

Practising physician's knowledge and patterns of practice regarding the asplenic state: the need for improved education and a practical checklist

Malcolm L. Brigden, MD;* Andrew Pattullo, MD;† Gail Brown, RN, BsN‡

Objective: To examine physicians' knowledge and actions regarding the asplenic state and to develop a practical checklist to aid in the systematic education and management of asplenic patients. **Design:** A prospective cohort survey utilizing an experienced nurse practitioner and a survey questionnaire with on-site interviews. **Setting:** The Okanagan Valley, British Columbia. **Subjects:** A cohort of 122 physicians serving a population base of 350 000. **Main outcome measures:** Beliefs and practices relating to vaccination and precautions necessary for adult and pediatric splenectomized patients. **Principal results:** The majority of physicians appeared to be knowledgeable about potential conditions affecting splenic function, except in the case of severe liver disease with portal hypertension and collagen vascular disease. There appeared to be good understanding on the part of most physicians of the risks associated with various infectious diseases and the asplenic state, except in the case of *Capnocytophaga canimorsus* infection linked to dog bites and the increased susceptibility of asplenic patients to intraerythrocytic parasites. Although a majority of physicians were cognizant of the need for pneumococcal vaccination and other immunizations in adults, there was marked uncertainty in relation to the need and the appropriate time interval for revaccination. In the case of children there appeared to be uncertainty regarding the role of antibiotic prophylaxis. There were discrepancies between physicians' expressed attitudes and the actions actually taken for asplenic patients in individual practices. **Conclusions:** Further education is required concerning the management of asplenic patients. The systematic use of a practical checklist may facilitate this process.

Objectif : Étudier les connaissances et les interventions des médecins au sujet de l'asplénie et élaborer une liste de contrôle pratique pour contribuer à l'éducation systématique et pour faciliter le traitement des patients aspléniques. **Conception :** Étude prospective de cohortes faisant appel à la participation d'une infirmière praticienne chevronnée et à l'utilisation d'un questionnaire d'enquête dans le cadre d'entrevues sur place. **Contexte :** La Vallée de l'Okanagan, Colombie-Britannique. **Sujets :** Une cohorte de 122 médecins au service d'une population de 350 000 personnes. **Principales mesures de résultats :** Croyances et pratiques ayant trait à la vaccination et aux précautions à prendre auprès des patients adultes et pédiatriques ayant subi une splénectomie. **Principaux résultats :** La majorité des médecins semblaient bien informés au sujet des affections qui peuvent avoir un effet sur la fonction splénique, sauf dans le cas de grave affection hépatique avec hypertension portale et collagénose avec manifestations vasculaires. La plupart des médecins semblaient bien comprendre les risques que posent diverses maladies infectieuses lorsqu'il y a asplénie, sauf pour ce qui est de l'infection au *Capnocytophaga canimorsus* liée aux morsures de chien et de la vulnérabilité accrue aux parasites intraérythrocytaires chez les patients aspléniques. Bien qu'il ait été reconnu par la majorité des médecins qu'il faut administrer le vaccin antipneumococcique et d'autres vaccins aux adultes, il régnait une incertitude prononcée quant à la nécessité de vacciner de nouveau et à l'intervalle indiqué pour la revaccination. Dans le cas des en-

From the *Penticton Hospital Cancer Clinic, Penticton, BC, the †Department of Infectious Diseases, Kelowna General Hospital, Kelowna, BC, and the ‡Canadian Blood Services, Kelowna

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Correspondence to: Dr. Malcolm L. Brigden, Regional Medical Oncologist, Penticton Hospital Cancer Clinic, 550 Carmi Ave., Penticton BC V2A 3G6; fax 250 492-9036

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fants, il semblait y avoir des incertitudes au sujet du rôle de la prophylaxie aux antibiotiques. On a constaté des écarts entre les attitudes exprimées par les médecins et les interventions auxquelles ils recourent effectivement dans leur pratique individuelle auprès des patients aspléniques. **Conclusions** : Il faut une éducation plus poussée sur le traitement des patients aspléniques. L'utilisation systématique d'une liste de contrôle pratique pourrait faciliter ce processus.

