

# MEDICAL POLICY



<b>SUBJECT: ENDOVASCULAR REPAIR (COIL EMBOLIZATION) OF INTRACRANIAL ANEURYSMS</b>	<b>EFFECTIVE DATE: 12/18/08</b> <b>REVISED DATE: 11/19/09, 11/18/10, 10/20/11, 09/20/12, 08/15/13, 07/17/14, 07/16/15, 06/16/16, 06/15/17, 05/17/18</b> <b>(ARCHIVED DATE: 09/16/99,</b> <b>EDITED DATE: 09/28/05, 11/16/06, 12/20/07)</b> <b>PAGE: 1 OF: 12</b>
<b>POLICY NUMBER: 7.01.81</b> <b>CATEGORY: Technology Assessment</b>	

- *If a product excludes coverage for a service, it is not covered, and medical policy criteria do not apply.*
- *If a commercial product (including an Essential Plan product) or a Medicaid product covers a specific service, medical policy criteria apply to the benefit.*
- *If a Medicare product covers a specific service, and there is no national or local Medicare coverage decision for the service, medical policy criteria apply to the benefit.*

## **POLICY STATEMENT:**

Based upon our criteria and assessment of the peer-reviewed literature:

- I. Endovascular repair of intracranial aneurysms using coil embolization has been medically proven to be effective and is considered **medically appropriate** as an alternative to aneurysm clipping in the treatment of intra-cranial aneurysms.
- II. Endovascular repair of wide-necked intracranial aneurysms using stent assisted embolic coiling is considered a **medically appropriate** treatment for otherwise inoperable aneurysms only when performed in an institution with a multidisciplinary neurosurgical team. *(See policy guidelines II and III.)*

*Refer to Corporate Medical Policy # 7.01.70 regarding Angioplasty, of Intracranial Atherosclerotic Stenoses with or without Stenting.*

## **POLICY GUIDELINES:**

- I. The Federal Employee Health Benefit Program (FEHBP/FEP) requires that procedures, devices or laboratory tests approved by the U.S. Food and Drug Administration (FDA) may not be considered investigational and thus these procedures, devices or laboratory tests may be assessed only on the basis of their medical necessity.
- II. Stent assisted embolic coiling must be performed at a facility having 24 hour/day 7 days/week availability of a multidisciplinary team that includes a neuroendovascular interventionalist.
- III. Flow-diverting stents are indicated for the treatment of large or giant wide-necked intracranial aneurysms, with a size of 10 mm or more and a neck diameter of 4 mm or more, in the internal carotid artery from the petrous to the superior hypophyseal segments.

## **DESCRIPTION:**

Surgical ligation and clipping has long been the standard treatment of intracranial aneurysms. Microsurgical techniques have evolved over the years, and a variety of surgical approaches and metal aneurysm clips have been developed. Surgical treatment has proven to be highly effective, with reported rates of complete occlusion of unruptured aneurysms of approximately 90–95%, with an extremely low rate of subsequent subarachnoid hemorrhage. Surgical repair of aneurysms in the posterior intracranial circulation, however, is extremely difficult due to technical access issues.

In 1991, Guido Guglielmi described a technique of occluding aneurysms with an endovascular approach using an electrolytic detachable platinum coil. In this procedure, one or more coils are introduced under radiologic guidance directly into the aneurysm via a microcatheter. The first coil is introduced into the aneurysm dome to form a basket, with subsequent coils of decreasing size placed within the aneurysm. The coils fill the aneurysm, blocking blood flow. A low positive direct electrical current is then delivered to the guide wire. Thrombosis occurs within the aneurysm due to the attraction of negatively charged white blood cells, red blood cells, platelets and fibrinogen to the positively charged platinum coil within the aneurysm. Electrical current detaches the platinum coil within a few minutes due to electrolysis of the stainless steel wire closest to the thrombus-covered coil.

