1.0 Introduction

The cause of vaso-occlusive crisis (VOC) is believed to be ischemic tissue injury from the obstruction of blood flow by sickled erythrocytes. Reduced blood flow causes hypoxia and acidosis. This further increases the sickling process, leading to further hypoxia and acidosis—a cycle that eventually leads to ischemic tissue injury. Each VOC varies in intensity and duration. Infection, fever, acidosis, hypoxia, dehydration, sleep apnea, and exposure to extremes of heat and cold can precipitate crises. Often, no cause is identified.

Painful VOC is the most frequent complication of Sickle Cell Disease. Common sites of pain include bone (extremities, dactylitis or hand/foot syndrome, back) and abdominal pain. Bone pain, the most common type of VOC, may or may not be accompanied by swelling, low-grade fever, redness, and warmth. It may be symmetrical, asymmetrical, or migratory. Dactylitis is a common presentation in infants and toddlers; back and abdominal pain are more common in older children. Abdominal pain in children with sickle cell disease is usually a simple VOC, but other diagnoses may present similarly (splenic sequestration, liver sequestration, appendicitis, pancreatitis, biliary colic and cholecystitis, urinary tract infection, pelvic inflammatory disease, etc.) and should be ruled out. In addition, pneumonia and chest crisis may present as, or accompany abdominal pain. During a severe painful crisis, a patient may also develop an acute chest syndrome, or a CNS event.

Pain should be treated early and aggressively. No laboratory features are pathognomonic of VOC; diagnosis is based strictly on the history and physical examination. When treating a painful crisis, the Healthcare Provider needs to be aware that concurrent illnesses such as an acute sequestration, priapism, aplastic episode, or fever/sepsis (see other protocols) may also occur, which must be dealt with concurrently.

This clinical practice guideline has been developed for the management of sickle cell patients with an acute painful episode who present to the emergency department and/or inpatient units.

2.0 Clinical Practice Recommendations

Statement of Evidence: Recommendations were made by expert group consensus. (Grade C)
Table 1. Grades of Recommendation

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Recommendation supported by at least one randomized controlled trial, systematic review or meta-analysis.</td>
</tr>
<tr>
<td>B</td>
<td>Recommendation supported by at least one cohort comparison, case study or other experimental study.</td>
</tr>
<tr>
<td>C</td>
<td>Recommendation supported by expert opinion or experience of a consensus panel.</td>
</tr>
</tbody>
</table>

2.1 Emergency Department Management (Grade C)

2.1.1 Place patients with concurrent fever of 38.5°C oral (38°C axilla) or higher immediately into a room, and see Fever: Guideline for Management in Children with Sickle Cell Disease. Do not delay administration of empiric antibiotics.

The threshold noted above is slightly higher than the normal definition of fever given that a low-grade fever may be secondary to VOC in the absence of any bacterial infection. Children who look unwell and have signs suggestive of sepsis require bloodwork and antibiotics.

2.1.2 For acute chest syndrome refer to and follow other guidelines or sickle cell management protocols:

- Acute Chest Syndrome

2.1.3 Place children without fever in a room as soon as possible (based on CTAS score), and conduct a brief history and physical concurrently with other measures including pain assessment and initial treatment ideally within one hour of registration (or 30 minutes from triage).
Acute Painful Episodes Vaso-occlusive Crisis: Guidelines for Management in Children with Sickle Cell Disease

History
- nature
- duration
- location
- severity of pain See Pain Assessment Policy
- how pain compares to previous crises
- what has worked in previous crises
- analgesics already used and doses
- associated symptoms

Physical
- vital signs including O₂ saturation and pain score, cardiopulmonary and hydration status
- spleen size
- neurologic exam
- presence of jaundice
- localizing signs of infection

Lab Tests (only if clinically indicated or obtaining IV access)
- request blood counts (CBC, differential, and reticulocyte count)
- please note that if the plan includes IV fluids, serum electrolytes (Na, K, glucose, urea, creatinine) should be measured prior to administration as per the hospital’s Fluid and Electrolyte Administration Clinical Practice Guideline

2.1.4 In the presence of chest pain or respiratory symptoms request a chest x-ray and monitor the child’s O₂ saturation. If the patient has severe respiratory distress, test venous blood gas (VBG) levels as well (refer to Acute Chest Syndrome CPG).

