02-33000-17

Original Effective Date: 04/15/01

Reviewed: 01/25/24

Revised: 02/15/24

Subject: Apheresis, Plasmapheresis and Plasma Exchange

THIS MEDICAL COVERAGE GUIDELINE IS NOT AN AUTHORIZATION, CERTIFICATION, EXPLANATION OF BENEFITS, OR A GUARANTEE OF PAYMENT, NOR DOES IT SUBSTITUTE FOR OR CONSTITUTE MEDICAL ADVICE. ALL MEDICAL DECISIONS ARE SOLELY THE RESPONSIBILITY OF THE PATIENT AND PHYSICIAN. BENEFITS ARE DETERMINED BY THE GROUP CONTRACT, MEMBER BENEFIT BOOKLET, AND/OR INDIVIDUAL SUBSCRIBER CERTIFICATE IN EFFECT AT THE TIME SERVICES WERE RENDERED. THIS MEDICAL COVERAGE GUIDELINE APPLIES TO ALL LINES OF BUSINESS UNLESS OTHERWISE NOTED IN THE PROGRAM EXCEPTIONS SECTION.

DESCRIPTION:

Apheresis, Plasmapheresis, and Plasma Exchange

The terms apheresis, plasmapheresis, and plasma exchange (PE) are often used interchangeably. The American Society for Apheresis (ASFA) defines these procedures as follows:

Apheresis: A procedure in which blood of the individual or donor is passed through a medical device which separates out one or more components of blood and returns the remainder with or without extracorporeal treatment or replacement of the separated component.

Plasmapheresis: A procedure in which blood of an individual or the donor is passed through a medical device which separates out plasma from the other components of blood and the plasma is removed (ie, <15% of total plasma volume) without the use of replacement solution.

Plasma exchange (PE): A therapeutic procedure in which blood of the individual is passed through a medical device which separates out plasma from other components of blood; the plasma is removed and replaced with a replacement solution such as colloid solution (eg, albumin and/ or plasma) or a combination of crystalloid/colloid solution.

Low-Density Lipid (LDL) Apheresis

Low-density lipid (LDL) apheresis refers to the extracorporeal removal of circulating apo B-containing lipoproteins, including LDL, lipoprotein (a), and very low-density lipoprotein (VLDL). There are multiple apheresis methods, including dextran sulphate cellulose adsorption, heparin-induced extracorporeal LDL cholesterol precipitation, immunoadsorption, and double filtration plasma pheresis of lipoproteins.

Therapeutic apheresis with selective HDL delipidation and plasma reinfusion

Therapeutic apheresis with selective HDL delipidation and plasma reinfusion is a procedure in which plasma is removed from the body by apheresis, processed through a delipidation device and then returned to the body. The delipidation procedure selectively removes cholesterol from HDL, converting the major alpha HDL to pre-beta-like HDL. The plasma with pre-beta-like HDL is then reinfused to the individual. The pre-beta-like HDL is a form of HDL that enhances cholesterol transport to the liver and is thought to reduce atherosclerosis development and burden.

Summary and Analysis of Evidence: An UpToDate review titled "Therapeutic apheresis (plasma exchange or cytapheresis): Indications and technology" (Fridey et al) states "TA is highly effective for the removal of pathologic autoantibodies. Immunoglobulin G (IgG) has an average molecular weight >150,000 daltons and a half-life of approximately 21 days. Thus, even if immunosuppressive therapy could immediately inhibit new antibody production, the plasma concentration would decrease by only approximately 50 percent within 21 days. Such a delay may not be acceptable with an aggressive autoantibody such as that seen in anti-glomerular basement membrane (anti-GBM) antibody disease. TA has other potential benefits, including unloading of the reticuloendothelial system, which can enhance endogenous removal of circulating toxins; stimulation of lymphocyte clones to enhance cytotoxic therapy; and the possibility of reinfusing plasma volumes in such a way that the risk of intravascular volume overload can be decreased. For some indications, TA is considered first-line therapy (eg, TTP, acute Guillain-Barré syndrome), whereas for others such as light chain cast nephropathy in multiple myeloma, apheresis may need to be used in combination with other established treatments such as chemotherapy to inhibit antibody production." An UpToDate review titled "Familial hypercholesterolemia in adults: Treatment" (Rosenson et al) states "Intense low density lipoprotein cholesterol (LDL-C) lowering in individuals with heterozygous or homozygous familial hypercholesterolemia (FH) decreases progression of angiographically demonstrated coronary artery disease, and reduces cardiovascular disease events (myocardial infarction), coronary heart disease mortality, and all-cause mortality. The magnitude of benefit has varied in these studies due to differing populations, the end point chosen, as well as the intensity and duration of treatment. Reduction in combined end points of up to 50 percent have been found. While all studies of the impact of therapy on mortality in FH patients have been observational, the results are consistent with the findings of randomized trials (usually with statins) that enrolled many individuals without FH. In the aggregate, these secondary prevention studies found a lowering of the risk for cardiovascular death and myocardial infarction."