<p><b>SUBJECT: ENDOVASCULAR REPAIR (COIL EMBOLIZATION) OF INTRACRANIAL ANEURYSMS</b></p> <p><b>POLICY NUMBER: 7.01.81</b></p> <p><b>CATEGORY: Technology Assessment</b></p>	<p><b>EFFECTIVE DATE: 12/18/08</b></p> <p><b>REVISED DATE: 11/19/09, 11/18/10, 10/20/11, 09/20/12, 08/15/13, 07/17/14, 07/16/15, 06/16/16, 06/15/17, 05/17/18</b></p> <p><b>(ARCHIVED DATE: 09/16/99,</b></p> <p><b>EDITED DATE: 09/28/05, 11/16/06, 12/20/07)</b></p> <p><b>PAGE: 2 OF: 12</b></p>
---	---

Endovascular repair of intracranial aneurysms, also called coil embolization, was originally performed only to treat aneurysms unsuitable for surgery. As clinical experience with this technique has grown and coil design has been refined, endovascular treatment has been used with increasing frequency even for patients who could be treated by conventional surgical clipping. Reported complications of endovascular coiling include bleeding, cerebral embolus, cerebral vasospasm, coil stretching, herniation, or migration, dissection, errant coil placement and thrombosis. Incomplete obliteration and aneurysm recurrence may also occur.

Stent assisted embolic coiling has been investigated in the treatment of wide-necked aneurysms where coils alone cannot be safely contained within the aneurysm fundus. The stent-assisted coil delivery procedure consists of the placement of the stent in the parent artery across the aneurysm neck. A microcatheter is then navigated through the stent interstices into the aneurysm sac, and coil embolization is performed. In a modified stent delivery procedure, the microcatheter is inserted into the aneurysm sac first, and then the stent is placed across the wide neck of the lesion. This locks the microcatheter in the aneurysm, helping to stabilize the device during delivery of the coils. The disadvantage with this method is that there is the potential to move or even damage the stent when removing the microcatheter. The stent serves as a mechanical scaffold for placement of the coils into the aneurysm. Stent placement can allow safe packing of the lesion, preventing herniation of the coils into the parent vessels and allowing for a denser coil mesh. A disadvantage is that these devices are very thrombogenic. An intravascular stent stimulates platelet aggregation as soon as it is exposed to the patient's blood. It is currently recommended that patients receive dual antiplatelet therapy 3 days before stent placement. Consequently, the ideal aneurysm for stent-assisted coil placement is an unruptured one.

The Pipeline Embolization Device (PED) is flow diverting stent-like device that is utilized in anatomical situations where stent-assisted coiling becomes difficult, such as in giant or fusiform aneurysms. The primary goal of the device is to divert blood flow away from the aneurysm by placing a mesh structure, similar to a stent, on the aneurysm neck along the parent artery. The device provides a scaffold for endothelial growth and the achievement of a biological seal. While blood flow through the parent vessel is maintained, flow within the aneurysm sac is disrupted, leading to blood stasis and thrombus formation inside the aneurysm.

### **RATIONALE:**

The Guglielmi Detachable Coil (GDC®) (Boston Scientific/Target, Fremont, CA) received FDA approval in 1995 as a Class III device through the 510(k) process. The Guglielmi coil is a bare platinum coil. Numerous additional coils fabricated of various components, including coils with biologically active materials, have subsequently received FDA 510(k) approval as Class II devices.

Published literature, including randomized controlled trials, comparing endovascular coil occlusion with traditional surgical treatment have demonstrated that endovascular treatment is a safe and effective alternative to surgical clipping.

The National Institute for Clinical Excellence (2005) states that current evidence suggests that the coil embolization of unruptured intracranial aneurysms issued is efficacious in obliterating unruptured intracranial aneurysms and that its safety is similar to that of surgical treatments. Guidance regarding coil embolization of ruptured intracranial aneurysms issued in 2005 was similar, stating that current evidence on the safety and efficacy appears adequate to support use of the procedure.

