

Vaccine utilization and overwhelming post-splenectomy infection risk factors in two asplenia cohorts

Matthew A. Soderstrom,¹ Mechelle A. Miller M.D.,² Qing Wang,² William P. Hennrikus,³ Nora L. Watson,⁴ Ryan C. Costantino,⁵ Matthew J. Bradley,³ V. Koneti Rao⁶ and Nathan A. Boggs^{2,7}

¹Department of Internal Medicine, Brooke Army Medical Center, San Antonio, TX; ²Allergy & Immunology Service, Walter Reed National Military Medical Center, Bethesda, MD; ³Department of General Surgery, Walter Reed National Military Medical Center, Bethesda, MD; ⁴Department of Research Programs, Walter Reed National Military Medical Center, Bethesda, MD; ⁵Enterprise Intelligence and Data Solutions Program Office, Program Executive Office, Defense Healthcare Management Systems, San Antonio, TX; ⁶Laboratory of Clinical Immunology and Microbiology, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, MD

and ⁷Department of Medicine, Uniformed Services University, Bethesda, MD, USA

Correspondence:

N. A. BOGGS - nathan.boggs@usuhs.edu

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Code	Description	National Capital Region Registry	DoD Trauma Registry
ICD9 41.5	Total splenectomy	Y	Y
ICD9 41.42	Excision of lesion or tissue of spleen	Y	
ICD9 41.43	Partial splenectomy		Y
ICD9 865	Spleen injury NFS closed		Y
ICD9 865.01	Spleen hematoma without rupture of capsule closed		Y
ICD9 865.02	Spleen injury with rupture of capsule closed		Y
ICD9 865.03	Spleen laceration extending into parenchyma closed		Y
ICD9 865.04	Spleen laceration with massive parenchymal disruption closed		Y
ICD9 865.09	Spleen injury other closed		Y
ICD9 865.11	Spleen hematoma without rupture of capsule open		Y
ICD9 865.12	Spleen injury with rupture of capsule open		Y
ICD9 865.13	Spleen laceration extending into parenchyma open		Y
ICD9 865.14	Spleen laceration with massive parenchymal disruption open		Y
ICD9 865.19	Spleen injury other open		Y
ICD9 282.41	Sickle-cell thalassemia without crisis	Y	
ICD9 282.42	Sickle-cell thalassemia with crisis	Y	
ICD9 282.5	Sickle-cell trait	Y	

ICD9 282.60	Sickle-cell disease, unspecified	Y	
ICD9 282.61	Hb-SS disease without crisis	Y	
ICD9 282.62	Hb-SS disease with crisis	Y	
ICD9 282.63	Sickle-cell/Hb-C disease without crisis	Y	
ICD9 282.68	Other sickle-cell disease without crisis	Y	
ICD9 759.0	Anomalies of spleen	Y	
ICD10 07BP0ZX	Excision of spleen, open approach, diagnostic		Y
ICD10 07BP0ZZ	Excision of spleen, open approach	Y	Y
ICD10 07BP4ZZ	Excision of spleen, percutaneous endoscopic approach	Y	Y
ICD10 07TP0ZZ	Resection of spleen, open approach	Y	
ICD10 07TP4ZZ	Resection of Spleen, Percutaneous Endoscopic Approach	Y	
ICD10 S36.00XA	Unspecified injury of spleen, initial encounter		Y
ICD10 S36.020A	Minor contusion of spleen, initial encounter		Y
ICD10 S36.021A	Major contusion of spleen, initial encounter		Y
ICD10 S36.029A	Unspecified contusion of spleen, initial encounter		Y
ICD10 S36.030A	Superficial (capsular) laceration of spleen, initial encounter		Y
ICD10 S36.031A	Moderate laceration of spleen, initial encounter		Y
ICD10 S36.032A	Major laceration of spleen, initial encounter		Y
ICD10 S36.039A	Unspecified laceration of spleen, initial encounter		Y