Asplenic patients have a long-term susceptibility to serious, potentially life-threatening infections, which may vary in clinical presentation from mild pneumonia to overwhelming, lethal postsplenectomy infection.¹⁻³ Although encapsulated organisms such as *Streptococcus pneumoniae* (pneumococcus), *Haemophilus influenzae* and *Neisseria meningitidis* (meningococcus) account for the majority of infections, a variety of other pathogens, such as gram-negative organisms and *Capnocytophaga canimorsus*, may also be responsible.^{1,2} The splenectomized host is also more susceptible to infections with intraerythrocytic parasites such *Babesia microti* and malaria.^{2,3} Vaccination against pneumococcal infection has been recommended since the 1970s, and the appropriate use of the pneumococcal vaccine has become increasingly relevant with the emergence of antibiotic-resistant strains of pneumococci.⁴⁻⁶ Patient education and counselling at the time of splenectomy is just as important as appropriate vaccination policies, but this in turn is dependent on knowledgeable physicians.^{7,8} A number of investigations have provided evidence for international deficiencies in both vaccination and patient education policies.⁹⁻¹¹ However, relatively little attention has been paid to the state of practising physicians' understanding of these important topics. The current study was undertaken in an attempt to document the level of knowledge for a defined cohort of physicians in relation to the asplenic state as well as their patterns of practice for individual asplenic patients. From the survey results, a second goal was to develop a practical checklist to aid in the systematic education and management of asplenic patients.

The survey

The Okanagan Valley in the interior of British Columbia includes 3 major cities: Vernon, Kelowna and Penticton. Each of these is associated with a regional hospital and services an overall population of approximately 350 000. From October 1998 to March 1999, all physicians in the Okanagan Valley were surveyed regarding their knowledge in relation to splenectomized adult and pediatric patients.

All interviews were conducted by a single experienced nurse practitioner. For the purpose of the study, childhood was defined as an age of 10 years or younger. Questions that were posed related to a knowledge of splenic functioning in various diseases, the presumed risk of various infections possibly associated with asplenism, potential precautions that should be taken with asplenic adults and children, and the appropriateness of adult revaccination including the desirable interval. At the same time, physicians were also surveyed regarding the actual patterns of practice for adult and pediatric asplenic patients within their patient populations. The survey questions are shown in Fig. 1.³⁻⁷

Results

Of the 188 physicians practising in the geographical area surveyed, 122 (65%) participated. The age, sex and types of practice of the 66 physicians who did not participate in the study were not significantly different from the others, with more than 80% of participants and nonparticipants being primary care physicians. A total of 194 asplenic patients were being managed by the physicians surveyed, of whom 179 (92.3%) were adults and 15 (7.7%) were children. The

median number of asplenic patients per individual practice was 1 (range from 0-4). Physicians' responses relating to a knowledge of splenic function in a variety of conditions is illustrated in Fig. 2. Reduced function was considered a potentially correct answer for the category of traumatic splenectomy due to the possibility of splenosis. Whereas most survey physicians (82.3%-91.7%) were aware of the risks posed by surgical, traumatic or congenital splenectomy, it was of interest that only 41.7% to 69.5% seemed to appreciate that reduced or absent splenic function might be seen with portal hypertension, collagen vascular diseases or tropical splenomegaly.

Physicians' knowledge in relation to various possible infectious risks posed by the asplenic state is documented in Fig. 3. Most physicians (93.5%) appeared to be aware of the risk for pneumococcal bacteremia, but they were less knowledgeable regarding the hazards of *H. influenzae*, *N. meningitidis* and *E. coli* infections; the 3 next commonest causes of overwhelming postsplenectomy infection. Physicians did seem to be aware that fungal and other bacterial infections such as *Staphylococcus aureus* did not ordinarily pose an increased risk. However, there did not seem to be an appropriate appreciation of the increased risk for intraerythrocytic parasites such as malaria and *Babesia* or the risk posed by dog bites in relation to *C. canimorsus* infection. It is noteworthy that except for pneumococcal and *Haemophilus* infections the percentage of uncertain responses was consistently above 20% and reached as high as 64%.

