).
- Ketamine is always given concurrently with an opioid. A breakthrough dose for the opioid must also be available.

Routes of Administration:

IV: preferred route for Waterloo Wellington at this time

Sub cut: Ketamine is very irritating at the subcutaneous site, therefore requiring frequent site changes

Orally: When taken orally, Ketamine has a very bitter taste, which can be masked by mixing in fruit juice or carbonated cola.

Drug Precautions

Ketamine may decrease or even reverse opioid tolerance due to blocking of NMDA receptors. This improved response to opioids may lead to increased opioid side effects such as sedation and respiratory depression, if the opioid dose is not adjusted appropriately. Since Ketamine enhances the effectiveness of the prescribed opioid, titration of the opioid as well as Ketamine must be managed very carefully.

Potential Side Effects:

Psychomimetic: Emergence Phenomena

- characterized by vivid dreams
- de-personalization
- hallucinations
- delirium
- agitation
- excessive sedation

Sympathomimetic: Actions

- Increased blood pressure
- Tachycardia
- Increased cardiac output
- Hyper-salivation
- Increase in intracranial pressure
- Vision changes: Diplopia, Nystagmus, eye pain
- Nausea
- Skeletal muscle hyperactivity
- Rash & itching
-

Prophylaxis Management of Psychomimetic Side Effects

- This protocol may have been initiated in hospital and should continue in the community.
- Patients may have started either a Benzodiazepine or Haloperidol before or with Ketamine.
- recommended medications include:
  - Lorazepam 0.5-1mgm BID p.o. or subcutaneous or S/L
  - Midazolam 5-20mg subcutaneous over 24 hours or
  - Haloperidol 1-2mg BID p.o. or subcutaneous dependant on individual
- These medications may be used concurrently in the management of psychomimetic side effects.
- **NOTE:** Benzodiazepines increase the bio-availability of Ketamine, thus may potentiate respiratory depression.

NOTE: It is important to monitor closely for side effects and report changes in condition to the Palliative MD

Ketamine Infusion Monitoring in Community

- BID nursing visits X 48 hours & following each Ketamine or opioid dose adjustment.
- Monitor VS - Blood Pressure, Pulse and Respirations q. visit.
- Assess pain q. visit – perform a thorough pain assessment.
- Assess level of sedation q. visit.
- Monitor for side effects listed above and report all changes to Palliative physician providing care.

1. Comments on Ketamine Delivery Methods:

1a Ketamine is not effective orally for long term use.

1b Ketamine can also be delivered intrathecally/ intraspinally.

1c Ketamine can be delivered with an opioid either by using 2 pumps or give opioid and ketamine in the same pump, or give the opioid orally. This is decided on a case by case basis.

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Notes