POSITION STATEMENT:

Apheresis, Plasmapheresis, and Plasma Exchange (36511-36514)

Apheresis, plasmapheresis, and plasma exchange meet the definition of medical necessity for the following conditions:

Autoimmune

- Severe multiple manifestations of mixed cryoglobulinemia (MC) such as cryoglobulinemic nephropathy, skin ulcers, sensory motor neuropathy, and widespread vasculitis in combination with immunosuppressive treatment

- Catastrophic antiphospholipid syndrome (CAPS)

Hematologic

- ABO incompatible hematopoietic progenitor cell transplantation
- Hyperviscosity syndromes associated with multiple myeloma or Waldenström macroglobulinemia
- Idiopathic thrombocytopenic purpura in emergency situations
- Thrombotic thrombocytopenic purpura (TTP)
- Atypical hemolytic-uremic syndrome
- Sickle cell disease, acute or non-acute
- Post-transfusion purpura
- HELLP syndrome of pregnancy (a severe form of preeclampsia, characterized by hemolysis [H], elevated liver enzymes [EL], and low platelet [LP] counts)
- Myeloma with acute renal failure
- Familial hypercholesterolemia
- In conjunction with CAR T-cell therapy

Neurologic

- Acute inflammatory demyelinating polyneuropathy (Guillain-Barré syndrome [GBS])
- Chronic inflammatory demyelinating polyradiculoneuropathy (CIDP)
- Multiple sclerosis (MS), with acute fulminant central nervous system (CNS) demyelination
- Myasthenia gravis in crisis or as part of preoperative preparation
- Paraproteinemia polyneuropathy; IgA, IgG
- Wilson's disease, fulminant with hepatic failure/hemolysis

Renal

- Antiglomerular basement membrane disease (Goodpasture syndrome)
- ANCA (antineutrophil cytoplasmic antibody) associated vasculitis [e.g., Wegener granulomatosis (also known as granulomatosis with polyangitis [GPA]) with associated renal failure
- Dense deposit disease with factor H deficiency and/or elevated C3 Nephritic factor

Transplantation

- Cardiac transplantation, for desensitization
- Hematopoietic stem cell transplantation, for ABO incompatibility
- Liver transplantation, for ABO incompatibility, or desensitization for living donor

- Renal transplantation, for any of the following:
    - ABO compatible/antibody mediated rejection
    - ABO compatible/living donor desensitization
    - ABO incompatible/living donor desensitization
    - ABO incompatible/antibody mediated rejection
    - Focal segmental glomerulosclerosis after renal transplant

Apheresis, plasmapheresis, and plasma exchange is considered **experimental or investigational** for all other conditions. There is insufficient evidence in the published medical literature to permit conclusions on safety, efficacy and long-term outcomes.

Low-density Lipid (LDL) Apheresis (36516, S2120)

Low-density lipid (LDL) apheresis **meets the definition of medical necessity** for homozygous familial hypercholesterolemia as an alternative to plasmapheresis.

Low-density lipid (LDL) apheresis meets the definition of medical necessity for heterozygous familial hypercholesterolemia (FH), when **ALL** of the following are met:

- Failed diet therapy and maximum tolerated combination drug therapy **AND** meets **ONE** of the following FDA-approved indications:
    - Functional hypercholesterolemic heterozygotes with LDL ≥300 mg/dL, **OR**
    - Functional hypercholesterolemic heterozygotes with LDL ≥200 mg/dL **AND** documented coronary artery disease*

*** Documented coronary artery disease:** includes a history of myocardial infarction, coronary artery bypass surgery, percutaneous transluminal coronary angioplasty or alternative revascularization procedure, or progressive angina documented by exercise or non-exercise stress test.