Physicians' attitudes toward potential precautions for adults with asplenism are illustrated in Fig. 4. The majority of physicians (100%) en-

Splenectomy Physician Survey

1. How would you rate expected splenic function in the following circumstances?

	Unsure	Normal	Reduced Function	Poor/No Function
Elective surgical splenectomy				
Sickle cell disease				
Tropical splenectomy				
Traumatic splenectomy				
Congenital asplenism				
Portal hypertension				
Lymphoma involving spleen				
Systemic lupus erythematosus				

2. How does asplenism affect the risk of the following serious infections?

	Unsure	Little Change	Mild Increase	Marked Increase
Pneumococcal bacteremia				
Invasive aspergillosis				
<i>Salmonella</i> bacteremia				
Blood-borne parasites (e.g., malaria, <i>Babesia</i>)				
<i>Staphylococcus aureus</i> abscess				
<i>Escherichia coli</i> bacteremia				
Meningococemia				
Invasive <i>Haemophilus influenzae</i>				
Streptococcal cellulitis				
Bacteremia from dog bite				

3. How do you feel about the following precautions for adults with asplenism?

	Not Indicated	Unsure	Recommended	Strongly Recommended
Pneumococcal vaccine				
<i>Haemophilus influenzae</i> type b vaccine				
Long-term prophylactic antibiotics				
Medic-Alert bracelet				
Emergency antibiotics at home				
Seek medical attention when febrile				
Meningococcal vaccine				
Hepatitis B vaccine				

3a. For vaccinations that you recommended above, what do you feel is the appropriate revaccination interval for adults (circle response)

Not indicated One Year Three Years Five Years Ten years

4. How do you feel about the following precautions for children with asplenism?

	Not indicated	Unsure	Recommended	Strongly recommended
Pneumococcal vaccine				
<i>Haemophilus influenzae</i> type b vaccine				
Long-term prophylactic antibiotics				
Medic-Alert bracelet				
Emergency antibiotics at home				
Seek medical attention when febrile				
Meningococcal vaccine				
Hepatitis B vaccine				

5. How many patients do you have in your own practice who lack a functional spleen?

6. How many of the asplenic patients are adults?

7. How many of your adult asplenic patients have had the following precautions provided or recommended?

Pneumococcal vaccine	Emergency antibiotics at home
<i>Haemophilus influenzae</i> type B vaccine	Seek medical attention when febrile
Long-term prophylactic antibiotics	Meningococcal vaccine
Medic-Alert bracelet	Hepatitis B vaccine

8. How many of the asplenic patients are children?

9. How many of your asplenic pediatric patients have had the following precautions provided or recommended?

Pneumococcal vaccine	Emergency antibiotics at home
<i>Haemophilus influenzae</i> vaccine	Seek medical attention when febrile
Long-term prophylactic antibiotics	Meningococcal vaccine
Medic-Alert bracelet	Hepatitis B vaccine

FIG. 1. The survey questionnaire sent to 122 physicians practising in the Okanagan Valley, British Columbia.

dorsed the use of pneumococcal vaccine, whereas 65.8% and 57.8% endorsed the *Haemophilus* and meningococcal vaccines respectively. Medic-Alert bracelets were considered appropriate by 87.9% of physicians, but it was of interest that the use of an emergency antibiotic supply or antibi-

otic prophylaxis was felt to be appropriate by only a minority (28.8% and 6.8% respectively). Most physicians (96.6%) thought patients should be counselled to seek prompt medical attention if a febrile episode ensued.

With respect to adult revaccination with pneumococcal vaccine,

25.5% of physicians thought revaccination was not indicated whereas 1.9% of physicians thought revaccination was indicated at 1 year, 1.9% at 3 years, 42.4% at 5 years and 28.3% at 10 years.

