### Inclusion Criteria
- Pre-op and post-op patients with presumed and confirmed non-hematogenous malignancy requiring inpatient admission (Surgical or Hematology/Oncology service)
  - With or without chemotherapy exposure
  - Any size resection, including biopsy

### Exclusion Criteria
- Neutropenia (ANC <500 cells/mm³)
- Outpatient surgical procedures
- Central line insertions only
- Neurosurgery patients
- Confirmed leukemia or lymphoma

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**Patient with solid tumor**

**Biopsy/Minor Procedure or Resection/Major Procedure?**

**Biopsy/Minor Procedure**
- Surgery coordinator schedules surgical sub-specialty visits
- Surgical sub-specialty clinic visit
- Consult surgical sub-specialty service
- Surgery Coordinator schedules OR date and ICU bed, if needed

**Resection/Major Procedure**
- Surgeon initiates the Checklist/PowerForm in the Cancer PRE-OP Checklist Plan
- Consult Surgical sub-specialty, Pain team, and Anesthesia
- Surgery Coordinator schedules OR date and ICU bed, if needed
- Complete Checklist/PowerForm:
  - Surgery - PASS
  - Pain - HemOnc
- Surgeon validates that PowerForm is complete

**Pre-Op Review:**
- OR Tech/Scrub
- Surgical Team checks to see if any of the following are needed:
  - Blood for OR
  - Equipment

**Ready for OR?**

**Able to Get What is Needed?**

**GO TO**

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**Summary of Version Changes**

**Approval & Citation**

**Explanation of Evidence Ratings**

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Last Updated: June 2018
Next Expected Review: June 2023
Post Operative Management

Inclusion Criteria
- Pre-op and post-op patients with presumed and confirmed non-hematogenous malignancy requiring inpatient admission (Surgical or Hematology/Oncology service)
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Medications
- Anti-emetics
- Home medications, as needed
- Bowel regimen

Pain Medications
- Acetaminophen scheduled
- Other post-op pain management per Pain Service

Other
- Vitals & I/Os
- VTE prophylaxis

Post Op Procedure
- Examples: chest tube removal, drain removal, dressing changes

Post Op Pain Management
- Consult Child Life, if appropriate
- Consider anxiolytics and/or analgesics (e.g. topical anesthetics, non-opioids, and opioids) for patients with a past history of procedural anxiety.
- Consult Pain Service if history of pain related anxiety or pain related issue.

Patient Discharge Instructions
- Follow-up with surgical sub-specialty
- Follow-up with HemOnc
- Call or return to ED for
  - Fever
  - Wound issues
- Outpatient ambulatory follow up (Pain clinic, PT, OT, Nutrition)
- Activities

Discharge Criteria
- No increased incision redness or pain
- Pain controlled without IV meds >4 hours
- Pain score <3 for last 4 hours
- Maintaining hydration orally/enterally
- Tolerates diet without emesis for 4 hours
- Urine output 1mL/kg/hour if ≤2 years, output 0.5mL/kg/hour ≥2 years
- Appropriate follow-up arranged
- Prescriptions available for pick-up
- Patient education provided

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Last Updated: June 2018
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**Fever management:**
- Use **acetaminophen** for fever management after cultures and temperature have been obtained.
- **Non-steroidal anti-inflammatory drugs (NSAIDs)** are CONTRAINDIATED.
- No rectal temperatures.

**Inclusion Criteria**
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**Fever Definition**
- Temp ≥ 38.3°C once OR
- Temp ≥ 38°C for > 1 hour

**Signs of Sepsis?**
- NO
- YES

**Put patient on Septic Shock Pathway**
- Off Pathway

**Central Line Present?**
- NO
- YES

**Lab Tests / Other Diagnostics as indicated based on symptoms and physical exam**

**Lab Tests**
- Blood
- Other Diagnostics as indicated based on symptoms and physical exam

**Other Dianostics and Interventions to consider**
- Urinalysis and culture
- Rapid respiratory viral panel if symptoms
- Sputum culture if productive cough
- Wound culture if drainage present
- Chest X-ray if clinical findings suspicious of pneumonia
- Lower extremity doppler if deep venous thrombosis suspected (e.g., swelling, calf tenderness)
- Consider removing foreign bodies (e.g., Foley catheters, epidural catheters) as soon as feasible in the setting of fever

**Testing indicative of infection?**
- NO
- YES

**Consult Infectious Diseases if ceftriaxone is continued >48 hours**

**Fever Definition**
- Temp ≥ 38.3°C once OR
- Temp ≥ 38°C for > 1 hour

**Absolute Neutrophil Count (ANC) < 200 cells/mm³?**
- YES
- NO

**Definitive Antibiotic Treatment**
- Tailor antibiotic therapy to the narrowest effective agent for an appropriate duration based on positive cultures identified or other diagnostic evidence of infection
- For central catheter-related infections see HOBSE pathway

