Appendix 1. Routine Health Care Maintenance of Pediatric Patients with Sickle Cell Diseases

This document is intended to identify routine health maintenance issues, important in the care of children with sickle cell hemoglobinopathies and to aid primary care physicians and hematologists who together provide the medical home for these patients. This is meant as a supplement to, not a substitute for, age-appropriate routine health maintenance for children and adolescents.

The information here is based primarily on the National Institutes of Health Evidence Report: Evidence Based Management of Sickle Cell Disease, 2014

I. Visit Frequency with Comprehensive Hematology Program: These should be in addition to routine primary care visits and not to replace any of those.

First 24 months of life	q 2-4 months
> 2 years – 12 years	q 6 months
> 12 years	q 6-12 month

**More frequent visits may be required for patients with increased educational needs around sickle cell disease, including those with language difficulties, more frequent complications, and for therapeutic monitoring (e.g. hydroxyurea or chronic transfusion therapy).*

II. Immunizations: Please note most children with sickle cell disease, particularly those with homozygous HbSS disease or HbSβ^0 thalassemia should be considered to be functionally asplenic.

This is a very abbreviated table for a basic overview of appropriate immunizations. Please see Advisory Committee on Immunization Practices (ACIP) for the specifics of all immunizations to be provided

Pneumococcal Conjugate Vaccine (PCV13) (Prevnar™)	Per routine childhood schedule For all patients of all ages	At least 2 doses, 6-8 weeks apart if over age 2 years at time of first immunization
Pneumococcal Polysaccharide Vaccine (PPV23) (Pneumovax™, Pnu-immune™)	Starting at 24 months Given after PCV13 series has been completed	Booster every 5 years
Haemophilus influenza b (Hib)	Per routine childhood schedule	For ages over 5 and unimmunized, give 1-2 doses at least 1 month apart.

III. Medications

Penicillin (PCN)	Birth – 3 y.o.	125mg PO BID
Penicillin	3 y.o. - 5 y.o.	250mg PO BID
Penicillin	>5 y.o.	If surgically splenectomized should receive PCN for a minimum of 2 years post splenectomy. If has experienced pneumococcal sepsis or meningitis, continue 250 mg PO BID indefinitely.
Erythromycin ethyl succinate	For patients with penicillin allergy	~20 mg/kg divided into BID dosing

Hydroxyurea	For select patients, but unless with a contraindication should be provided for all patients with HbSS disease.	Dosed at 20-35 mg/kg/day as a single daily dose for patients with HbSS, HbSβ^0 thalassemia, starting at 9 months of age. Consideration for non- phenotypically homozygous S under specific circumstances.
Folic Acid		Not recommended as routine medication unless deficiency documented or patient pregnant

IV. Elements of Comprehensive Visits – as performed in the hematologist's office, or PCP's office with documentation that the particular aspect of care has been addressed.
Should include, but not be limited to:

- Medication Review: including prophylactic medication and home pain plan
- Review State Prescription Monitoring Program (PMP): Look into State PMP, per State recommendations, for details of opioid prescriptions prepared
- Interval History: Inquire about fever, painful episodes, respiratory symptoms, priapism, neurological symptoms, splenic sequestration, nocturnal enuresis, snoring, ED visits, admissions, transfusions and missed school
- Physical Examination: Comprehensive: all organ systems reviewed
- Educational: Should begin from infancy and be reinforced at each visit. Document topics covered and remaining educational needs. As child matures, begin similar curriculum with them with goal of adolescent understanding all topics at age of transition.