The data in relation to physicians' attitudes to potential precautions for

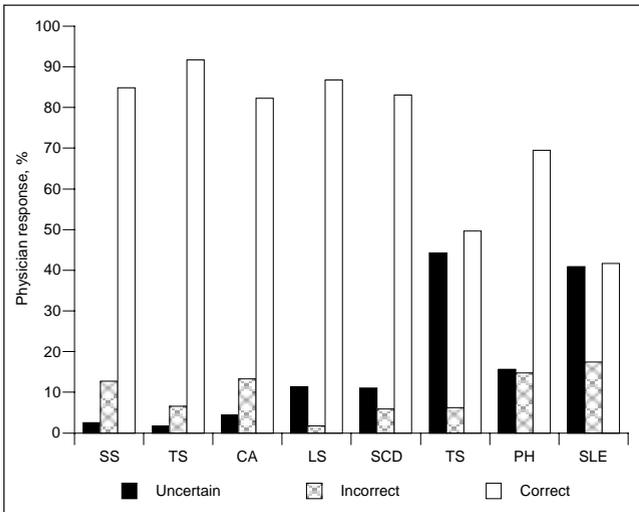


FIG. 2. Physicians' responses with respect to splenic function in a variety of conditions. SS = surgical splenectomy, TS = traumatic splenectomy, CA = congenital asplenic, LS = lymphoma of spleen, SCD = sickle cell disease, TS = tropical splenomegaly, PH = portal hypertension, SLE = systemic lupus erythematosus.

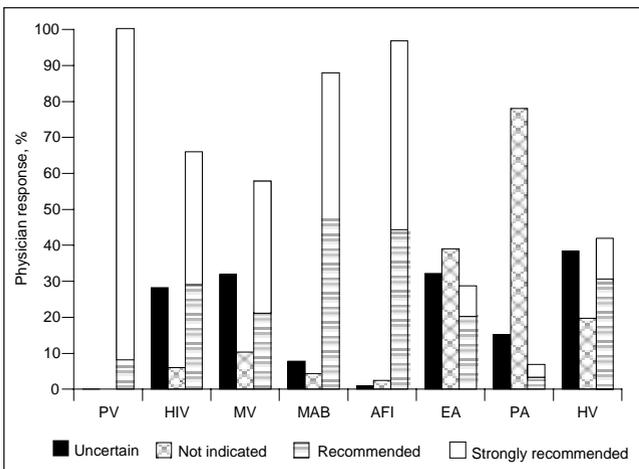


FIG. 4. Physicians' responses concerning the precautions needed for adult asplenic patients. For the purposes of this bar graph the categories of recommended and strongly recommended are shown in a single bar to give an overall percentage. PV = pneumococcal vaccine, HIV = *Haemophilus influenzae* vaccine, MV = meningococcal vaccine, MAB = Medic-Alert bracelet, AFI = attention for febrile illness, EA = emergency antibiotics, PA = prophylactic antibiotics, HV = hepatitis vaccine.

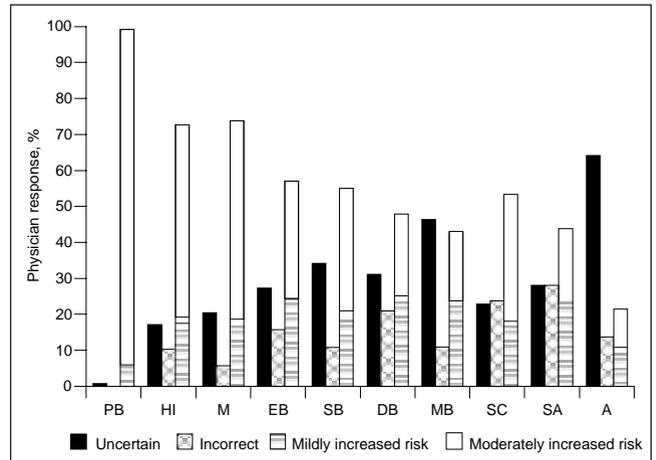


FIG. 3. Physicians' responses with respect to the risk for a variety of infections after splenectomy. For the purposes of this bar graph the categories of recommended and strongly recommended are shown in a single bar to give an overall percentage. PB = pneumococcal bacteremia, HI = *Haemophilus influenzae* (invasive), M = meningococemia, EB = *Escherichia coli* bacteremia, SB = *Salmonella* bacteremia, DB = dog-bite bacteremia, MB = malaria/*Babesia*, SC = *Streptococcus cellulitis*, SA = *Staphylococcus aureus* abscess, A = aspergillosis (invasive).