A Cochrane Systematic Review (2006) compared the effects of endovascular coiling versus neurosurgical clipping in patients with aneurysmal subarachnoid hemorrhage. The review was based primarily on the ISAT and Vanninen/Koivisto randomized trials and an unpublished controlled trial of a series of 20 patients randomly assigned to surgical or endovascular treatment. The Cochrane review concluded that, for patients in good clinical condition with ruptured aneurysms of either the anterior or the posterior circulation, there is firm evidence that endovascular treatment is associated with a better outcome in cases in which the aneurysm is considered suitable for either treatment.

Currently three self-expanding intracranial microstents (SEIMs) for use with embolic coils are available for use in the US. In 2003, the Neuroform™ Microdelivery Stent System (Boston Scientific) was released for use in treating wide-necked aneurysms under the Humanitarian Device Exemption (HDE). In 2007, the FDA also granted HDE approval for

<p><b>SUBJECT: ENDOVASCULAR REPAIR (COIL EMBOLIZATION) OF INTRACRANIAL ANEURYSMS</b></p> <p><b>POLICY NUMBER: 7.01.81</b></p> <p><b>CATEGORY: Technology Assessment</b></p>	<p><b>EFFECTIVE DATE: 12/18/08</b></p> <p><b>REVISED DATE: 11/19/09, 11/18/10, 10/20/11, 09/20/12, 08/15/13, 07/17/14, 07/16/15, 06/16/16, 06/15/17, 05/17/18</b></p> <p><b>(ARCHIVED DATE: 09/16/99,</b></p> <p><b>EDITED DATE: 09/28/05, 11/16/06, 12/20/07)</b></p> <p><b>PAGE: 3 OF: 12</b></p>
---	---

the Cordis Enterprise (TM) Vascular Reconstruction Device and Delivery System for use with embolic coils in the treatment of wide-neck intracranial aneurysms. MicroVention Inc's, Low-profile Visualized Intraluminal Support Device (LVIS and LVIS Jr) received HDE approval from the FDA in July 2014. The LVIS is a stent assisted coiling device that is intended for use with bare platinum coils for the treatment of unruptured, wide neck (neck greater or equal to 44 mm or dome to neck ration < 2), intracranial, saccular aneurysms arising from a parent vessel with a diameter of equal to or greater than > 2.5 mm and less than or equal to 4.5 mm.

Published literature regarding use of stent assisted embolic coiling in wide-necked aneurysm therapy consists mostly of retrospective case series. Early data suggest improved durability of repair but with the risk of delayed stenosis. Evidence is sufficient to indicate that, when performed in an institution with a multidisciplinary team, successful stent deployment rates above 90% can be achieved and outcomes are improved compared to the natural history of these aneurysms for this otherwise inoperable, high-risk population.

The Pipeline™ Embolization Device (Chestnut Medical Technologies) received FDA PMA approval in April 2011. This flow-diverter stent device is approved for the endovascular treatment of wide-neck or giant aneurysms in the internal carotid artery from the petrous to superior hypophyseal segments.

FDA approval was based on data from the Pipeline for Uncoilable or Failed Aneurysms (PUFS) study. PUFS was a prospective, multi-center, single-arm, open label clinical study conducted at 8 sites in the US and 2 sites outside of the US. PUFS subjects were adults with a single target aneurysm on the internal carotid artery with size of at least 10 mm and neck of at least 4 mm. The primary effectiveness endpoint of the study was complete occlusion of the target aneurysm on 180-day cerebral angiography in the absence of use of other treatments and in the absence of major (>50%) stenosis of the parent artery. The primary safety endpoint was the occurrence of major ipsilateral stroke or neurologic death by 180 days. The primary safety endpoint was judged by a clinical events committee. PED was placed successfully in 107 of 108 attempted (99.0%) subjects. In one subject, the parent artery distal to the IA could not be catheterized and the PED procedure was abandoned. A mean of 3.1 PEDs was placed per subject. Complete IA occlusion was seen in 81.8% of subjects at 180 days and 85.7% at 1 year. The study's primary safety endpoint, ipsilateral major stroke or neurologic death by 180 days after treatment, occurred in 6 subjects. The posterior probability that the major safety endpoint rate was less than 20%, the predetermined safety success threshold, was 0.999979. Both the effectiveness and safety endpoint posterior probability values exceeded the pre-study probability threshold of 0.975, indicating that both results were statistically significant. The study met the pre-specified primary effectiveness and safety endpoints at 180 days which remained statistically significant at one year.