LDL apheresis is considered **experimental or investigational** for all other conditions, including but not limited to treatment of preeclampsia, nonfamilial hypercholesterolemia, nephrotic syndrome, sudden sensorineural hearing loss, severe diabetic foot ulcerations, peripheral artery disease, and non–arteritic acute anterior ischemic optic neuropathy. There is insufficient to clinical evidence to determine the impact of this procedure on health outcomes.

Therapeutic apheresis with selective high-density lipoprotein (HDL) delipidation and plasma reinfusion **(0342T)** is considered **experimental or investigational,** for all indications, including but not limited to acute coronary syndrome. The available clinical evidence does not support clinical value.

BILLING/CODING INFORMATION:

CPT Coding:

36511	Therapeutic apheresis; for white blood cells

36512	Therapeutic apheresis; for red blood cells
36513	Therapeutic apheresis; for platelets
36514	Therapeutic apheresis; for plasma pheresis
36516	Therapeutic apheresis; with extracorporeal immunoadsorption, selective adsorption or selective filtration and plasma reinfusion
0342T	Therapeutic apheresis with selective HDL delipidation and plasma reinfusion **(investigational)**

HCPCS Coding:

S2120	Low density lipoprotein (LDL) apheresis using heparin-induced extracorporeal LDL precipitation

ICD-10 Diagnosis Codes That Support Medical Necessity for 36511-36514:

C88.0	Waldenstrom macroglobulinemia
C88.2	Heavy chain disease
D47.3	Essential (hemorrhagic) thrombocythemia
D57.00-D57.819	Sickle-cell disorders
D58.8	Other specified hereditary hemolytic anemias
D59.3	Hemolytic-uremic syndrome
D69.49	Other primary thrombocytopenia
D69.51	Posttransfusion purpura
D69.59	Other secondary thrombocytopenia
D75.1	Secondary polycythemia
D89.1	Cryoglobulinemia
G35	Multiple sclerosis
G60.9	Hereditary and idiopathic neuropathy, unspecified
G61.0	Guillain-Barre syndrome
G61.81	Chronic inflammatory demyelinating polyneuritis
G70.01	Myasthenia gravis with (acute) exacerbation
M30.1	Polyarteritis with lung involvement [Churg-Strauss]
M31.0	Hypersensitivity angiitis
M31.1	Thrombotic microangiopathy
M31.30	Wegener's granulomatosis without renal involvement
M31.31	Wegener's granulomatosis with renal involvement
O14.10	Severe pre-eclampsia, unspecified trimester
O14.12	Severe pre-eclampsia, second trimester
O14.13	Severe pre-eclampsia, third trimester
O14.20	HELLP syndrome (HELLP), unspecified trimester
O14.22	HELLP syndrome (HELLP), second trimester
O14.23	HELLP syndrome (HELLP), third trimester
O90.89	Other complications of the puerperium, not elsewhere classified

ICD-10 Diagnosis Codes That Support Medical Necessity for 36516, S2120:

E78.01	Familial hypercholesterolemia

REIMBURSEMENT INFORMATION:

Refer to section entitled **POSITION STATEMENT**.

PROGRAM EXCEPTIONS:

Federal Employee Program (FEP): Follow FEP guidelines.

State Account Organization (SAO): Follow SAO guidelines.

Medicare Advantage products:

The following National Coverage Determination (NCD) was reviewed on the last guideline reviewed date: APHERESIS (Therapeutic Pheresis) (110.14), located at cms.gov.

If this Medical Coverage Guideline contains a step therapy requirement, in compliance with Florida law 627.42393, members or providers may request a step therapy protocol exemption to this requirement if based on medical necessity. The process for requesting a protocol exemption can be found at Coverage Protocol Exemption Request.