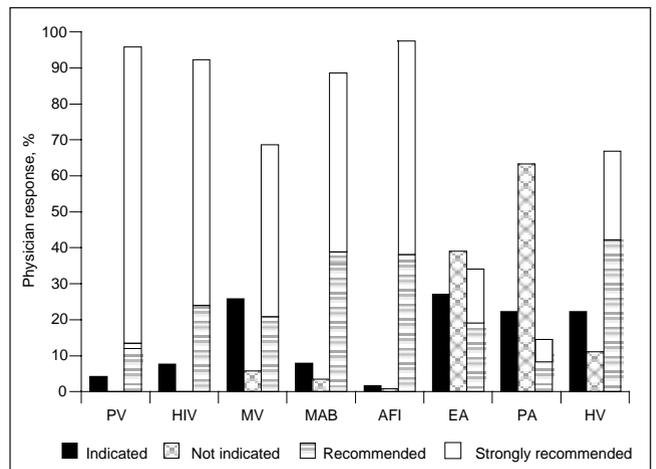


FIG. 5. Physicians' responses concerning the precautions needed for pediatric asplenic patients. For the purposes of this bar graph the categories of recommended and strongly recommended are shown in a single bar to give an overall percentage. PV = pneumococcal vaccine, HIV = *Haemophilus influenzae* vaccine, MIV = meningococcal vaccine, MAB = Medic-Alert bracelet, AFI = attention for febrile illness, EA = emergency antibiotics, PA = prophylactic antibiotics, HV = hepatitis vaccine.

asplenic children is documented in Fig. 5. The approval figures for pneumococcal, *Haemophilus* and meningococcal vaccines were very similar to those for adult patients except that there was greater endorsement of *Haemophilus* vaccine for children versus adults (92.4% v. 65.8%). Of interest was the fact that a relatively few physicians (14.5%) felt that long-term antibiotic prophylaxis was indicated for asplenic children.

The actual management of adult and pediatric asplenic patients in individual physician's practices is outlined in Fig. 6. Of note is that although 95.5% of adult patients had received pneumococcal vaccine, considerably fewer had received meningococcal and *Haemophilus* vaccines (25.7% and 16.2% respectively) in contrast to the fact that the majority of physicians surveyed had indicated a priority for these vaccinations. Similarly, the proportion of patients who actually obtained Medic-Alert bracelets (28.5%) and had emergency antibiotics at home (7.8%) appeared low in relation to the number of physicians who had endorsed these measures in the survey (87.9% and 28.8% respectively).

For children, although the absolute study number was small it was

disconcerting to see that approximately only 50% had actually received pneumococcal vaccine. A substantially greater number of children had received *Haemophilus* (93.3%) and meningococcal (60.0%) vaccines than adults. In addition, more children than adults had Medic-Alert bracelets (66.7%), a home supply of emergency antibiotics (40.0%) and were receiving prophylactic antibiotics (53.3%). Interestingly, the proportion of children receiving prophylactic antibiotics appeared higher than might have been anticipated from the survey of physicians.

Discussion

A number of measures have been advocated to reduce the risk of sepsis for the asplenic or hyposplenic state, including chemoprophylaxis, immunoprophylaxis and patient education.^{2,7,8,11} Most authorities recommend antibiotic prophylaxis for asplenic or hyposplenic children, for at least the first 2 years after splenectomy, possibly for a total of 5 years or even through to 21 years of age.^{7,12} However, no controlled data relating to the efficacy of chemoprophylaxis in adult asplenic patients are available even though some recent

international guidelines have recommended lifelong antibiotic therapy.^{1,7,13} Concern over the increasing resistance of pneumococci to commonly used antibiotic agents together with patient compliance issues have influenced others to advise that chemoprophylaxis be limited to a supply of emergency antibiotics for self-prescription at the first possible sign of infection prompt medical attention cannot be sought.^{6,14,15}