Examples of other flow diverting devices that are currently being investigated (no known FDA approval) include the Flow Redirection Endoluminal Device System (FRED), the Surpass Flow Diverter, the Luna Aneurysm Embolization System, and the Barrel Vascular Reconstruction Device.

**CODES:**      Number              Description

*Eligibility for reimbursement is based upon the benefits set forth in the member's subscriber contract.*

**CODES MAY NOT BE COVERED UNDER ALL CIRCUMSTANCES. PLEASE READ THE POLICY AND GUIDELINES STATEMENTS CAREFULLY.**

Codes may not be all inclusive as the AMA and CMS code updates may occur more frequently than policy updates.

<b><u>CPT:</u></b>	61624	Transcatheter permanent occlusion or embolization (e.g., for tumor destruction, to achieve hemostasis, to occlude a vascular malformation), percutaneous, any method; central nervous system (intracranial, spinal cord)
	61635	Transcatheter placement of intravascular stent(s), intracranial (e.g., atherosclerotic stenosis), including balloon angioplasty, if performed.
	75894	Transcatheter therapy, embolization, any method, radiological supervision and

<p><b>SUBJECT: ENDOVASCULAR REPAIR (COIL EMBOLIZATION) OF INTRACRANIAL ANEURYSMS</b></p> <p><b>POLICY NUMBER: 7.01.81</b></p> <p><b>CATEGORY: Technology Assessment</b></p>	<p><b>EFFECTIVE DATE: 12/18/08</b></p> <p><b>REVISED DATE: 11/19/09, 11/18/10, 10/20/11, 09/20/12, 08/15/13, 07/17/14, 07/16/15, 06/16/16, 06/15/17, 05/17/18</b></p> <p><b>(ARCHIVED DATE: 09/16/99,</b></p> <p><b>EDITED DATE: 09/28/05, 11/16/06, 12/20/07)</b></p> <p><b>PAGE: 4 OF: 12</b></p>
---	---

interpretation

Copyright © 2018 American Medical Association, Chicago, IL

**HCPCS:** No codes

747.89 Other aneurysm, congenital, specified site not elsewhere classified

**ICD10:** 160.00-160.9 Nontraumatic subarachnoid hemorrhage (code range)

161.0-161.9 Nontraumatic intracerebral hemorrhage (code range)

167.0-167.1 Cerebral aneurysm, nonruptured (code range)

Q27.30 Arteriovenous malformation, site unspecified

Q27.4 Congenital phlebectasis

Q28.0-Q28.3 Arteriovenous malformation or other malformation of precerebral/cerebral vessels (code range)

Q28.8 Other specified congenital malformations of circulatory system

**REFERENCES:**

Alghamdi F, et al. Stent-assisted coiling of intracranial aneurysms located on small vessels: midterm results with LVIS Junior stent in 40 patients with 43 aneurysms. Neuroradiology 2016 Mar 5 [Epub ahead of print].

\*Alurkar A, et al. Stent-assisted coiling in ruptured wide-necked aneurysms: A single-center analysis. Surg Neurol Int 2012;3:131.

\*Akpek S, et al. Self-expandable stent-assisted coiling of wide-necked intracranial aneurysms: a single-center experience. AJNR Am J Neuroradiol 2005 May;26(5):1223-31.

Arrese I, et al. Flow-diverter devices for intracranial aneurysms: systematic review and meta-analysis. Neurosurgery 2013 Aug;73(2):193-9.

Avdin K, et al. Stent-assisted coiling of wide-neck intracranial aneurysms using low-profile LEO baby stents: initial and midterm results. AJNR Am J Neuroradiol 2015 Oct;36(10):1934-41.

Becks T, et al. Pipeline for uncoilable or failed aneurysms: results from a multicenter clinical trial. Radiology 2013 Jun;267(3):858-68.

