

**TEXAS CHILDREN'S HOSPITAL**  
**EVIDENCE-BASED OUTCOMES CENTER**  
**Infection Prevention in the Pediatric Patient with Neutropenia**  
**Evidence Summary**

**Inclusion Criteria**

- Patients ≤ 21 years of age with neutropenia, regardless of etiology, who are being treated in the inpatient setting

**Exclusion Criteria**

- Pregnancy
- Patients with severe primary and other immune deficiency (These patients may have neutropenia but need protective isolation)

**Background**

Pediatric patients with neutropenia are at a high risk of morbidity and mortality as a result of infections given their immunocompromised status. In this review, the content expert team critically reviewed the evidence on strategies to prevent infection in infants, children, and young adults (≤ 21 years of age) with neutropenia, focusing on personal protective equipment and diet modifications, both commonly referred to as “neutropenic precautions” or the “neutropenic diet”. An internal survey revealed that there was marked variability in the perception of “neutropenic precautions” across the institution, and this survey highlighted the need to critically appraise the evidence and help to standardize the approach from the institution’s perspective. This review did not include infection prevention strategies outside the hospital setting or other modifications to the environment apart from personal protective equipment and diet modifications for patients with neutropenia.

**Critically Analyze the Evidence**

The **GRADE criteria** were used to evaluate the quality of evidence presented in research articles reviewed during the development of this guideline. The table below defines how the quality of evidence is rated and how a strong versus a weak recommendation is established.

Recommendation	
<b>STRONG</b>	Desirable effects clearly outweigh undesirable effects or vice versa
<b>WEAK</b>	Desirable effects closely balanced with undesirable effects
Quality	Type of Evidence
<b>High</b>	Consistent evidence from well-performed RCTs or exceptionally strong evidence from unbiased observational studies
<b>Moderate</b>	Evidence from RCTs with important limitations (e.g., inconsistent results, methodological flaws, indirect evidence, or imprecise results) or unusually strong evidence from unbiased observational studies
<b>Low</b>	Evidence for at least 1 critical outcome from observational studies, from RCTs with serious flaws or indirect evidence
<b>Very Low</b>	Evidence for at least 1 critical outcome from unsystematic clinical observations or very indirect evidence

**Critical Points of Evidence\***

***Evidence Against***

- The use of a restrictive “neutropenic” diet to prevent infections. (Moody, Taggart, Van Dalen) – Strong recommendation, moderate quality evidence

**Remarks:** Adherence to the [Safe-Food Handling Guidelines](#) issued by the US Food and Drug Administration should reduce exposure to food-borne illnesses. These recommendations include washing hands and surfaces often, separating raw meats from other foods, cooking foods to the right temperature, promptly refrigerating foods, and washing all fresh fruits and vegetables. Other measures include avoidance of buffet-style restaurants and ensuring all food prepared from a restaurant is well-cooked, dairy products are pasteurized, and lunch meat is heated prior to consumption.

***Consensus Recommendation***

- To adhere to standard precautions or transmission-based precautions (i. e., droplet, contact, airborne, or special) as indicated to prevent infections in pediatric patients with chemotherapy-induced neutropenia (Tramsen), neutropenia and bone marrow transplant. (Libbrecht), neonates, patients with solid organ transplant (Slota), and patients with neutropenia of other etiologies.– Consensus recommendation

**Remarks:** There is insufficient data to suggest that neutropenic precautions in the inpatient setting have an impact on hospital-acquired infections or cost, and the content expert team felt that no additional interventions apart from standard precautions or transmission-based precautions were needed.

**Good Practice Statement**

- To avoid other potential interventions that could potentially put the patient at risk, such as rectal temperatures, enemas, suppositories, rectal exams, indwelling urine catheters. Minimize invasive procedures as appropriate, and restrict any sick contacts (either visitors or staff). Adhere to proper hand hygiene practices. –Consensus recommendation

**Remarks:** Although Hematology or Oncology patients may be neutropenic, intermittent catheterization for neurogenic bladder and/or rectal stimulation for neurogenic bowel are as per Pediatric Rehabilitation National Guidelines. Patients may be discussed on a case-by-case basis if these practices have greater than normal risk."

\*NOTE: The references cited represent the entire body of evidence reviewed to make each recommendation.