DEFINITIONS:

Familial hypercholesterolemia (FH): A recessive genetic disorder caused by a defect on chromosome 19 that makes the liver incapable of metabolizing (or removing) excess LDL. The result is very high LDL levels which can lead to premature cardiovascular disease. There are two forms of FH. If inherited from one parent, the result is heterozygous FH (HeFH). HeFH occurs in 1 in 200 to 500 people worldwide. If inherited from both parents, it is much more severe in its consequences. This form of FH is called homozygous FH (HoFH). It is very rare, occurring in about 1 in 160,000 to one million people worldwide.

Guillain-Barre syndrome: an acute demyelinating neuropathy whose severity is graded on a scale of 1-5. Plasma exchange is reserved for those with grades 3-5 disease who do not initially respond to prednisone.

HELLP syndrome of pregnancy: a severe form of preeclampsia, characterized by hemolysis [H], elevated liver enzymes [EL], and low platelet [LP] counts).

Myasthenia gravis: an autoimmune disease with autoantibodies directed against the postsynaptic membrane of the muscle end plate. Clinically, the disease is characterized by fatigable weakness of voluntary muscles. Initial treatment focuses on the use of cholinesterase inhibitors to overcome the postsynaptic blockade. Immunosuppressant drugs including corticosteroids and azathioprine are also effective. Plasma exchange has been used as a short-term therapy in individuals with acute exacerbations associated with severe weakness.

Post-transfusion purpura: a rare disorder characterized by an acute severe thrombocytopenia occurring about 1 week after a blood transfusion in association with a high titer of anti-platelet alloantibodies.

Rapidly progressive glomerulonephritis (RPGN) including Goodpasture's syndrome: a general term describing the rapid loss of renal function in conjunction with the finding of glomerular crescents on renal biopsy specimens. There are multiple etiologies of RPGN including vasculitis, the deposition of anti-glomerular basement membrane (GBM) antibodies as seen in Goodpasture's syndrome, or the deposition of immune complexes as seen in various infectious diseases or connective tissue diseases. RPGN may also be idiopathic. Because many cases of RPGN represent an immune-mediated disease of acute onset, RPGN was an early focus of PE research.

Thrombotic thrombocytopenic purpura (TTP)—Hemolytic uremic syndrome (HUS): Once considered distinct syndromes, TTP and HUS are now considered different manifestations of the same disease process, i.e., thrombotic microangiopathy. The classic signs and symptoms include fever, thrombocytopenia, microangiopathic hemolytic anemia, neurologic abnormalities, and renal involvement. TTP-HUS may be seen in association with other conditions, such as pregnancy or HIV infection. PE has become the primary treatment for TTP-HUS, although a rationale for its effectiveness is unknown. PE is performed daily until a response is noted, the length of treatment averages about once a month, with increasing intervals between PE treatments.

RELATED GUIDELINES:

Extracorporeal Photopheresis, 01-90919-02

OTHER:

None applicable

REFERENCES:

1. AHRQ National Guideline Clearinghouse. Guideline Summary NGC-8493: British Association of Dermatologists' guidelines for the management of bullous pemphigoid 2012. Br J Dermatol. 2012 Dec;167(6):1200-14.
2. AHRQ National Guideline Clearinghouse. Guideline Summary NGC-8948. Lipids and lipoproteins. In: Expert panel on integrated guidelines for cardiovascular health and risk reduction in children and adolescents. National Heart, Lung, and Blood Institute; 2011. p. 184-281.
3. AHRQ National Guideline Clearinghouse. Guideline Summary NGC 10426: Guidelines on the diagnosis and management of Waldenström macroglobulinaemia. 2006 Mar (revised 2014 May). British Committee for Standards in Haematology - Professional Association.
4. Barth D, Nouri MN, Ng E, Nwe P, Bril V. (2011). Comparison of IVIg and PLEX in patients with myasthenia gravis. Neurology, 76(23), 2017-2023.
5. Biller E, Zhao Y, Berg M, et al. Red blood cell exchange in patients with sickle cell disease-indications and management: a review and consensus report by the therapeutic apheresis subsection of the AABB. Transfusion. 2018;58(8):1965–1972. doi:10.1111/trf.14806. PMID: 30198607.
6. Blue Cross Blue Shield Association Evidence Positioning System®. 8.02.02 – Plasma Exchange (archived 11/17).
7. Blue Cross Blue Shield Association Evidence Positioning System®. 8.02.04 - Lipid Apheresis (archived 07/21).