Education Topics

General Information	Health Maintenance	Acute Episodes	Treatments	Psychosocial
○ Introduction ○ Genetics ○ Growth & Development ○ Prognosis ○ Role of Primary and Specialty Care ○ Evolving molecular advances including gene advances and therapies	○ Penicillin ○ Immunizations ○ Nutrition ○ TCD Screening ○ Contraception and contraceptive counseling ○ Hydration ○ Nocturnal Enuresis ○ Smoking ○ Pain Prevention ○ Anemia ○ Dental Care ○ Vision exams	○ Access to Care ○ Fever ○ VOC and Home Management ○ Acute Chest ○ Splenic Sequestration ○ Aplastic Crisis ○ Stroke ○ Priapism ○ AVN ○ Gallstones ○ Leg Ulcers	○ Blood Transfusions ○ Hydroxyurea ○ Chronic Transfusion ○ Bone Marrow Transplant ○ Iron Chelation	○ Parenting a Child with a Chronic Illness ○ Child Care ○ Education and Educational Advocacy ○ Transition to Adult Care ○ Vocational Issues ○ Fears of Addiction ○ Chronic Pain ○ Drug and Alcohol Use ○ Depression and Anxiety

V. Laboratory Monitoring

CBC with reticulocyte count	Within first year of life and q year thereafter
Quantitative electrophoresis	In the first year of life as follow up to positive NBS result Family studies and/or DNA-based testing if needed for clarifying diagnosis or genetic counseling
RBC antigen testing	Between 1 and 2 years of age, or before first transfusion
Ferritin	If patient ion a hypertranfusion protocol: q 3 months
LFTs/Bili/Renal	Annually
Urinalysis	Annually after 10 years of age with microalbumin

VI. Screening

Cardiology	CXR, EKG and echo only if clinical concern including unusual murmur, history of fluid intolerance or significant pulmonary disease. Dyspnea on exertion: check for pulmonary hypertension. Lower threshold for cardiac evaluation in older adolescents. Routine EKG / ECHO not recommended in individuals with SCD
Pulmonary	Routine screening not necessary – evaluate for pulmonary disease and test and refer if positive. Refer for recurrent acute chest syndrome, asthma, sleep disturbances/ apnea/snoring/hypoxia.
Hepatic	Annual LFTs, more frequently prn patient on HU and concerns for LFT abnormalities, risk of chelation toxicity If patient on a hypertransfusion protocol, q 6 – 12 months
Renal	Annual renal function testing. Starting at 10 years: annual urine for protein/microalbimin. If positive for protein do urine albumin/creatinine ratio. If abnormal refer to specialist. Check pre HU therapy and monitor if patient on chelation therapy
Neurologic	Transcranial Doppler Ultrasound q 12 months from ages 2 to 16 years if normal (flow rates < 170 cm/sec). If flow rates > 170 cm/sec needs referral to a pediatric Hematology. Not indicated in patients with HbSC or HbSbeta plus^{+} thalassemia, or those on chronic transfusion programs unless with a clinical concern Neuropsychometric testing: Consider for school or developmental concerns or in setting or abnormal MRI findings that might correlate with neuropsychological abnormalities
Ophthalmologic	Annually once 10 years old – all genotypes
Audiology	Only if clinical concern, including the prolonged use of ototoxic antibiotics or history of meningitis
Endocrinology	Pregnancy test: pre HU and as clinically indicated Progesterone-only preparations not contraindicated, also IUDs and barrier methods acceptable. Risk benefit ration needs to be considered for combined hormone preparations. Contraceptive counseling and management should be provided to all post-pubertal individuals.
Hematologic	Work with Blood Bank to have an extended phenotype panel on record before the first transfusion. Check for alloantibodies q transfusion. Provide C,D, E, Kell matched cells every time and more closely matched per Blood Bank's recommendations. HLA typing of patient and siblings to determine possibility of a (family matched) stem cell transplantation.

Selected references:

-AAP Section on Hematology/Oncology. Health supervision for children with sickle cell disease. *Pediatrics*. 2002 109(3): 526 – 535.http://www.aap.org/policy/re1011.html.

-Evidence-Based Management of Sickle Cell Disease, An Expert Panel Report, 2014

-Center for Disease Control The Recommended Immunization Schedule for Children 18 years and younger (2017)

- Hydroxyurea and Transfusion Therapy for the Treatment of Sickle Cell Disease An American Society of Hematology publication November 2014

- Centers for Disease Control and Prevention, Advisory Committee on Immunization Practices CDC.gov accessed 12/15/2017