NEPSCC
New England Pediatric Sickle Cell Consortium

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Management of Acute Pain in Pediatric Patients with Sickle Cell Disease (Vaso-Occlusive Episodes)

Disclaimer Statement:
Hospital clinical pathways are designed to assist clinicians by providing an analytical framework for the diagnosis and treatment of specific medical problems. They may be used for patient education and to assist in planning future care. They are not intended to replace a physician's judgment or to establish a protocol for all patients with a particular condition. The ultimate decision regarding the care of any patient should be made in respect to the individual circumstances presented by the patient. Any specific medications and dosing must always be reviewed carefully for each patient in view of any drug allergy or adverse reactions.
This document was based on available research and clinical experience at time of its compilation. The following protocol is a regional guideline, and may be adopted by individual institutions as needed.

BACKGROUND

- Vaso-occlusive pain episodes (VOE) are the hallmark complication of sickle cell disease.
- They can be precipitated by exposure to cold, stress, infection, and dehydration.
- Maybe 'rebound' after incomplete resolution of previous VOE episode.
- Most VOE symptoms can be managed at home with oral medications.
- More severe pain requires management in a dedicated Day Hospital, if available or Emergency Room evaluation with possible hospital admission for parenteral opioids,
- Goal of VOE treatment is to minimize pain and to prevent complications, (acute chest syndrome).

APPROPRIATE HOME MANAGEMENT

- Appropriate home care of the child with sickle cell disease is crucial to optimize best health outcomes for the patient.
- Pain management begins with avoidance of precipitating factors, importantly, keeping the patient warm, well, hydrated and free from stress
- Vasoocclusive pain occurs very frequently in SCD and must be anticipated. The family of a child with SCD should have, at all times, a sickle cell care plan that details how to manage a painful crisis – including which medicines and what doses to use. The patient must have an adequate supply of pain medications in the house at all times and must know how to ask for a refill before the bottle is finished.
- Management of an acute painful episode must include adequate oral pain medicines prior to ever giving parenteral narcotics
- If the child has not received adequate oral medications there must be a trial of oral medicines prior to parenteral narcotics being given.

PEDIATRIC EMERGENCY DEPARTMENT (ED) EVALUATION:

PATIENTS WITH SICKLE CELL DISEASE AND PAIN SHOULD BE ASSIGNED LEVEL 2 TRIAGE CRITERIA, AS DEFINED BY THE EMERGENCY SEVERITY INDEX (ESI CRITERIA).

- Rapid triage: immediately on presentation to ED clinic.
- Age appropriate pain assessment at triage and again before and after each intervention.

▫Immediate evaluation with brief history and physical: VS, oximetry, pallor, hydration status, cardio-pulmonary status, spleen size, evidence of infection, medication history: character, nature, location, duration severity of pain.

▫Assessment of medication allergies.

▫Complete a brief, initial psychosocial evaluation.

▫Give pain medication ASAP. (See pain management algorithm)) Goal is first dose of pain medication within 30 minutes of arrival to ED. Can complete H&P when patient's pain is better controlled.

▫ If patient is ≥ 6 years of age and has received opioids at home, Actiq (transmucosal Fentanyl) can be provided at a dose of 200 mcg every 30 minutes until IV is placed or other pain management is instituted.

▫Pain medication as per chart below.

▫Oral medications if has not previously received any.

▫Opioid bolus and subsequent doses as recommended below.

▫Anti-inflammatory medication when necessary/appropriate. (See Algorithm)

IV fluids
Consider bolus only if dehydrated
1.25 maintenance (IV + PO), to be modified based on history of fluid intolerance and signs of dehydration. If concerned for the possibility of an acute chest syndrome (ACS) developing, limit volume to 2/3-3/4 maintenance, to avoid fluid overload.

Laboratory tests and possible imaging studies:

▫Complete blood count with differential and reticulocyte count

▫Blood culture if febrile

▫CXR- PA and lateral – for patients with chest pain, hypoxia, respiratory symptoms- but not as a routine.

▫Additional studies based on history, PE, and clinical presentation

▫SAO_2 and CVR monitors as necessary

ACUTE PAIN MANAGEMENT IN THE ED

Ensure adequate oral pain medication prior to parenteral therapy (Oral or IV therapy must be determined by pain score)
Start with PO Opioids if pain not > 5/10 or equivalent, on other pain scale or faces measure
See treatment algorithm below for details

MEPERIDINE (DEMEROL) SHOULD NOT BE USED IN SICKLE CELL PATIENTS BECAUSE OF THE INCREASED RISK OF SEIZURES.

