

Prevention of Overwhelming Postsplenectomy Infection in Adults

Introduction

The spleen is the largest lymphatic organ in the body and its primary functions are to filter damaged red blood cells and micro-organisms from the blood and to aid in the production of antibodies to enhance the immune response.¹ Asplenic patients or patients who suffer from functional asplenia have an increased risk of infection and are at risk of contracting a syndrome known as overwhelming postsplenectomy infection (OPSI).² Overwhelming postsplenectomy infection has been defined as "septicaemia and/or meningitis, usually fulminant but not necessarily fatal, occurring at any time after removal of the spleen".³ The incidence of OPSI has been difficult to establish due to a wide variation in occurrence rates among different groups of patients, but lifetime risk has been estimated at 5%.² Risk of OPSI has been found to be dependent on age at which splenectomy occurs, time interval from splenectomy, cause for asplenia and immune status of the patient.⁴ Although the incidence of OPSI is low, the estimated mortality is high (38 – 69%).² Therefore, prevention and early identification of OPSI have been identified as key strategies to improve patient outcome.² Some of the current strategies being used and recommended to decrease a patient's risk of OPSI include vaccination, communication of hyposplenic state to other healthcare providers and patient education.^{1,2,5} In addition, some groups recommend either short term or lifelong prophylactic antibiotics to reduce the risk of OPSI.⁸ However, the use of antibiotics for the prevention of OPSI is often limited by poor compliance and antibiotic resistance; therefore, its use should be assessed on a case-by-case basis.⁸ Recommendations from the Canadian Pediatric Society include the administration of prophylactic antibiotics until the patient is 60 months of age with consideration to be given for lifelong prophylaxis.¹⁴ Experts and some guidelines also recommend that patients have a home supply of antibiotics for urgent use.^{15,16}

The Provincial Anti-infective Stewardship Committee (ASC) has prepared resources to facilitate recommended vaccination orders, vaccine distribution, patient education and communication to the primary care provider. Recommendations regarding the prophylactic or as needed use of antibiotics are beyond the scope of these guidelines, please consult a local infectious disease specialist for recommendations.

Vaccinations

Asplenic patients are at risk of OPSI with any micro-organism but particularly encapsulated bacteria such as *Streptococcus pneumoniae*, *Haemophilus influenzae* and *Neisseria meningitidis*.^{2,4} Encapsulated bacteria are more difficult for the body to clear because they resist antibody binding and their clearance is primarily completed by the spleen.⁴ Therefore, it is important that attention be paid to providing optimal protection against encapsulated bacteria using appropriate immunizations.⁶ The National Advisory Committee on Immunization (NACI) and the Canadian Immunization Guideline currently recommend the following vaccines for adult asplenic or hyposplenic patients: pneumococcal 13-valent conjugate vaccine (PNEU-C-13), pneumococcal 23-valent polysaccharide vaccine (PNEU-P-23), *Haemophilus influenzae* type b conjugate (Hib) vaccine, meningococcal ACYW-135 conjugate (Men-C-ACYW) vaccine, all routine immunizations and yearly influenza vaccine.^{6,7} NACI also recommends multi-component meningococcal serogroup B (4CMenB) vaccination for active immunization of patients with anatomical or functional asplenia who are greater than 2 months of age.¹¹

Streptococcus pneumoniae is responsible for 50 – 90% of all cases of OPSI.⁴ Pneumococcal polysaccharide vaccine (PNEUMOVAX 23) provides protection against 23 serotypes of *Streptococcus pneumoniae* and is the vaccine of choice for adult patients at high risk of invasive pneumococcal disease (IPD).⁶ The pneumococcal polysaccharide vaccine has been found to have an efficacy of 50 to 80% against IPD among the elderly and high risk groups.⁶ However, after immunization with PNEU-P-23 vaccine, antibody levels begin to decline after 5 to 10 years and the duration of immunity is unknown.⁶ In an effort to improve the duration of immunity the current NACI guidelines recommend for adults with asplenia or hyposplenia one dose of PNEU-C-13 vaccine (PREVNAR 13) followed at least 2 months later by one dose of PNEU-P-23 vaccine.⁶ If PNEU-P-23 vaccine has been previously received, then wait 1 year before giving PNEU-C-13 vaccine.¹⁰ In the case where only one vaccine can be given then it should be the PNEU-P-23 vaccine. A single booster of PNEU-P-