The pneumococcal vaccine was reformulated in 1983 to include the commonest 23 serotypes responsible for approximately 88% of pneumococcal infections in North America.^{4,5} In the healthy immunocompetent host the vaccine has a 70% to 80% protection rate, since approximately 10% of possible antibody responses to individual antigens are not seen.^{4,5} Unfortunately, there is evidence that vaccine efficacy is poorer in younger patients who are those at the highest risk.^{14,16} Ideally, vaccination should precede splenectomy by 14 days.^{2,3} Revaccination is recommended for asplenic or functionally hyposplenic patients older than 10 years after 5 years or sooner if a rapid decline of specific antibody titres is expected, as in renal failure, sickle cell disease, nephrotic syndrome or hypogammaglobulinemia.^{4,5} For patients 10 years of age or younger, revaccination is recommended after 3 years.^{4,5}

Some individual guidelines have also recommended that asplenic patients also receive the conjugated *Haemophilus* and meningococcal vaccines.^{2,7,12} However, any vaccinations provided should never result in a false sense of security, since sporadic cases of pneumococcal and other vaccine failures have been reported in appropriately immunized individuals even in the face of concomitant prophylactic antibiotic therapy.^{6,16,17}

In view of these considerations, adequate patient education forms an essential element in managing the hyposplenic or postsplenectomy state. However, appropriate use of

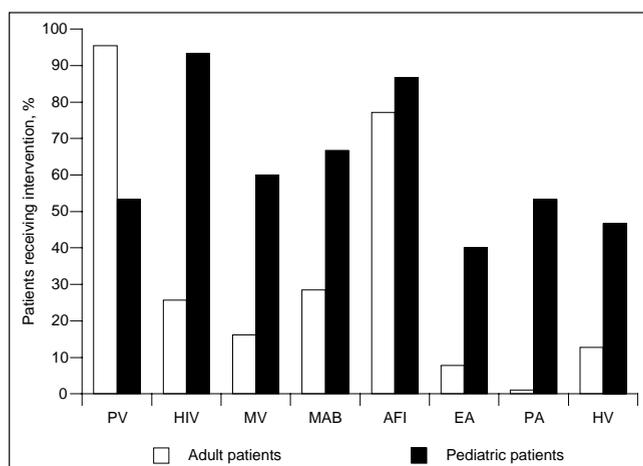


FIG. 6. Percentage of adult and pediatric patients who had various interventions after splenectomy. PV = pneumococcal vaccine, HIV = *Haemophilus influenzae* vaccine, MV = meningococcal vaccine, MAB = Medic-Alert bracelet, AFI = attention for febrile illness, EA = emergency antibiotics, PA = prophylactic antibiotics, HV = hepatitis vaccine.

chemoprophylaxis, immunoprophylaxis and patient education is obviously predicated on individual physicians having an adequate understanding of both the risks and management of the asplenic state.^{8,11} Although several studies have attempted to determine rates of immunization and education in splenectomized patients, no investigations have reported on the level of knowledge of physicians in this regard.^{9,10,18,19} The various international immunization studies have documented pneumococcal vaccination rates ranging from 32% to 74%.^{9,10,19,20} These investigations have usually not documented the state of patient knowledge. In one study, only 32% appeared to have been warned about the need for revaccination or possible future infectious risks.²⁰ In another investigation, only 11% of patients were aware of any possible complications of the asplenic state without interviewer prompting, and this figure only rose to 40% with prompting.⁹ Interestingly, in this study 100% of responsible surgeons felt that they had adequately described all possible complications of the postsplenectomy state.