Disposition

Consider discharge home from ED if pain is captured with minimal number of doses (≤ 2) of IV opioids and then controlled with po medication. – see algorithm
Consider admission if patient requires multiple boluses of IV opioids without good pain control, or if patient is febrile, or if patient has respiratory symptoms.
Start PCA as soon as apparent that patient will not be adequately controlled with oral or bolus pain medicines.

INPATIENT MANAGEMENT

Medications

Continue home medications including penicillin and folic acid when applicable
○ Continue Hydroxyurea if labs are stable (ANC>1500)

Opioids

○ Continuous opioid infusion via patient Controlled Analgesia

See Pediatric PCA policy of your own institution for guidelines.
PCA may not be appropriate for patients < 7 year of age. Most often these patients should be placed on basal rate only.
Parent or Nurse controlled PCA should NOT be used. This can result in excessive sedation.

○ Definitions

PCA: A technique whereby the patient self- administers opioid medications using a preprogrammed infusion pump. A method of patient-controlled delivery of an opioid which maintains optimal analgesia while minimizing sedation.
Bolus dose: a larger dose of opioid given as an initial dose, for persistent or increased pain, before a procedure with an increase in opioid requirement. The goal of a bolus dose is to quickly bring the patient to a therapeutic analgesic blood concentration.
PCA dose: Dose of opioid administered when patient activates pump during a "drug available" interval.
Lockout interval: Period during which PCA cannot be activated; the number minutes allowed between PCA doses.
Basal dose: Low dose continuous infusion of opioid used to maintain constant "background" level of analgesia.
One hour limit: Predetermined maximum drug amount that can be delivered during any one hour period.

○ SEE INSTITUTIONAL PEDIATRIC PCA POLICY FOR INDIVIDUAL DOSING.

	Morphine	Hydromorphone (Dilaudid)
Basal rate (mg/kg/hour)	0.02-0.04	0.003-0.007
PCA dose (mg/kg)	0.015	0.0025
Lockout period (min)	6	6
Bolus dose (mg/kg)	0.05	0.008

Use lower dose for opioid naïve patients and higher dose for opioid experienced patients
1 hour limit = basal rate + (PCA dose x # of PCA doses per hour)
Select patients may have specific opioid dosing guidelines, refer to patient history
PCA teaching sheet should be available for reference for anyone not versed in its use.
Patients on PCA need frequent assessment regarding pain intensity and sedation level per individual hospital's policy. Dosing adjustment may be necessary:
If patient has increased or persistent pain and is using PCA dosing > 3x/hour consider additional bolus of 0.05 mg/kg/dose morphine or 0.008 mg/kg/dose hydromorphone and increase basal dose by 10-20%. Re-evaluate q 1 hour until pain is captured and then q 4-6 hours while on PCA.
Every 12-24 hours calculate the total amount of medication given through basal rate vs. total amount of medication given by bolus+ PCA. Adjust the basal rate appropriately so that the PCA and bolus dosing is < 1/3 the total mg received per day. If pain is well controlled and patient is pushing PCA < 3x/hour consider decreasing basal rate by 10-20%, every 12-24 hours as tolerated.
If patient on basal rate is over sedated decrease basal rate by 10-20%
For somnolence of respiratory depression stop the infusion, stimulate patient, and apply oxygen. Consider naloxone.

Switching from IV to PO analgesics
Patients should be changed from IV to PO when pain is well controlled on a total IV Morphine dose (basal+PCA+bolus) of approximately 0.025mg/kg/hr (Hydromorphone dose 0.003mg/kg/hr).
PO regimen should include a long acting opioid (replaces basal rate) and a short acting opioid (replaces PCA)
Give initial dose of oral medication, then discontinue IV medication 1 hour after.
For patients who are difficult to transition to po pain medication consider starting long acting opioid, stopping basal rate of PCA, and continuing PCA dose for 12-24 hours. This regimen can provide the patient with a greater sense of control. If pain is well controlled after 12-24 hours, d/c PCA dose and give po short acting opioids as needed for breakthrough pain
Calculations:
Calculate total mg of parenteral opioid given in previous 24 hours.
Use table to convert 24-hour parenteral dose to oral equivalent dose.