23 vaccine is recommended 5 years after the initial dose.⁶ Due to the increased risk of invasive pneumococcal disease and rapid decline in antibodies following PNEU-P-23 vaccination, patients age 65 years and over, regardless of previous vaccination history, should receive one dose of PNEU-P-23 vaccine as long as 5 years have passed since the previous PNEU-P-23 vaccine dose.¹² The Center for Disease Control and Prevention's Advisory Committee on Immunization Practices released a statement in October 2012 with similar recommendations for all adult patients 19 years of age or greater.¹⁰

A single dose of *Haemophilus influenzae* type b (Hib) conjugate vaccine is recommended in all patients who are functionally or anatomically asplenic and greater than 5 years of age regardless of previous Hib immunization.^{5,6} Current Hib vaccine should be given at least one year after any previous dose.⁶ This is despite limited efficacy data and a low overall risk of *Haemophilus influenzae* sepsis in patients greater than 5 years of age.⁶

Meningococcal ACYW-135 conjugate vaccine, **MENACTRA** or **MENVEO**, is recommended for all groups at high risk of invasive meningococcal infection when long-term protection is required.^{6,7} MENVEO (Men-C-ACYW-CRM) has the A, C, Y and W-135 serogroup oligosaccharides conjugated to the CRM₁₉₇ protein.^{6,13} Men-C-ACYW-CRM (MENVEO) can be administered concomitantly with routine childhood vaccines but further studies are needed with respect to concomitant administration with other CRM₁₉₇ conjugate vaccines such as the pneumococcal 13-valent conjugate vaccine (PREVNAR); therefore, Men-C-ACYW-CRM vaccine has been left off the clinical order set to avoid this concomitant administration.^{6,13} Recommendations are to give 2 doses of meningococcal ACYW-135 conjugate vaccine at least 8 weeks apart for patients with anatomic or functional asplenia between the ages of 1 – 55.⁶ Based on limited evidence and expert opinion, current NACI guidelines recommend that 2 doses of meningococcal ACYW-135 conjugate vaccine given 8 weeks apart is also appropriate for individuals greater than 55 years of age, despite lacking authorization for use in this age group.^{6,7} Booster doses are recommended every 3 - 5 years in individuals vaccinated at 6 years of age or younger and every 5 years for individuals vaccinated at greater than 6 years of age.⁶ Multi-component meningococcal serogroup B (4CMenB) vaccine (**BEXSERO**) given as a 2 dose series 4 weeks apart is also recommended.¹¹

In addition, all routine immunizations and yearly influenza vaccination should be given as there are no contraindications to the use of any vaccine in patients with functional or anatomical hyposplenia.⁶ When an elective splenectomy is planned, the necessary vaccines are recommended to be given two weeks before removal of the spleen.⁶ In the case of an emergent splenectomy, vaccines should be given two weeks post-splenectomy or prior to hospital discharge if there is a concern that the patient may not return for vaccination.⁶

Asplenic patients are at increased risk of travel related infectious diseases, including malaria and babesiosis.⁹ Expert advice should be sought prior to travel to endemic areas.

Patient Education

Education has also been cited as an essential component for successful prevention of OPSI.² Patients should be educated regarding their increased risk of developing life threatening sepsis, what to do at the first sign of infection, to inform all healthcare providers of their hyposplenic state and to take appropriate precautions to prevent OPSI.² Education may be provided through thorough discussion and provision of appropriate reading materials.²

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References:

1. Jones P, Leder K, Woolley I, et al. Postsplenectomy Infection: Strategies For Prevention In General Practice. Australian Family Physician 2010; 39(6):383-386
2. Moffett S. Overwhelming postsplenectomy infection: Managing Patient's at risk. JAAPA 2009; 22(7):36-39
3. Waghorn DJ. Overwhelming Infection in Asplenic Patients: Current Best Practice Measures Are Not Being Followed. J Clin Pathol 2001; 54:214-218
4. Okabayashi T, Hanazaki K. Overwhelming Postsplenectomy Infection Syndrome in Adults—A Clinically Preventable Disease. World J Gastroenterol 2008;14(2):176-179
5. Spelman D, Buttery J, Daley A, Isaacs D, Jennens I, Kakakios A, Lawrence R, Roberts S, Torda A, Watson D, Woolley I, Anderson T, Street A. Guidelines for the Prevention of Sepsis in Asplenic and Hyposplenic Patients. Int Med Journal 2008;38:349-356
6. National Advisory Committee on Immunization (NACI). Canadian Immunization Guide. Ottawa (ON): Public Health Agency of Canada <http://www.phac-aspc.gc.ca/naci-ccni/index-eng.php> Accessed January 3rd, 2017
7. National Advisory Committee on Immunization (NACI). Statement on Conjugate Meningococcal Vaccine for Serogroups A, C, Y and W135. Can Commun Dis Rep 2007; 33;(ACS-3):1-24
8. Sabatino AD, Carsetti R, Corazza GR. Post-Splenectomy and Hyposplenic States. Lancet. 2011 Apr 5. [Epub ahead of print] doi:10.1016/S0140-6736(10)61493-6

9. Watson D. Pretravel Health Advice for Asplenic Individuals. *J Travel Med* 2003; 10:117-121
10. Use of 13-valent Pneumococcal Conjugate Vaccine and 23-Valent Pneumococcal Polysaccharide Vaccine for Adults with Immunocompromising conditions: Recommendations of the Advisory Committee on Immunization Practices. *Morbidity and Mortality Weekly Report* 61(40):816-819 October 12, 2012
11. National Advisory Committee on Immunization (NACI). Advice for the use of the Multicomponent Meningococcal Serogroup B (4CMenB) Vaccine: An Advisory Committee Statement (ACS) National Advisory Committee on Immunization (NACI). April 2014
12. National Advisory Committee on Immunization (NACI). Re-Immunization with Polysaccharide 23-Valent Pneumococcal Vaccine (Pneu-P-23): An Advisory Committee Statement (ACS) – National Advisory committee on Immunization (NACI). July 2016
13. National Advisory Committee on Immunization (NACI). Update on the use of quadrivalent conjugate meningococcal vaccines. *Canada Communicable Disease Report* Vol 39. January 2013
14. Salvadori MI, Price VE; Canadian Paediatric Society, Infectious Diseases and Immunization Committee. Preventing and treating infections in children with asplenia or hyposplenia. *Paediatr Child Health* 2014;19:271-8.
15. Davies JM, Lewis MP, Wimperis J, et al.; British Committee for Standards in Haematology. Review of guidelines for the prevention and treatment of infection in patients with an absent or dysfunctional spleen: prepared on behalf of the British Committee for Standards in Haematology by a working party of the Haemato-Oncology task force. *Br J Haematol* 2011;155:308-17.
16. Solverson KJ, Doig CJ. A fatal case of pneumococcal sepsis years after splenectomy. *CMAJ*. 2017 Jun 12;189(23):E800-E802. doi: 10.1503/cmaj.160455.



****The following clinical order set is provided as a sample only and would have to be modified to an individual zone's format for local use****

Clinical Order Set

Post-Splenectomy Vaccinations – Adult

Provincial Anti-infective Stewardship Committee

Patient: _____

Allergies: _____

INSTRUCTIONS

1. The following orders will be carried out by a nurse **only** on the **authority of a physician/nurse practitioner**.
2. A bullet preceding an order indicates the order is standard and should always be implemented.
3. A check box preceding an order indicates the order is optional and must be checked off to be implemented.
4. Applicable boxes to the right of an order must be checked off and initialed by the person implementing the order.
5. Date and time of administration must be recorded