8. Buyukkurt N, Kozanoğlu I, Korur AP, et al. Comparative efficacy in red blood cell exchange transfusions with different apheresis machines in patients with sickle cell disease. Indian J Hematol Blood Transfus. 2018;34(3):495–500. doi:10.1007/s12288-017-0898-5.
9. Centers for Medicare and Medicaid Services (CMS). National Coverage Determination (NCD) for APHERESIS (Therapeutic Pheresis) (110.14) (07/30/92).
10. Chegini A, Ahmadi Karvigh S, Rahbar M, Sharifi Rayeni A. Therapeutic apheresis in neurological, nephrological and gastrointestinal diseases. Transfus Apher Sci. 2019;58(3):266–272. doi: 10.1016/j.transci.2019.04.011. PMID: 31029610.
11. ClinicalTrials.gov. NCT01518205: HELP-Apheresis in Diabetic Ischemic Foot Treatment (H.A.D.I.F) (HADIF). December 2014.
12. ClinicalTrials.gov. NCT01753232: Safety and Efficacy of the DALI LDL-adsorber and MONET Lipoprotein Filter (LINET) (December 2013).
13. ClinicalTrials.gov. NCT01840683: HELP Therapy for Dry AMD (HELPuc) (November 2014).
14. Colvin MM, et al. Antibody-mediated rejection in cardiac transplantation: emerging knowledge in diagnosis and management: a scientific statement from the American Heart Association. Circulation. 2015 May 5;131(18):1608-39.
15. Connelly-Smith LS, Linenberger ML. Therapeutic apheresis for patients with cancer. Cancer Control. 2015 Jan;22(1):60-78.
16. Cordoba JP, et al. Therapeutic plasma exchange in rheumatic diseases: a university hospital experience. Rev Bras Reumatol. 2016 Dec 16.
17. Cortese I, Chaudhry V, So YT et al. Evidence-based guideline update: Plasmapheresis in neurologic disorders. Neurology 2011; 76(3):294-300.
18. Cortese I, Cornblath DR. Therapeutic plasma exchange in neurology: 2012. J Clin Apher. 2013 Feb;28(1):16-9.
19. D'Erasmo L, Gallo A, Cefalù AB, et al. Long-term efficacy of lipoprotein apheresis and lomitapide in the treatment of homozygous familial hypercholesterolemia (HoFH): a cross-national retrospective survey. Orphanet J Rare Dis. 2021 Sep 8;16(1):381. doi: 10.1186/s13023-021-01999-8.
20. Dhaun N, et al. Benefits of an expanded use of plasma exchange for anti-neutrophil cytoplasmic antibody-associated vasculitis within a dedicated clinical service. BMC Musculoskelet Disord. 2015 Nov 9; 16:343.
21. ECRI, Windows on Technology – “Plasmapheresis for the Treatment of Multiple Sclerosis” (10/01).
22. El-Bayoumi MA, El-Refaey AM, Abdelkader AM, El-Assmy MM, Alwakeel AA, El-Tahan HM. (2011). Comparison of intravenous immunoglobulin and plasma exchange in treatment of mechanically ventilated children with Guillain Barre syndrome: a randomized study. Crit Care, 15(4), R164.
23. First Coast Service Options, Inc. Florida Medicare Part B Local Coverage Determination L33777, Noncovered Services. Retired 07/01/20.
24. Goldberg AC, Hopkins PN, Toth PP, et al. Familial hypercholesterolemia: screening, diagnosis and management of pediatric and adult patients: clinical guidance from the National Lipid Association Expert Panel on Familial Hypercholesterolemia. J Clin Lipidol. Jun 2011;5(3 Suppl): S1-8.
25. HAYES Medical Technology Directory; “Extracorporeal Immunoadsorption Using Protein A Columns (Prosorba®) for the Treatment of Rheumatoid Arthritis” EXTR0201.18 (06/00).
26. HAYES Update: “Extracorporeal Immunoadsorption Using Protein A Columns (Prosorba) for the Treatment of Rheumatoid Arthritis”, EXTR0201.18 (11/21/02).
27. Health Quality Ontario. Low-density lipoprotein apheresis: an evidence-based analysis. Ontario health technology assessment series 7.5 (2007): 1.