2.1.5 Insert an IV if the patient is dehydrated or in moderate to severe pain not responding to adequate oral treatment. Start cardiopulmonary monitoring and obtain a CBC, differential and reticulocyte count. Serum electrolytes (Na, K, glucose, urea, creatinine) should be ordered prior to IV fluid administration as per the hospital’s Fluid and Electrolyte Administration Clinical Practice Guideline.

2.1.6 Notify the Haematology Consult Service to see patients with any of the following:
- hemodynamic instability
- sepsis
- meningitis
- stroke, aplastic crisis, or acute splenic sequestration
- O₂ saturation <90% on room air
- priapism
- or otherwise concerned about the patient’s clinical status

2.1.7 Consider physical and psychological interventions such as heating pads, massage, warm baths, and other comfort measures. The Child Life Specialist can recommend structured activity. Imagery and distraction are helpful.

2.1.8 Children with sickle cell disease who have a painful episode WITHOUT fever, breathing difficulties or other medical problems may be admitted to the Sickle Cell Day Hospital between 0800 and 1400, Monday through
Friday (refer to the Sickle Cell Pain Day Hospital guideline). The last admission will be no later than 1400. Page the Sickle Cell Pain Pager at (416) 530-7155.

2.1.9 Medication Management

Note: oral medication should be considered first-line treatment if the patient tolerates fluids and is not vomiting. Note: take into consideration timing and dosing of previous medication.

<table>
<thead>
<tr>
<th>Pain Severity</th>
<th>Medication (refer to eformulary links for dosing information)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Degrees of pain (mild, moderate, severe)</td>
<td>Acetaminophen And Ibuprofen</td>
<td>Scheduled acetaminophen AND ibuprofen are recommended unless contraindications exist.</td>
</tr>
</tbody>
</table>

In addition to above

| Moderate pain (4-6 on numerical scale or equivalent on most appropriate scale) | Add Morphine or Hydromorphone taken orally or by IV | - IV is preferred if home oral pain management at an adequate dose has failed.  
- Unless the child is opioid naïve, recommended practice is to begin with a higher dosing range and to dose opioids based on ideal body weight.  
- If within 30-60 minutes, pain relief is inadequate on oral opiates, move to IV.  
- If adequate pain relief is established for 2 hours with 1 or 2 doses of intermittent IV opioid, then change to equivalent dose of oral opioid.  
- If pain relief is adequate, the patient is tolerating oral fluids, and there are no other acute complications, the patient can be discharged on oral analgesics.  
- Encourage patients to drink.  
- In all patients in moderate to severe pain who are unable to tolerate oral fluids, administer IV fluids at a total fluid intake (TFI) of maintenance.  
- Serum electrolytes (Na, K, glucose, urea, creatinine) should be ordered prior to IV fluid administration as per the hospital's... |
Severe pain (≥7 on numerical scale or equivalent on most appropriate scale)  
Morphine continuous IV infusion  
OR  
Hydromorphone continuous IV infusion  
Consider intranasal Fentanyl while establishing IV access (See Intranasal Medication Administration Using a Mucosal Atomization Device MAD policy)  
- If patients are dehydrated: administer a 10mL/kg bolus of saline, followed by a TFI of maintenance. If signs of acute chest crisis, abdominal or back pain, do NOT give bolus and ensure a strict maximum TFI of maintenance.
- If inadequate pain relief is established for 2 hours with 1 or 2 doses of intermittent IV morphine, then change to equivalent dose of oral morphine around the clock.
- If pain is controlled on oral morphine, the patient can be discharged home, provided they are tolerating oral fluids.

2.1.10 ED Discharge Medication Management and Follow-up
- For all degrees of pain (mild, moderate, severe) use acetaminophen and ibuprofen around the clock in addition to morphine unless contraindications exist. Around the clock administration of acetaminophen and ibuprofen should continue for one to two days and then as needed. Refer to the eformulary for dosing guidelines.
- PEG 3350 should be taken to prevent constipation while on opiates used to treat pain episodes.
- Page Haematology Consult Service and notify them of the ED visit and discharge in order to arrange outpatient follow-up.
- Ensure appropriate discharge pain management instructions and prescriptions are reviewed and administered to the patient. A prescription for 30 doses of opioids is recommended.
2.2 Inpatient Management (Grade C)

2.2.1 Hospitalization is indicated if pain control with oral analgesics is not adequate, or if concerns relating to fever, dehydration, etc.