Divide 24-hour daily oral dose into appropriate dose per time interval.
If using a long acting po opioid be sure to include a short acting opioid breakthrough pain.
When switching from IV to PO opioid , dose reductions should be considered if the patient has stable controlled pain. Effective management may be achieved at 50% of the calculated equianagesic dose because there is not complete cross-tolerance among these drugs.

SEE ORAL DOSING GUIDELINES FOR MORE ORAL MEDICATION OPTIONS.

OPIOD	PARENTERAL DOSE/24H	ORAL EQUIVALENT /24H	ORAL MEDICATION	ORAL DOSE INTERVAL
Morphine	20mg	60mg	30mg MS Contin	Q12H
Hydromorphone	3.0 mg	15 mg	1-2mg tablets	Q 3-4 h
Codeine	N/A	400 mg	1-2 T#3 tablets	Q 4-6 h
Oxycodone	N/A	30 mg	5 mg oxycodone	Q -6 h

<u>Naloxone</u>
Must be readily available
Dose:
Age < 1year- 0.02mg/dose
Age 1-12 years- 0.04mg/dose
Age ≥ 12 years – 0.08mg/dose

<u>Anti- inflammatory medications</u>
Ketorolac- 0.5 mg/kg dose IV max dose 30 mg/dose, 120 mg/day. Max treatment duration 72 hours. May switch to PO NSAID at that time.
Ibuprofen 10mg/kg/dose PO q 6 hours. Max dose 800mg
Choline magnesium trilisate 25mg/kg/dose PO q 12 hours. Max 1500mg/dose. Do not use for patients with aspirin allergy or G6PD deficiency.
Celebrex is also an option if platelets are a concern (50-100mg 1-2x daily)

Side Effect Management

Bowel Regimen: mandatory unless medically contraindicated.
Ducosate divided into 1-4 doses/24 hours
< 3 years: 10-40mg/day
3-6 years: 20-60 mg/day
6-12 years: 40-150 mg/day
> 12 years: 50-400 mg/day
Add other meds as needed
Senna 2.5-10 ml/dose or 1-2 tabs PO QHS or BID. Max 2 tabs BID.
Milk of Magnesia 5-15 ml/dose PO BID
Lactulose 5-20g/ day divided TID-QID. Patient must be taking PO fluids
Bisacodyl 5-10mg/dose PO/PR QD
Miralax 0.8 g/kg/day
Itching:
Diphenhydramine 1mg/kg/dose IV/PO q 6 hours PRN itching
Hydroxyzine 0.5- 1mg/dose IV q 4-6 hours; or 2 mg/kg/day PO divided q 6-8 hours PRN itching. Max 600 mg/day
Claritin/ Zyrtec: 2-5 years 5mg daily, 6 years and older 10 mg daily
GI Discomfort/Nausea
Ondansetron (Zofran)
< 10 kg give 0.1 mg/dose PO or IV q8 hours
≥ 10 kg give 1 mg/dose PO or IV q8 hour
Prochlorperazine if > 2y of age, 0.1mg/kg/dose PO/PR q 6h, max 10mg/dose
Promethazine if > 2y of age, 0.25 – 1mg/kg/dose q 4-6h, max 25mg/dose
Anxiolytics
Can be used in conjunction with opioids, should not replace opioids.
Watch for increased respiratory suppression when used in conjunction with opioids.

Monitoring
Baseline VS: HR, RR, BP, O2 sat (room air), pain, and sedation level.
HR, RR, BP, O2 sat (room air), pain, and sedation level every 15 minutes x2 initially and with any dose change.
HR, RR, pain level Q 4h
RR, sedation level Q 2h
Continues SaO_2 monitor
Patients on PCA must be accompanied by nurse or physician during transport to clinical or non-clinical areas.
Oxygen and appropriate BMV must be readily available

Fluids
IV + PO at 1- 1.25 maintenance. Adjust based on history of fluid intolerance and signs of dehydration. Close monitoring of fluid status including strict I's & O's and weights
Consider decreasing IVF after 24 hours. Limit fluid if patient at risk for ACS.

Labs
CBC with diff and retic q 48 – 72 hours or more frequently if clinically indicated
Blood cultures with CBC for T>101˚F

Psychiatric, Behavioral, Physical therapy interventions as indicated.