ICD10 S36.09XA	Other injury of spleen, initial encounter	Y
ICD10 D57.00	Hb-SS disease with crisis, unspecified	Y
ICD10 D57.01	Hb-SS disease with acute chest syndrome	Y
ICD10 D57.1	Sickle-cell disease without crisis	Y
ICD10 D57.219	Sickle-cell/Hb-C disease with crisis, unspecified	Y
ICD10 D57.3	Sickle-cell trait	Y
ICD10 D57.419	Sickle-cell thalassemia, unspecified, with crisis	Y
ICD10 D57.80	Other sickle-cell disorders without crisis	Y
ICD10 D57.819	Other sickle-cell disorders with crisis, unspecified	Y
ICD10 D73.0	Hyposplenism	Y
ICD10 D73.5	Infarction of spleen	Y
ICD10 Q89.01	Asplenia (congenital)	Y
ICD10 Q89.09	Congenital malformations of spleen	Y
ICD10 Z90.81	Acquired absence of spleen	Y
CPT 38100	Excision Procedures on the Spleen	Y
CPT 38120	Laparoscopic Procedures on the Spleen	Y

Table S1. ICD10 and ICD9 Diagnosis and Procedure Codes to Identify Asplenia in the National Capital Region Registry (NCRR) and DoD Trauma Registry (DoDTR)

Age [^] /Sex	IgM (70-400 mg/dL)	Pre-PPSV23 pneumococcal serology titers >1.3 mg/mL; >0.35 mg/mL	Post-PPSV23 (4-6 weeks) pneumococcal serology titers >1.3 mg/mL; >0.35 mg/mL
58/M	129; 135	23/23; 23/23	Not performed
53/F*	<25; <25	0/23; 5/23	2/23; 9/23
		0/11 (0%) PPSV23 serotypes > 1.3 mg/mL	0/11 (0%) PPSV23 serotypes > 1.3 mg/mL
		0/11 (9%) PPSV23 serotypes > 0.35 mg/mL	1/11 (9%) PPSV23 serotypes > 0.35 mg/mL
13/F*	28; 29	10/23; 18/23	12/23; 18/23
		2/11 (18%) PPSV23 serotypes > 1.3 mg/mL	2/11 (18%) PPSV23 serotypes > 1.3 mg/mL
		6/11 (54%) PPSV23 serotypes > 0.35 mg/mL	6/11 (54%) PPSV23 serotypes > 0.35 mg/mL
1/M	121; 66	17/23; 22/23	Not performed
1/F	75; 73	12/23; 22/23	Not performed

Table S2. Immunologic data of subjects with OPSI.

[^] Age corresponds to age at splenectomy or age 1 where asplenia is present in HbSS disease

* These two subjects had post-PPSV23 immunization titers drawn due to low pre-PPSV23 titers.

Note: All subjects had normal levels of immunoglobulin G and A (not shown). All subjects had been immunized with PCV13 prior to PPSV23 vaccine titer assessments and PPSV23 has 11 serotypes that are not found in PCV13. A cutoff of 1.3 mcg/mL for each pneumococcal serotype is the current Practice Parameter recommendation for immunity¹ while a cutoff of 0.35 mcg/mL may be more specific for invasive disease².

Note: The subject age 53 at splenectomy was blood type B+ and had very low isohemagglutinin titers (IgG anti-A titer 1:2 and IgM anti-A 1:4). All other subjects had isohemagglutinin titers within reference ranges.

References

1. Bonilla FA, Khan DA, Ballas ZK, et al. Practice parameter for the diagnosis and management of primary immunodeficiency. *J. Allergy Clin. Immunol.* 2015;136(5):1186–205.e1.
2. McNulty CMG, Li JT. Interpretation of post-pneumococcal vaccine antibody levels: Concerns and pitfalls. *J. Allergy Clin. Immunol. Pract.* 2019;7(3):1061–1062.