To our knowledge, the current investigation represents the only published study that has attempted to examine the knowledge base of a geographical cohort of physicians in relation to possible risks associated with the asplenic state, as well as the need for vaccination, revaccination and antibiotic prophylaxis. Although it is encouraging that the majority of survey physicians seem to be aware of the risks associated with splenectomy, there was a lesser degree of knowledge in relation to the possible risks of hyposplenism associated with portal hypertension and collagen vascular diseases. Similarly, although the risk posed by the asplenic state for pneumococcal bacteremia seemed to be well understood, more physician education is required in relation to meningococcal and *H. influenzae* infections as well as hazards posed by

dog bites (*C. canimorsus*) and intraerythrocytic parasites such as malaria and *Babesia*. Knowledge regarding the need for pneumococcal vaccination seemed to be appropriate, but there did seem to be an inappropriate degree of uncertainty in relation to the need for and the timing of revaccination since over 25% of physicians felt that revaccination was unnecessary in adults and only 42% correctly identified the currently recommended 5-year time frame.

With regard to children, there seemed to be a lack of knowledge regarding the recommendations for ongoing antibiotic prophylaxis. The data relating to the actual management of asplenic patients within individual practices revealed some interesting contrasts. Fewer patients appeared to have been provided with Medic-Alert bracelets and at-home emergency antibiotics than would have been anticipated, and in children there was a similar disparity: a

A Checklist for Known Asplenic Subjects or Potential Splenectomy Patients	
GENERAL	
•	The medical discharge summary should document splenectomy and vaccination status, the need and interval for periodic revaccination and any other education provided.
SPECIFIC	
<u>Immunoprophylaxis</u>	
•	Pneumococcal vaccine should be given at 14 days before splenectomy or as soon as possible postoperatively.
•	Consideration should also be given to the use of meningococcal and <i>Haemophilus influenzae</i> type b vaccines.*
<u>Chemoprophylaxis</u>	
•	Indicated for children under the age of 4 years.
•	Lifelong prophylaxis should be considered in the case of immunocompromised adult patients, but there is no expert consensus in this regard.*
•	Traditional oral penicillin prophylaxis should be replaced by drugs such as amoxicillin/clavulanic acid, trimethoprim/sulfamethoxazole or cefuroxime.
•	When a decision is made to provide emergency at-home antibiotics, there should be an up-to-date supply to be taken if a febrile illness develops.*
•	Prophylaxis failures have been reported as well as infections caused by penicillin-resistant strains of pneumococcus.
<u>Education</u>	
•	Patients should obtain a Medic-Alert bracelet or necklace.
•	Patients should be informed about the various risks and types of infections.
•	Patients should be advised to seek prompt medical attention if unwell, if planning travel to a malaria or babesiosis endemic area, or if bitten by ticks or any animals, especially dogs.
•	Patients should be informed regarding the necessity of pneumococcal vaccine booster injections every 3 to 5 years depending on age and/or underlying medical conditions.
*See text — indicates a possibly controversial recommendation or one that is not uniformly accepted.	

FIG. 7. A practical checklist recommended for use in asplenic patients or those about to undergo splenectomy.

greater proportion appeared to be receiving prophylactic antibiotics than might have been anticipated from the survey responses. The finding of such discrepancies serves to further document that physicians do not always practise in accordance with stated beliefs.^{21,22}

In summary, this survey showed that there was a relatively satisfactory understanding of the hyposplenic state in the specific physician population surveyed, especially in regard to an increased risk for pneumococcal infection and the need for pneumococcal vaccination. Further education appeared to be required in relation to other diseases and infectious risks associated with asplenia, the need for and appropriate timing of revaccination, and the long-term use of prophylactic antibiotics in children. To help with a systematic approach, we have formulated a practical checklist for patients who undergo splenectomy or are otherwise found to be asplenic or hyposplenic^{3-5,7} (Fig. 7).

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LE PRIX MACLEAN-MUELLER

À l'attention des résidents et des directeurs des départements de chirurgie

Le *Journal canadien de chirurgie* offre chaque année un prix de 1000 \$ pour le meilleur manuscrit rédigé par un résident ou un fellow canadien d'un programme de spécialité qui n'a pas terminé sa formation ou n'a pas accepté de poste d'enseignant. Le manuscrit primé au cours d'une année civile sera publié dans un des premiers numéros (février ou avril) de l'année suivante et les autres manuscrits jugés publiables pourront paraître dans un numéro ultérieur du Journal.

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