Contraindications
<ul style="list-style-type: none"> Hypersensitivity to any vaccine component Anaphylactic reaction to previous dose of any of the vaccines listed below
Vaccinations (if not received pre-operatively for elective surgeries or if not received previously)
<ul style="list-style-type: none"> <i>Haemophilus influenzae</i> type b conjugate vaccine (ACT-HIB) 0.5 mL intramuscularly in deltoid Meningococcal ACYW-135 conjugate vaccine (MENACTRA) 0.5 mL intramuscularly in deltoid (additional dose of meningococcal ACYW-135 conjugate vaccine required in 2 months followed by a booster every 5 years) Multicomponent Meningococcal Serogroup B (4CMenB) Vaccine (BEXSERO) 0.5 mL intramuscularly in the deltoid (additional dose of Multicomponent Meningococcal Serogroup B (4CMenB) Vaccine required in 1 month) <p><u>Pneumococcal Vaccination:</u></p> <p><input type="checkbox"/> If pneumococcal 23-valent polysaccharide vaccine (PNEUMOVAX 23) not previously received <u>or</u> received greater than one year ago then give Pneumococcal 13-valent conjugate vaccine (PREVNAR 13) 0.5 mL intramuscularly in deltoid (Pneumococcal 23-valent polysaccharide vaccine (PNEUMOVAX 23) required 8 weeks later if not <u>previously received</u>. Single lifetime booster of Pneumococcal 23-valent polysaccharide (PNEUMOVAX 23) required 5 years after first dose.)</p> <p style="text-align: center;">OR</p> <p><input type="checkbox"/> If Pneumococcal 23-valent polysaccharide vaccine (PNEUMOVAX 23) previously received but less than one year ago then wait 1 year from that date to give Pneumococcal 13-valent conjugate vaccine (PREVNAR 13). Single lifetime booster of Pneumococcal 23-valent polysaccharide (PNEUMOVAX 23) required 5 years after first dose.</p> <ul style="list-style-type: none"> Seasonal Influenza Vaccine (if not already received)
Notes
<p>-Vaccinations should be given two weeks post-operatively or on hospital discharge if there is a concern that he or she might not return for vaccination.</p> <p>-All vaccinations may be administered simultaneously. Separate syringes and separate injection sites should be used if more than one vaccine is administered on the same day.</p>

Adapted with permission from Antimicrobial Handbook-2010 Capital Health, Nova Scotia

Revised and Approved September 2017

Adult Splenectomy Vaccines

Documentation for Primary Care Provider and Public Health

Please complete and forward to patient's primary care provider and local Public Health office on discharge.

From: _____	
Phone: _____	Fax: _____

To: _____
Fax #: _____

To: Local Public Health Office Fax
#: _____

Re. Patient Name: _____
HCN: _____
D.O.B: _____

Asplenic patients are known to be at risk of infection, and are particularly susceptible to encapsulated organisms. Vaccinations are recommended to reduce the risk of infection in this patient population.

Your patient received the following vaccinations while in hospital after splenectomy. Please update your records, and note the patient's need for future vaccinations.

Meningococcal ACYW-135 conjugate vaccine (MENACTRA)

(2 doses, 2 months apart)

Date 1 st dose given:	Lot#:	Dose:	Administration Site:
Date 2 nd dose given:	Lot#:	Dose:	Administration Site:

A booster is recommended every 5 years

Multicomponent Meningococcal Serogroup B (4CMenB) Vaccine (BEXSERO)

(2 doses, 1 month apart)

Date 1 st dose given:	Lot#:	Dose:	Administration Site:
Date 2 nd dose given:	Lot#:	Dose:	Administration Site:

Haemophilus influenzae type b conjugate vaccine (ACT-HIB)

Date given:	Lot#:	Dose:	Administration Site:
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Pneumococcal 13-valent conjugate vaccine (PREVNAR 13)

Date given:	Lot#:	Dose:	Administration Site:
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Pneumococcal polysaccharide vaccine (PNEUMOVAX 23) due 8 weeks after pneumococcal 13-valent conjugate vaccine (PREVNAR 13)

Date given:	Lot#:	Dose:	Administration Site:
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A single booster dose of pneumococcal polysaccharide vaccine is recommended after 5 years.

- Yearly influenza vaccine recommended.

If you have any questions regarding these vaccinations please call the numbers above, or contact the Department of Public Health for further information.

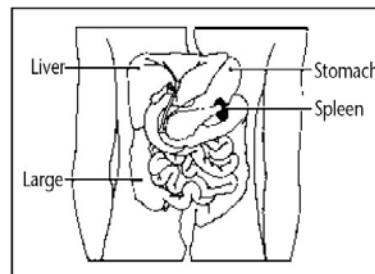
Thank you.