Respiratory
Incentive spirometry 10x/hour while awake
Ambulation at least twice a shift
Oxygen to keep SaO2 >95%. Nurse to inform MD immediately if patient has an increasing O2 requirement

Consider BiPAP in patients with history of ACS or with chest pain

OUTPATIENT MANAGEMENT
Patients can be sent home on PO pain medications (NSAID and opioid) if the following criteria are met:
Able to hydrate with PO fluids
CBC stable (baseline)
Pain has been controlled for at least 1 hour after last dose of PO opioid medication
Patient and family comfortable with discharge and feel pain can be controlled with PO medications at home.
Stable respiratory status
Plan for pain treatment at home.
Make sure medications are available at home
Give meds around the clock for 24-48 hours to make sure pain is captured and the give PRN
Provide instructions for pain management in writing
Alternate opioid and Non- opioid medications

Oral Analgesia Dosing Guidelines

Opioids

Medication	Dose	Preparations
Codeine (but beware of its pharmacogenetic profile and its lack of efficacy. Ultram:	0.5-1mg/kg/dose PO q4h Max 60 mg/dose	Tylenol + Codeine Elixir (120 mg Acetaminophen +12mg codeine/5ml) Tylenol+Codeine#2(300mg acetaminophen/15mg codeine) Tylenol+Codeine#3 (300mg acetaminophen/30mg codeine) Tylenol+Codeine#4 (300mg acetaminophen/60mg codeine) Codeine Elixir 15mg/5ml Codeine 15, 30, 60mg tablets
Hydromorphone (Dilaudid)	0.03-0.08 mg/kg/dose PO q3 4h	Dilaudid 1,2,3,4mg tablets Usual adult dose 2-4 mg
Methadone	0.2mg/kg/dose PO q4-6h	Oral solution 5mg/5ml,10mg/5ml Oral concentrate 10mg/ml 5,10,40 mg
Morphine (immediate release)	0.2-0.5 mg/kg dose PO q3-4h	Oral solution 10mg/5ml, 20mg/5ml Oral concentrate 20mg/ml 15,30 mg tablets
Morphine sustained release)	0.3-0.6mg/kg/dose PO q12h	MS Contin 15, 30mg tablets
Oxycodone (immediate release)	0.1-0.2 mg/kg/dose	Oxycodone 5mg tablets Percocet/Roxicet 9325 mg acetaminophen+5mg oxycodone tablets) Roxicet

Non- Opioid

Medication	Dose	Preparation
Acetaminophen	15mg/kg/dose po /PR q 4h Max 4g/day	Tylenol elixir 160mg/5ml Tylenol drops 80mg/0.8ml Tylenol 325, 750, 100mg tablets
Choline magnesium trilisate	25mg/kg/dose BID Max 1500mg/dose	Trilisate 500, 750, 1000mg tablets
Ibuprofen	10mg/kg/dose PO q6h Max 800mg/dose	Children's Motrin/Advil Elixir (100mg/5ml) Motrin: 200mg tablets OTC. 400,600,800mg tablets with Rx