\*Bederson JB, et al. Guidelines for the management of aneurismal subarachnoid hemorrhage: a statement for healthcare professionals from a special writing group of the Stroke Council, American Heart Association. Stroke 2009 Mar;40(3):994-1025.

Bekelis K, et al. Surgical clipping versus endovascular coiling for elderly patients presenting with subarachnoid hemorrhage. J Neurointerv Surg 2016 Sept;8(9):913-918.

\*Biondi A, et al. Neuroform stent-assisted coil embolization of wide-neck intracranial aneurysms: strategies in stent deployment and midterm follow-up. Neurosurgery 2007 Sep;61(3):460-8; discussion 468-9.

BlueCross BlueShield Association. Endovascular Procedures for Intracranial Arterial Disease (Atherosclerosis and Aneurysms). Medical Policy Reference Manual Policy #2.01.54. 2017 Sept 14.

\*Bodily KD, et al. Stent-assisted coiling in acutely ruptured intracranial aneurysms: a qualitative, systematic review of the literature. AJNR Am J Neuroradiol 2011 Aug;32(7):1232-6.

Brasiliense LB, et al. Silent ischemic events after Pipeline embolization device: a prospective evaluation with MR diffusion-weighted imaging. J Neurointerv Surg 2016 Jan 8.

<p><b>SUBJECT: ENDOVASCULAR REPAIR (COIL EMBOLIZATION) OF INTRACRANIAL ANEURYSMS</b></p> <p><b>POLICY NUMBER: 7.01.81</b></p> <p><b>CATEGORY: Technology Assessment</b></p>	<p><b>EFFECTIVE DATE: 12/18/08</b></p> <p><b>REVISED DATE: 11/19/09, 11/18/10, 10/20/11, 09/20/12, 08/15/13, 07/17/14, 07/16/15, 06/16/16, 06/15/17, 05/17/18</b></p> <p><b>(ARCHIVED DATE: 09/16/99,</b></p> <p><b>EDITED DATE: 09/28/05, 11/16/06, 12/20/07)</b></p> <p><b>PAGE: 5 OF: 12</b></p>
---	---

Briganti F, et al. Endovascular treatment of cerebral aneurysms using flow-diverter devices: A systematic review. Neuroradiol J 2015 Aug;28(4):365-75.

Briganti F, et al. Mid-term and long-term follow-up of intracranial aneurysms treated by the p64 Flow Moderation Device: a multicenter experience. J Neurointerv Surg 2017 Jan;9(1):70-76.

\*Brinjikji W, et al. Endovascular treatment of very small (3 mm or smaller) intracranial aneurysms: report of a consecutive series and a meta-analysis. Stroke 2010 Jan;41(1):116-21.

\*Brinjikji W, et al. Better outcomes with treatment by coiling relative to clipping of unruptured intracranial aneurysms in the United States, 2001-2008. AJNR Am J Neuroradiol 2011 Jun-Jul;32(6):1071-5.

\*Brinjikji W, et al. Patient outcomes are better for unruptured cerebral aneurysms treated at centers that preferentially treat with endovascular coiling: a study of the national inpatient sample 2001-2007. AJNR Am J Neuroradiol 2011 Jun-Jul;32(6):1065-70.

Brinjikji W, et al. Age-related outcomes following intracranial aneurysm treatment with the Pipeline Embolization Device: a subgroup analysis of the IntrePED registry. J Neurosurg 2015 Nov 6:1-5.

\*Chalouhi N, et al. Safety and efficacy of endovascular treatment of basilar tip aneurysms by coiling with and without stent-assistance: a review of 235 cases. Neurosurgery 2012 Oct;71(4):785-94.

Chalouhi N, et al. Comparison of flow diversion and coiling in large unruptured intracranial saccular aneurysms. Stroke 2013 Aug;44(8):2150-4.

Chalouhi N, et al. Stent-assisted coiling of intracranial aneurysms: predictors of complications, recanalization, and outcome in 508 cases. Stroke 2013 May;44(5):1348-53.