28. Hollyman D, et al. Manufacturing validation of biologically functional T cells targeted to CD19 antigen for autologous adoptive cell therapy. J Immunother. 2009 Feb-Mar;32(2):169-80.

29. Ito MK, Watts GF. Challenges in the Diagnosis and Treatment of Homozygous Familial Hypercholesterolemia. Drugs. 2015 Oct;75(15):1715-24.

30. Julius U. Lipoprotein apheresis in the management of severe hypercholesterolemia and of elevation of lipoprotein(a): current perspectives and patient selection. Med Devices (Auckl). 2016 Oct 13; 9:349-360.

31. Kavey REW, et al. Cardiovascular Risk Reduction in High-Risk Pediatric Patients. Circulation 114.24 (2006): 2710-2738.

32. Kiki I. What is the role of apheresis technology in stem cell transplantation? Transfus Apher Sci. 2017;56(6):788–794. doi: 10.1016/j.transci.2017.11.007.

33. Koshi-Ito E, Koike K, Tanaka A, et al. Effect of Low-Density Lipoprotein Apheresis for Nephrotic Idiopathic Membranous Nephropathy as Initial Induction Therapy. Ther Apher Dial. 2019;23(6):575-583. doi:10.1111/1744-9987.12811. PMID: 30993827.

34. Kobashigawa JA, Patel JK, Kittleson MM, et al. The long-term outcome of treated sensitized patients who undergo heart transplantation. Clin Transplant. 2011;25(1): E61–E67. doi:10.1111/j.1399-0012.2010.01334.

35. Korsak J, Wańkowicz Z. New Options of Apheresis in Renal Diseases: How and When? Blood Purif. 2016;41(1-3):1-10.

36. Leebmann J, Roeseler E, Julius U, et al. Lipoprotein apheresis in patients with maximally tolerated lipid-lowering therapy, lipoprotein(a)-hyperlipoproteinemia, and progressive cardiovascular disease: prospective observational multicenter study. Circulation. Dec 17, 2013;128(24):2567-2576.

37. Malvezzi P, Jouve T, Noble J, Rostaing L. Desensitization in the Setting of HLA-Incompatible Kidney Transplant. Exp Clin Transplant. 2018;16(4):367–375. doi:10.6002/ect.2017.0355.

38. McGuirk J, et al. Building blocks for institutional preparation of CTL019 delivery. Cytotherapy. 2017 Sep;19(9):1015-1024.

39. National Comprehensive Cancer Network (NCCN). NCCN Guidelines: Multiple Myeloma, Version 2.2015. 09/30/2014. Accessed at http://www.nccn.org/professionals/physician_gls/pdf/myeloma.pdf.

40. National Institute for Health and Clinical Excellence (NICE). National Collaborating Centre for Primary Care. Identification and management of familial hypercholesterolaemia. London (UK). 2008 Aug. (Clinical guideline; no.71).

41. National Institute for Health and Care Excellence (NICE). NICE Guideline 185: Acute Coronary Syndrome. November 2020. Accessed at https://www.nice.org.uk/guidance/ng185.

42. National Institute for Health and Clinical Excellence (NICE). Medical technologies guidance [MTG28]: Spectra Optia for automatic red blood cell exchange in patients with sickle cell disease (March 2016).

43. O'Donghaile D, Kelley W, Klein HG, Flegel WA. Recommendations for transfusion in ABO-incompatible hematopoietic stem cell transplantation. Transfusion. 2012 Feb;52(2):456-8.

44. Onwuemene OA, Grambow SC, Patel CB, et al. Indications for and outcomes of therapeutic plasma exchange after cardiac transplantation: A single center retrospective study. J Clin Apher. 2018;33(4):469–479. doi:10.1002/jca.21622.

45. Pagano MB, Murinson BB, Tobian AA, King KE. Efficacy of therapeutic plasma exchange for treatment of stiff-person syndrome. Transfusion, 2014.

46. Raina R, Krishnappa V. An update on LDL apheresis for nephrotic syndrome. Pediatr Nephrol. 2019;34(10):1655-1669. doi:10.1007/s00467-018-4061-9. PMID: 30218191.