2.2.2 Patients to be admitted to units 7BCDE under Paediatric Medicine. Stable patients may be transferred for admission to a Satellite Sickle Cell Centre – Brampton Civic Hospital or Rouge Valley Centenary.

2.2.3 Observe patients for signs of deterioration through continuous cardiac and $O_2$ saturation monitoring with continuous opioid infusions. When continuous monitoring is no longer required, vital signs assessed as per BedsidePEWS, fluid input and output, and daily weight. Assess the child’s comfort level q4h, and before and after each pain medication and non-pharmacologic intervention, with a consistent pain tool. See Pain Assessment Policy

2.2.4 Unless there are contraindications, initiation of incentive spirometry and referral to physiotherapy is indicated for children admitted with chest, back, neck or abdominal VOC. For patients with limb/other VOC, a physiotherapy consult may still be warranted. The physiotherapist will encourage ambulation and activity within the child’s tolerance. Other health professionals should promote mobility as per physiotherapy recommendations. Note that nursing may initiate incentive spirometry prior to assessment by physiotherapy. See Cardiopulmonary Physiotherapy policy.

2.2.5 Consider physical and psychological interventions such as heating pads, massage, warm baths, and other comfort measures. The Child Life Specialist can recommend structured daily activity. Imagery and distraction are helpful.

2.2.6 If pain is not managed despite appropriate analgesics consult Acute Pain Services.

2.2.7 Inpatient Medication Management

<table>
<thead>
<tr>
<th>Medication</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral Morphine</td>
<td>• Oral Morphine: An equivalent dose of long acting oral morphine may be used as an alternative to continuous IV morphine in stable inpatients.</td>
</tr>
</tbody>
</table>
| Morphine continuous IV infusion | • When effective analgesia is maintained for 24 hours, the dose can be reduced in a stepwise manner as per instructions found in the eformulary.  
|                                | • When stable switch to oral analgesics.        |

© 2012 The Hospital for Sick Children ("SickKids"). All Rights Reserved. This document may be reproduced or used strictly for non-commercial clinical purposes. However, by permitting such use, SickKids does not grant any broader license or waive any of its exclusive rights under copyright or otherwise at law; in particular, this document may not be used for publication without appropriate acknowledgement to SickKids. This Clinical Practice Guideline has been developed to guide the practice of clinicians at the Hospital for Sick Children. Use of this guideline in any setting must be subject to the clinical judgment of those responsible for providing care. SickKids does not accept responsibility for the application of this guideline outside SickKids.
2.2.8 For a pain crisis in children 8 years of age and older, consider a Patient Controlled Analgesia (PCA) pump. As well, consider a PCA pump for patients previously treated with a PCA pump or for patients not achieving adequate analgesia. A PCA can be obtained by paging the Acute Pain Services at (416) 235-8912, who will set the PCA’s basal rate, bolus rate, and lockout time.

2.2.9 **Polyethylene Glycol (PEG) 3350** should be administered to prevent constipation.

2.2.10 **Hydration:** Continue IV/PO fluids for a total fluid intake (TFI) of maintenance.

2.2.11 **Oxygen:** Studies do not support systematic use of oxygen for VOC. However, hypoxia may occur in children with VOC, resulting in increased sickling. Therefore, monitor O₂ saturation regularly, and provide oxygen to patients exhibiting hypoxemia (<95%).

2.2.12 **Discharge Guidelines**
- Tolerating oral fluids and medications.
- Pain is under control with oral medications.
- Concurrent problems are resolved.
- Discharge pain plan has been provided and education complete.
- Ensure Sickle Cell discharge process is followed.