**Other Diagnostics and Interventions to consider**
- Urinalysis and culture
- Rapid respiratory viral panel if symptoms
- Sputum culture if productive cough
- Wound culture if drainage present
- Chest X-ray if clinical findings suspicious of pneumonia
- Lower extremity doppler if deep venous thrombosis suspected (e.g., swelling, calf tenderness)
- Consider removing foreign bodies (e.g., Foley catheters, epidural catheters) as soon as feasible in the setting of fever

**Antimicrobials:**
- Start ceftriaxone for empiric coverage. Do not delay first dose for any diagnostic evaluations with the exception of blood cultures
- Discontinue other perioperative antibiotics
- For post-op head and neck surgery, add clindamycin
- For post-op abdominal surgery, add metronidazole

**Cultures positive?**
- NO
- YES

**Put patient on HOBSE Pathway**
- Off Pathway

**Definitive Antibiotic Treatment**
- Tailor antibiotic therapy to the narrowest effective agent for an appropriate duration based on positive cultures identified or other diagnostic evidence of infection
- For central catheter-related infections see HOBSE pathway

**Consult Infectious Diseases if ceftriaxone is continued >48 hours**

**Lab Tests / Other Diagnostics as indicated based on symptoms and physical exam**

**Lab Tests**
- Blood
- Other Diagnostics as indicated based on symptoms and physical exam

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- NO
- YES

**Put patient on Septic Shock Pathway**
- Off Pathway
The original pathway was entitled Post-op Tumor Resection Fever Pathway and focused solely on standardizing post-op management of fever in patients that had previously been treated with chemotherapy.

With approximately 25-50 patients annually, the pathways was effective in insuring that patients received antibiotics and blood cultures in a timely fashion.

During the pathway’s original run, there were some changes along the way such as altering the antibiotics regimen – in general the pathway was well received.

There was a perceived need to try to address larger issues in this patient population: pre-operative consults, equipment planning, ordering of blood products, post-operative analgesia, and routine post-operative orders.

It was from this need that this current iteration of the pathway was generated – applying not only to those that had or did not have pre-operative chemotherapy.
New to this pathway is the development of a PowerForm that is intended to place all of the pertinent perioperative plans on one form for ease of use. There are some important aspects that need to be called out:

- The PowerForm is intended to be used for those patients having a Major Resection/Procedure. As such, it is designed to have patients evaluated by the pain service to plan for post-op analgesia and anesthesia to plan for anesthesia on the day of the procedure. Those patients having minor procedures such as a small biopsy are not anticipated to need pain or anesthesia planning.

- The PowerForm must be initiated so all providers can fill their respective portion. In general, the surgery team will initiate the PowerForm however, any provider may do so as the order in which the patient will be evaluated is not anticipated to be a linear flow.

- It is however the responsibility of the Surgery team to insure that the PowerForm has been completed PRIOR to the day of surgery. This is to optimally plan the day of surgery and post-operative management.
**NSAIDs**
The patients included in this pathway will be those having a possible diagnosis of a malignancy and will be undergoing a surgical procedure. The expectation is that these patients will need medications to provide post-operative analgesia.

NSAIDs are not recommended for this patient population as they have anticoagulative properties that may increase bleeding and antipyrexic properties that may mask fevers. It is however recognized that some patients may benefit from these medications – such discussions should be made jointly with Hem/Onc, Pain Team, and the Surgical Service.

**Acetaminophen**
The patients included in this pathway will be those having a possible diagnosis of a malignancy and will be undergoing a surgical procedure. The expectation is that these patients will need medications to provide post-operative analgesia.

Acetaminophen until recently has been limited in us for patients less than 1 year of age and for only the first 24 hours post procedure to try to reduce the use of narcotics. However, it is recognized that this reduction of narcotics is important and so the use of acetaminophen is now being expanded to include all ages with no set duration. Further, while providing analgesia, it is known to also be an antipyretic medication and so to avoid masking a fever, a temperature needs to be taken prior to administration of this medication. If there is a fever, please initiate the fever phase of this Powerplan.
Post-Op Antibiotics Recommendations

**Recommendations:**
- Antibiotic prophylaxis is not recommended beyond standard pre- and intra-operative dosing for patients undergoing surgical procedures. (Guideline)
- Prolonged antibiotic prophylaxis is not recommended for patients with a surgical drain in place. (Guideline)

**Evidence Synthesis:**
In a large meta-analysis of 69 RCTs and over 21000 patients, there was no significant difference in the incidence of post-operative surgical site infections in patients who received a prolonged postoperative antibiotic course versus those who received a single dose of antibiotics [LOE: moderate quality; (National Guideline Clearinghouse, 2016)].