47. Safarova MS, Kullo IJ. My Approach to the Patient with Familial Hypercholesterolemia. Mayo Clin Proc. 2016 Jun;91(6):770-86.

48. Schettler V, Neumann CL, Hulpke-Wette M, Hagenah GC, Schulz EG, Wieland E; German Apheresis Working Group. Current view: indications for extracorporeal lipid apheresis treatment. Clin Res Cardiol Suppl. 2012 Jun;7(Suppl 1):15-9.

49. Schmidt JJ, et al. Effect of therapeutic plasma exchange on plasma levels and total removal of adipokines and inflammatory markers. BMC Obes. 2015 Sep 30; 2:37.

50. Schwartz J, Winters JL, Padmanabhan A et al. Guidelines on the use of therapeutic apheresis in clinical practice-evidence-based approach from the Writing Committee of the American Society for Apheresis: the sixth special issue. J Clin Apher 2013; 28(3):145-284.

51. Schwartz J, Padmanabhan A, et al. Guidelines on the Use of Therapeutic Apheresis in Clinical Practice—Evidence Based Approach from the Writing Committee of the American Society for Apheresis: The Seventh Special Issue. Journal of Clinical Apheresis 31:149–162 (2016).

52. Schettler VJ, et al; Scientific Board of GLAR for the German Apheresis Working Group. The German Lipoprotein Apheresis Registry (GLAR) - almost 5 years on. Clin Res Cardiol Suppl. 2017 Mar;12(Suppl 1):44-49.

53. Stegmayr B, Newman E, Witt V, et al. Using the World Apheresis Association Registry Helps to Improve the Treatment Quality of Therapeutic Apheresis. Transfus Med Hemother. 2021 Aug;48(4):234-239. doi: 10.1159/000513123. Epub 2021 Jan 5.

54. Stussi G, Buser A, Holbro A. Red Blood Cells: Exchange, Transfuse, or Deplete. Transfus Med Hemother. 2019;46(6):407–416. doi:10.1159/000504144.

55. Thibodeaux SR, Tanhehco YC, Irwin L, Jamensky L, Schell K, O'Doherty U. More efficient exchange of sickle red blood cells can be achieved by exchanging the densest red blood cells: An ex vivo proof of concept study. Transfus Apher Sci. 2019;58(1):100–106. doi: 10.1016/j.transci.2018.12.005.

56. United States Food & Drug Administration (FDA). Humanitarian Device Exemption (HDE) Approval Order H170002 (March 20, 2018).

57. UpToDate. Therapeutic apheresis (plasma exchange or cytapheresis): Indications and technology. 2023. Accessed at uptodate.com.

58. UpToDate. Therapeutic apheresis (plasma exchange or cytapheresis): Complications. 2023. Accessed at uptodate.com.

59. UpToDate. Familial hypercholesterolemia in adults: Treatment. 2023. Accessed at uptodate.com.

60. UpToDate. Treatment of drug-resistant hypercholesterolemia. 2023. Accessed at uptodate.com.

61. Vlachopanos G, Georgalis A, Gakiopoulou H. Plasma Exchange for the Recurrence of Primary Focal Segmental Glomerulosclerosis in Adult Renal Transplant Recipients: A Meta-Analysis. J Transplant. 2015; 2015:639628.

62. Vrielink H, Le Poole K, Stegmayr B, Kielstein J, Berlin G, Ilhan O, Seval GC, Prophet H, Aandahl A, Deeren D, Bojanic I, Blaha M, Lanska M, Gasova Z, Bhuiyan-Ludvikova Z, Blahutova S, Hrdlickova R, Audzijoniene J, Griskevicius A, Glatt T, Strineholm V, Ott M, Nilsson T, Newman E, Derfler K, Witt V, Toss F. The world apheresis association registry, 2023 update. Transfus Apher Sci. 2023 Dec;62(6):103831. doi: 10.1016/j.transci.2023.103831. Epub 2023 Oct 7.

63. Waksman R, Torguson R, Kent KM, et al. A first-in-man, randomized, placebo-controlled study to evaluate the safety and feasibility of autologous delipidated high-density lipoprotein plasma infusions patients with acute coronary syndrome. J Am Coll Cardiol. Jun 15, 2010;55(24):2727-2735.