**References**

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- Slota, M., Green, M., Farley, A., Janosky, J., Carcillo, J. (2001). The role of gown and glove isolation and strict handwashing in the reduction of nosocomial infection in children with solid organ transplantation. *Pediatric Critical Care*, 29(2), 405-412.

**Clinical Standards Preparation**

This clinical standard was prepared by the Evidence-Based Outcomes Center (EBOC) team in collaboration with content experts at Texas Children's Hospital. Development of this clinical standard supports the TCH Quality and Patient Safety Program initiative to promote clinical standards and outcomes that build a culture of quality and safety within the organization.

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No relevant financial or intellectual conflicts to report.

**Development Process**

This clinical standard was developed using the process outlined in the EBOC Manual. The literature appraisal documents the following steps:

1. Review Preparation
  - PICO questions established
  - Evidence search confirmed with content experts
2. Review of Existing External Guidelines
  - Centers for Disease Control and Prevention Guideline for Isolation Precautions: Preventing transmission of Infectious agents in Healthcare 2007
  - Infectious Disease Society of America Clinical Practice Guideline for the Use of Antimicrobial Agents in Neutropenic Patients with Cancer: 2010 Update by the Infectious Diseases Society of America 2011
  - Association of Pediatric Hematology/Oncology Nurses Guideline for the Management of Fever and Neutropenia in Children with

Cancer and/or Undergoing Hematopoietic Stem Cell Transplantation 2014

- Oncology Nursing Society Evidence Based Clinical Guideline Review PEP Topic: Prevention of Infection 2018
- Infectious Disease Society of America Outpatient Management of Fever and Neutropenia in Adults Treated for Malignancy 2018

3. Literature Review of Relevant Evidence
  - Searched: Cochrane, PubMed, CINAHL, Embase
4. Critically Analyze the Evidence
  - One meta-analysis, one randomized **controlled** trial, and one nonrandomized study.
5. Summarize the Evidence
  - Materials used in the development of the clinical standard, literature appraisal, and any order sets are maintained in an Infection Prevention in the Pediatric Patient with Neutropenia evidence-based review manual within EBOC.

**Evaluating the Quality of the Evidence**

Published clinical guidelines were evaluated for this review using the **AGREE II** criteria. The summary of these guidelines are included in the literature appraisal. AGREE II criteria evaluate Guideline Scope and Purpose, Stakeholder Involvement, Rigor of Development, Clarity and Presentation, Applicability, and Editorial Independence using a 4-point Likert scale. The higher the score, the more comprehensive the guideline.

This clinical standard specifically summarizes the evidence *in support of* or *against* specific interventions and identifies where evidence is *lacking/inconclusive*. The following categories describe how research findings provide support for treatment interventions.

**"Evidence Supports"** provides evidence to support an intervention

**"Evidence Against"** provides evidence against an intervention.

**"Evidence Lacking/Inconclusive"** indicates there is insufficient evidence to support or refute an intervention and no conclusion can be drawn *from the evidence*.

The **GRADE** criteria were utilized to evaluate the body of evidence used to make practice recommendations. The table below defines how the quality of the evidence is rated and how a strong versus weak recommendation is established. The literature appraisal reflects the critical points of evidence.

Recommendation	
<b>STRONG</b>	Desirable effects clearly outweigh undesirable effects or vice versa
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**Recommendations**

Practice recommendations were directed by the existing evidence and consensus amongst the content experts. Patient and family preferences were included when possible. The Content Expert Team and EBOC team remain aware of the controversies in infection prevention in pediatric patients with neutropenia. When

evidence is lacking, options in care are provided in the clinical standard and the accompanying order sets (if applicable).

#### **Approval Process**

Clinical standards are reviewed and approved by hospital committees as deemed appropriate for its intended use. Clinical standards are reviewed as necessary within EBOC at Texas Children's Hospital. Content Expert Teams are involved with every review and update.

#### **Disclaimer**

Practice recommendations are based upon the evidence available at the time the clinical standard was developed. Clinical standards (guidelines, summaries, or pathways) do not set out the standard of care and are not intended to be used to dictate a course of care. Each physician/practitioner must use his or her independent judgment in the management of any specific patient and is responsible, in consultation with the patient and/or the patient's family, to make the ultimate judgment regarding care.

#### **Version History**

<b>Date</b>	<b>Comments</b>
Nov 2019	Document creation