The same guideline panel reviewed 7 RCTs that addressed the role of prolonged antibiotic prophylaxis in patients with surgical drains in place and showed that there was no benefit in terms of reducing surgical site infections when compared to patients who received a single dose pre-operatively [LOE: low quality; (National Guideline Clearinghouse, 2016)].
Patients with malignancy and who have surgery are a unique group.

Hematology/Oncology Bloodstream Infection (HOBSI) Definition: Fever (Temp ≥ 38.3°C, or greater than 38°C for more than 1 hour)
Why is fever management different for patients who have been treated with chemotherapy?

It is known that chemotherapy can have an inhibitory effect on antibacterial, antiviral, and antimycotic immune responses. The surgical oncology patient, although not usually neutropenic at the time of surgery, is likely immunosuppressed owing to prior chemotherapies. Pediatric oncology patients therefore may be at a higher risk than the general population to acquire an infection in the postoperative period. This risk is compounded by several factors: a lower baseline performance status, malnourishment, altered gastrointestinal mucosa, lengthy and complicated surgeries, indwelling central venous catheters (CVC), and gastrointestinal tubes. Special consideration needs to be taken when caring for surgical oncology patients. LOE: [E (Expert Opinion), (Hendershot, et al. 2009)]
Cancer PERI-OP Approval and Citation

Approved by the CSW Cancer PERI-OP team for June 26, 2018

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Please cite as:
Version 1.0 (6/26/18): Created Cancer Pre-Op Phase and Post-Op Plan to algorithm and updated the Post-Op Tumor Resection Fever Management algorithm, including it as a phase of the Cancer PERI-OP Pathway and PowerPlan. Also, implemented a Cancer Pre-Op Checklist Plan to initiate a PowerForm Checklist, which creates a post-op plan for Surgery, Pain, PASS/Anesthesia, HemOnc, and Orthopedics.
Medical Disclaimer

Medicine is an ever-changing science. As new research and clinical experience broaden our knowledge, changes in treatment and drug therapy are required.

The authors have checked with sources believed to be reliable in their efforts to provide information that is complete and generally in accord with the standards accepted at the time of publication.

However, in view of the possibility of human error or changes in medical sciences, neither the authors nor Seattle Children’s Healthcare System nor any other party who has been involved in the preparation or publication of this work warrants that the information contained herein is in every respect accurate or complete, and they are not responsible for any errors or omissions or for the results obtained from the use of such information.

Readers should confirm the information contained herein with other sources and are encouraged to consult with their health care provider before making any health care decision.
This pathway was developed through local consensus based on published evidence and expert opinion as part of Clinical Standard Work at Seattle Children’s. Pathway teams include representatives from Medical, Subspecialty, and/or Surgical Services, Nursing, Pharmacy, Clinical Effectiveness, and other services as appropriate.

When possible, we used the GRADE method of rating evidence quality. Evidence is first assessed as to whether it is from randomized trial or cohort studies. The rating is then adjusted in the following manner (from: Guyatt G et al. J Clin Epidemiol. 2011;4:383-94.):

Quality ratings are **downgraded** if studies:
- Have serious limitations
- Have inconsistent results
- If evidence does not directly address clinical questions
- If estimates are imprecise OR
- If it is felt that there is substantial publication bias

Quality ratings are **upgraded** if it is felt that:
- The effect size is large
- If studies are designed in a way that confounding would likely underreport the magnitude of the effect OR
- If a dose-response gradient is evident

Guideline – Recommendation is from a published guideline that used methodology deemed acceptable by the team.

Expert Opinion – Our expert opinion is based on available evidence that does not meet GRADE criteria (for example, case-control studies).
**Literature Search Strategy**

Studies were identified by searching electronic databases using search strategies developed and executed by a medical librarian, Susan Groshong. Searches were performed in July, 2017, in the following databases – on the Ovid platform: Medline, Cochrane Database of Systematic Reviews and Cochrane Central Register of Controlled Trials; elsewhere: Embase, National Guideline Clearinghouse, TRIP and Cincinnati Children’s Evidence-Based Recommendations. Additional searches were completed in CINAHL, Nursing+ and RNAO Best Practice Guidelines for one clinical question. In Medline and Embase, appropriate Medical Subject Headings (MeSH) and Emtree headings were used respectively, along with text words, and the search strategy was adapted for other databases using text words. Concepts searched were antibiotic prophylaxis, postoperative fever etiology and diagnosis, use of antipyretics and NSAIDs for chemotherapy patients, procedural pain analgesic and distraction therapies, and parenteral nutrition. Retrieval was limited to 2007 to current, ages 0-18, English language and to certain evidence categories, such as relevant publication types, index terms for study types and other similar limits. The search was broadened to human (no age limits) for one clinical question. Additional articles were identified by team members and added to results.

November 17, 2017

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**Flow diagram adapted from Moher D et al. BMJ 2009;339:bmj.b2535**