This message is CONFIDENTIAL. If you received this fax by mistake, please notify us immediately.

Splenectomy Information for Patients

Role of the spleen:

- The spleen has many functions, including removal of damaged blood cells. It also plays an important role in removal of certain types of bacteria.
- The spleen may be removed (*splenectomy*) if it becomes overactive, stops working or is ruptured in an accident.



Life without a spleen:

- Adults can live a normal life without a spleen. However, you may be at risk of developing infections caused by certain types of bacteria which are normally removed by the spleen.
- The most serious possible infection is called overwhelming post-splenectomy infection (OPSI). This infection is rare, but can progress rapidly and may result in the loss of limbs or death.

How to reduce the risk of infection:

- Inform all doctors, dentists and other health care professionals that you do not have a spleen.
- A series of vaccinations is recommended for patients who have their spleen removed. These vaccines are two doses of meningococcal quadrivalent conjugate vaccine, pneumococcal conjugate vaccine, pneumococcal polysaccharide vaccine (due 2 months after pneumococcal conjugate vaccine), two doses of multi-component meningococcal serogroup B vaccine and Haemophilus influenzae type b conjugate vaccine.
- You should receive a single booster of pneumococcal polysaccharide vaccine in **5 years**.
- You should receive a booster dose of meningococcal conjugate vaccine **every 5 years**.
- You should receive a **yearly** flu shot.
- Your primary care provider will receive a letter explaining the vaccinations you received in hospital, as well as recommendations for future vaccinations.
- Seek expert medical advice before travel. Patients without a spleen are at increased risk of travel-related infectious diseases, including severe malaria. Additional vaccines and/or one or more medications may be recommended to prevent or treat travel-related infectious diseases. Where malaria is endemic, preventative measures including antimalarial medications, insect repellent and barrier precautions should be used.

Identification:

- Wallet card (included with this information) includes information on vaccinations you have received.
- Medic-Alert™ bracelet should be worn. It should indicate that you had your spleen removed.

When to seek medical attention:

- If you receive a tick or animal bites/scratches. You may be at risk of developing a serious infection.
- Fever, shakes and/or chills may be a sign of a serious infection. Proceed immediately to the nearest emergency department for further evaluation and care. If you have been provided antibiotics to use on an as needed basis for infection, take one dose immediately and then proceed to the nearest emergency department.

Wallet card for Asplenic Patients

Please complete card and give to patient on hospital discharge.

Medical Alert Asplenic Patient

Patient Name: _____
Physician Name: _____
Physician Phone: _____

Patient is at risk of potentially fatal, overwhelming infections. Medical attention required for:

- Signs of infection- fever > 38°C, sore throat, chills, unexplained cough.
- Tick and animal bites/scratches.

Vaccination Record

Patient has received the following vaccinations:

Meningococcal ACYW-135 conjugate vaccine (MENACTRA)

2 doses 8 weeks apart

Date 1st dose given: _____ Date 2nd dose given: _____

Meningococcal ACYW-135 conjugate vaccine booster (MENACTRA or MENVEO)

Dates due: every 5 years

Dates given: _____

Multicomponent Meningococcal Serogroup B (4CMenB) Vaccine (BEXSERO)

2 doses 4 weeks apart

Date 1st dose given: _____ Date 2nd dose given: _____

Pneumococcal 13-valent conjugate vaccine (PREVNAR 13)

Date given: _____

Pneumococcal polysaccharide vaccine (PNEUMOVAX 23)

Date due: 8 weeks after pneumococcal 13-valent conjugate vaccine (PREVNAR 13)

Date given: _____

Pneumococcal polysaccharide booster (PNEUMOVAX 23)

Date due: single dose 5 years after initial vaccine

Date given: _____

Haemophilus influenzae type b conjugate vaccine (ACT-HIB)

Date given: _____





Splenectomy Vaccine Checklist

- 1) Post-Splenectomy Vaccinations Clinical Order Set
- 2) Vaccines as per clinical order set plus package inserts
- 3) Splenectomy Vaccines – Documentation for Primary Care Provider and Public Health Form
- 4) Splenectomy – Information for Patients Sheet
- 5) Wallet Card for Asplenic Patients Sheet