Chitale R, et al. Treatment of ruptured intracranial aneurysms: comparison of stenting and balloon remodeling. Neurosurgery 2013 Jun;72(6):953-9.

Clajus C, et al. Initial and mid-term results from 108 consecutive patients with cerebral aneurysms treated with the WEB device. J Neurointerv Surg 2017 April;9(4):411-417.

\*Colby GP, et al. A single center comparison of coiling versus stent assisted coiling in 90 consecutive paraophthalmic region aneurysms. J Neurointerv Surg 2012 Mar;4(2):116-20.

Colby GP, et al. Immediate procedural outcomes in 44 consecutive Pipeline Flex cases; the first North American single-center series. J Neurointerv Surg 2016 July;8(7):702-709.

Consoli A, et al. Assisted coiling of saccular wide-necked unruptured intracranial aneurysms: stent versus balloon. J Neurointerv Surg 2016 Jan;8(1):52-7.

Cruz JP, et al. Pipeline embolization device in aneurysmal subarachnoid hemorrhage. AJNR Am J Neuroradiol 2013 Feb;34(2):271-6.

Dabus G, et al. Treatment of complex anterior cerebral artery aneurysms with Pipeline flow diversion: mid-term results. J Neurointerv Surg 2017 Feb;9(2):147-151.

\*Deutschmann HA, et al. Long-term follow-up after treatment of intracranial aneurysms with Pipeline embolization device: results from a single center. AJNR Am J Neuroradiol 2012 Mar;33(3):481-6.

Fan L, et al. Stent-assisted coiling versus coiling alone of ruptured anterior communicating artery aneurysms: a single-center experience. Clin Neurol Neurosurg 2016 May;144:96-100.

\*Fargen KM, et al. Long-term results of Enterprise stent-assisted coiling of cerebral aneurysms. Neurosurgery 2012 Aug;71(2):239-44.

<p><b>SUBJECT: ENDOVASCULAR REPAIR (COIL EMBOLIZATION) OF INTRACRANIAL ANEURYSMS</b></p> <p><b>POLICY NUMBER: 7.01.81</b></p> <p><b>CATEGORY: Technology Assessment</b></p>	<p><b>EFFECTIVE DATE: 12/18/08</b></p> <p><b>REVISED DATE: 11/19/09, 11/18/10, 10/20/11, 09/20/12, 08/15/13, 07/17/14, 07/16/15, 06/16/16, 06/15/17, 05/17/18</b></p> <p><b>(ARCHIVED DATE: 09/16/99,</b></p> <p><b>EDITED DATE: 09/28/05, 11/16/06, 12/20/07)</b></p> <p><b>PAGE: 6 OF: 12</b></p>
---	---

Feng Z, et al. The safety and efficacy of low profile visualized intraluminal support (LVIS) stents in assisting coil embolization of intracranial saccular aneurysms: a single center experience. J Neurointerv Surg 2016 Jan 8 [Epub ahead of print].

Feng Z, et al. Staged stenting with or without additional coils after conventional initial coiling of acute ruptured wide-neck intracranial aneurysms. World Neurosurg 2017 Dec;108:506-512.

Feng X, et al. Comparison of recanalization and in-stent stenosis between the low-profile visualized intraluminal support stent and Enterprise stent-assisted coiling for 254 intracranial aneurysms. World Neurosurg 2018 Jan;109:e99-e104.

\*Ferns SP, et al. Coiling of intracranial aneurysms: a systematic review on initial occlusion and reopening and retreatment rates. Stroke 2009 Aug;40(8):e523-9.

\*Finitsis S, et al. Endovascular treatment of ACom intracranial aneurysms. Report on series of 280 patients. Interv Neuroradiol 2010 Mar;16(1):7-16.

\*Fiorella D, et al. Usefulness of the Neuroform stent for the treatment of cerebral aneurysms: results at initial (3-6-mo) follow-up. Neurosurgery 2005 Jun;56(6):1191-201; discussion 1201-2.

Fischer S, et al. Initial experience with p64: a novel mechanically detachable flow diverter for the treatment of intracranial saccular sidewall aneurysms. AJNR Am J Neuroradiol 2015 Nov;36(11):2082-9.