64. Walsh M, et al. Plasma exchange for renal vasculitis and idiopathic rapidly progressive glomerulonephritis: a meta-analysis. American journal of kidney diseases: the official journal of the National Kidney Foundation 57.4 (2011): 566.

65. Wang A, et al. Systematic Review of Low-Density Lipoprotein Cholesterol Apheresis for the Treatment of Familial Hypercholesterolemia. J Am Heart Assoc. 2016 Jul 6;5(7). pii: e003294.

66. Watts GF, Gidding SS, Hegele RA, Raal FJ, Sturm AC, Jones LK, Sarkies MN, Al-Rasadi K, Blom DJ, Daccord M, de Ferranti SD, Folco E, Libby P, Mata P, Nawawi HM, Ramaswami U, Ray KK, Stefanutti C, Yamashita S, Pang J, Thompson GR, Santos RD. International Atherosclerosis Society guidance for implementing best practice in the care of familial hypercholesterolaemia. Nat Rev Cardiol. 2023 Dec;20(12):845-869. doi: 10.1038/s41569-023-00892-0. Epub 2023 Jun 15.

67. Youngblom E, Pariani M, Knowles JW. Familial Hypercholesterolemia. 2014 Jan 2 [Updated 2016 Dec 8]. In: Pagon RA, Adam MP, Ardinger HH, et al., editors. GeneReviews® [Internet]. Seattle (WA): University of Washington, Seattle; 1993-2017. Available from: https://www.ncbi.nlm.nih.gov/books/NBK174884/.

68. Zheng W, Zhao KM, Luo LH, Yu Y, Zhu SM. Perioperative Single-Donor Platelet Apheresis and Red Blood Cell Transfusion Impact on 90-Day and Overall Survival in Living Donor Liver Transplantation. Chin Med J (Engl). 2018;131(4):426–434.

COMMITTEE APPROVAL:

This Medical Coverage Guideline (MCG) was approved by the Florida Blue Medical Policy and Coverage Committee on 01/25/24.

GUIDELINE UPDATE INFORMATION:

11/15/00	Medical Coverage Guideline developed.
04/15/01	Revised to include coverage information for ECI.
08/28/02	Revised to include ICD-9 diagnosis code for a covered indication for 36521; Add clarification for ICD-9 diagnosis codes that support medical necessity for 36520.
01/01/03	HCPCS coding update.
04/15/03	Reviewed; revised to include additional covered indication.
05/15/07	Medical Coverage Guideline archived.
02/15/15	Medical Coverage Guideline returned to active status. Revised MCG title, description section, position statement, CPT, HCPCS, ICD9, and ICD10 coding; Medicare Advantage program exception, and definitions. Updated references and reformatted guideline.
10/01/15	Revision; updated ICD9 coding section.
02/15/16	Scheduled review. Maintained position statement, revised program exceptions section, and updated references.
10/01/16	ICD-10 coding update: deleted code E78.0; added code E78.01.
11/17/16	Unscheduled revision. Deleted ICD10 code G70.00.
03/15/17	Scheduled review. Maintained position statement. Updated references. Reformatted guideline.
07/15/17	Revision: Revised description section, coverage for low-density lipoprotein (LDL) apheresis, and definitions section. Updated references.
01/01/18	Annual CPT/HCPCS coding update: deleted 36515; revised 36516.
03/15/18	Revision: added CAR T-cell therapy as a covered indication. Updated references.
04/26/18	Revision: updated related guidelines.
03/15/20	Scheduled review, Revised description. Added coverage statements to position statement for sickle cell disease, Wilson's disease, and certain conditions associated with heart, liver, kidney, and stem cell transplantation. Revised ICD10 coding section and updated references.

08/15/20	Unscheduled review. Maintained position statement and updated references.
07/15/21	Revision: minor update to position statement for selective high-density lipoprotein (HDL) delipidation and plasma reinfusion when used for acute coronary syndrome. Updated references.
02/15/22	Scheduled review. Revised description, maintained position statement, and updated references.
05/23/23	Update to Program Exceptions section.
02/15/24	Scheduled review. Revised description, maintained position statement, and updated references.