3.0 **Guideline Group and Reviewers**

**Guideline Group Membership:**

**Original Guideline (2007)**

1. Manuel D. Carcao, MD, Haematologist
2. Dawn Cook, RN, CPNP
3. Upton Allen, MD, Chief, Division of Infectious Diseases
4. Jeremy Friedman, MD, Head, Division of Paediatric Medicine
5. Nadya Chorostil, BSc Phm, Staff Pharmacist

© 2012 The Hospital for Sick Children ("SickKids"). All Rights Reserved. This document may be reproduced or used strictly for non-commercial clinical purposes. However, by permitting such use, SickKids does not grant any broader license or waive any of its exclusive rights under copyright or otherwise at law; in particular, this document may not be used for publication without appropriate acknowledgement to SickKids. This Clinical Practice Guideline has been developed to guide the practice of clinicians at the Hospital for Sick Children. Use of this guideline in any setting must be subject to the clinical judgment of those responsible for providing care. SickKids does not accept responsibility for the application of this guideline outside SickKids.
Acute Painful Episodes Vaso-occlusive Crisis: Guidelines for Management in Children with Sickle Cell Disease

6. Ron Grant, MD Staff Physician

Revised (2011)
1. Melanie Kirby, MD, Staff Physician, Division of Haematology/Oncology
2. Jeremy Friedman, MD, Head, Division of Paediatric Medicine
3. Isaac Odame, MD, Staff Haematologist
4. Upton Allen, MD Chief, Division of Infectious Diseases
5. Dennis Scollnick MD, Staff Physician, Division of Emergency Medicine
6. Lori Palozzi RN, NP Nurse Practitioner Acute Pain Service

Revised (2015) – Listed alphabetically
1. Carolyn Beck, MD, Staff Paediatrician, Division of Paediatric Medicine
2. Fiona Campbell, MD, Staff Anesthesiologist
3. Melina Cheong, RN, Nurse Practitioner, Division of Haematology/Oncology
4. Averill Clarke, Senior Manager, Haematology/Oncology Clinic & Day Hospital
5. Heather Dalziel, RN, Quality Lead, Division of Paediatric Emergency Medicine
6. Jeremy Friedman, MD, Staff Paediatrician, Division of Paediatric Medicine
7. Melanie Kirby, MD, Staff Physician, Division of Haematology/Oncology
8. Lynn Mack, RN, Quality Analyst 7BCD
9. Mollie McConnell, NP, Nurse Practitioner, Division of Paediatric Medicine
10. Trent Mizzi, MD, Staff Paediatrician, Division of Paediatric Emergency Medicine
11. Jenny Moloney, Quality Lead, Haematology / Oncology / BMT
12. Olivia Ostrow, MD, Staff Paediatrician, Division of Paediatric Emergency Medicine
13. Lori Palozzi RN, NP, Nurse Practitioner, Acute Pain Service
14. Marina Strzelecki, Clinical Pharmacist

4.0 References


© 2012 The Hospital for Sick Children (“SickKids”). All Rights Reserved. This document may be reproduced or used strictly for non-commercial clinical purposes. However, by permitting such use, SickKids does not grant any broader license or waive any of its exclusive rights under copyright or otherwise at law; in particular, this document may not be used for publication without appropriate acknowledgement to SickKids. This Clinical Practice Guideline has been developed to guide the practice of clinicians at the Hospital for Sick Children. Use of this guideline in any setting must be subject to the clinical judgment of those responsible for providing care. SickKids does not accept responsibility for the application of this guideline outside SickKids.
### Acute Painful Episodes Vaso-occlusive Crisis: Guidelines for Management in Children with Sickle Cell Disease

<table>
<thead>
<tr>
<th>Version: 3</th>
</tr>
</thead>
</table>

5.0 Related documents

- Acute Chest Syndrome or Pneumonia: Guidelines for Management in Children with Sickle Cell Disease
- Pain Assessment Policy
- Pain Management Clinical Practice Guideline
- Sickle Cell Pain Day Hospital

Attachments:

Revision History.docx

---

© 2012 The Hospital for Sick Children ('SickKids'). All Rights Reserved. This document may be reproduced or used strictly for non-commercial clinical purposes. However, by permitting such use, SickKids does not grant any broader license or waive any of its exclusive rights under copyright or otherwise at law; in particular, this document may not be used for publication without appropriate acknowledgement to SickKids. This Clinical Practice Guideline has been developed to guide the practice of clinicians at the Hospital for Sick Children. Use of this guideline in any setting must be subject to the clinical judgment of those responsible for providing care. SickKids does not accept responsibility for the application of this guideline outside SickKids.