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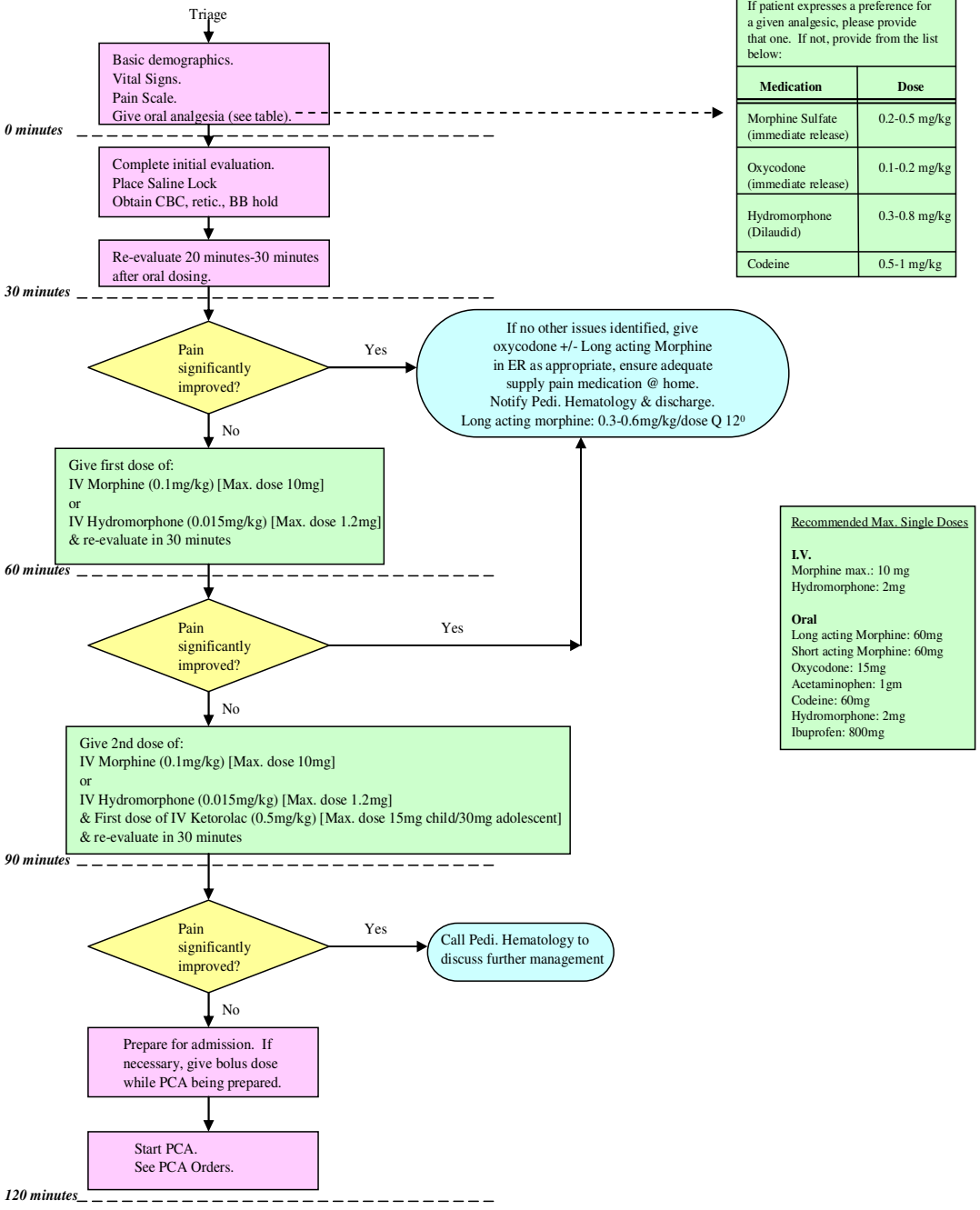
Specific Guidelines for the Management of Pain in the Emergency Room

THE GOAL OF THE CONSORTIUM MEMBERS IS TO HAVE INITIAL PAIN THERAPY PROVIDED WITHIN 30 MINUTES OF THE PATIENT'S PRESENTATION TO THE EMERGENCY WITH A MAXIMUM TIME ELAPSED BETWEEN PRESENTATION AND FIRST TREATMENT OF 60 MINUTES.

Please see below two different options for the initial management of pain in the Emergency Room.

Guidelines for the Management of Uncomplicated Vaso-Occlusive Pain in Children with Sickle Cell Disease in the E.D.

The purpose of these guidelines is to provide an educational resource for clinicians at BMC. Clinicians are encouraged to follow these guidelines. It is recognized however, that at times there will be exceptions to the guidelines that make different medical management appropriate.



Oral Analgesics
If patient expresses a preference for a given analgesic, please provide that one. If not, provide from the list below:

Medication	Dose
Morphine Sulfate (immediate release)	0.2-0.5 mg/kg
Oxycodone (immediate release)	0.1-0.2 mg/kg
Hydromorphone (Dilaudid)	0.3-0.8 mg/kg
Codeine	0.5-1 mg/kg

Recommended Max. Single Doses

I.V.
Morphine max.: 10 mg
Hydromorphone: 2mg

Oral
Long acting Morphine: 60mg
Short acting Morphine: 60mg
Oxycodone: 15mg
Acetaminophen: 1gm
Codeine: 60mg
Hydromorphone: 2mg
Ibuprofen: 800mg

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SICKLE CELL PAIN MANGEMENT CPG
E.D. INITIAL ASSESSMENT / TREATMENT ALGORITHM