Food and Drug Administration. Recently approved medical devices. Pipeline™ Embolization Device-P100018. [[http://www.accessdata.fda.gov/cdrh\\_docs/pdf10/P100018c.pdf](http://www.accessdata.fda.gov/cdrh_docs/pdf10/P100018c.pdf)] accessed 4/3/18.

Food and Drug Administration. Recently approved medical devices. cPAX Aneurysm Treatment System-H100002. [[http://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/ DeviceApprovalsandClearances/Recently-ApprovedDevices/ucm254457.htm](http://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/DeviceApprovalsandClearances/Recently-ApprovedDevices/ucm254457.htm)] accessed 4/3/18.

\*Gallas S, et al. Long-term follow-up of 1036 cerebral aneurysms treated by bare coils: a multicentric cohort treated between 1998 and 2003. AJNR Am J Neuroradiol 2009 Nov;30(10):1986-92.

\*Gao X, et al. Complications and adverse events associated with Neuroform stent-assisted coiling of wide-neck intracranial aneurysms. Neurol Res 2011 Oct;33(8):841-52.

\*Gao X, et al. A single-centre experience and follow-up of patients with endovascular coiling of large and giant intracranial aneurysms with parent artery preservation. J Clin Neurosci 2012 Mar;19(3):364-9.

Ge H, et al. Lvis stent versus eEnterprise stent for the treatment of unruptured intracranial aneurysms. World Neurosurg 2016 Apr 22 [Epub ahead of print].

Gross BA, et al. Endovascular treatment of previously clipped aneurysms: continued evolution of hybrid neurosurgery. J Neurointerv Surg 2017 Feb;9(12):169-172.

Guedon A, et al. Very late ischemic complications in flow-diverter stents: a retrospective analysis of a single-center series. J Neurosurg 2016 Jan 29:1-7.

Hetts SW, et al. Stent-assisted coiling versus coiling alone in unruptured intracranial aneurysms in the matrix and platinum science trial: safety, efficacy, and mid-term outcomes. AJNR Am J Neuroradiol 2014 Apr;35(4):698-705.

Hong Y, et al. Stent-assisted coiling versus coiling in treatment of intracranial aneurysm: a systematic review and meta-analysis. PLoS One 2014 Jan 15;9(1):e82311.

\*Huang Q, et al. Stent-assisted embolization of wide-neck anterior communicating artery aneurysms: review of 21 consecutive cases. AJNR Am J Neuroradiol 2009 Sep;30(8):1502-6.

\*Hwang G, et al. Comparison of 2-year angiographic outcomes of stent-and nonstent- assisted coil embolization in unruptured aneurysms with an unfavorable configuration for coiling. AJNR Am J Neuroradiol 2011 Cct;32(9):1707-10.

<p><b>SUBJECT: ENDOVASCULAR REPAIR (COIL EMBOLIZATION) OF INTRACRANIAL ANEURYSMS</b></p> <p><b>POLICY NUMBER: 7.01.81</b></p> <p><b>CATEGORY: Technology Assessment</b></p>	<p><b>EFFECTIVE DATE: 12/18/08</b></p> <p><b>REVISED DATE: 11/19/09, 11/18/10, 10/20/11, 09/20/12, 08/15/13, 07/17/14, 07/16/15, 06/16/16, 06/15/17, 05/17/18</b></p> <p><b>(ARCHIVED DATE: 09/16/99,</b></p> <p><b>EDITED DATE: 09/28/05, 11/16/06, 12/20/07)</b></p> <p><b>PAGE: 7 OF: 12</b></p>
---	---

\*Jahromi BS, et al. Clinical and angiographic outcome after endovascular management of giant intracranial aneurysms. Neurosurgery 2008 Oct;63(4):662-74.

Jahshan S, et al. Results of stent-assisted vs non-stent-assisted endovascular therapies in 489 cerebral aneurysms: single center experience. Neurosurgery 2013 Feb;72(2):232-9.

Johnson AK, et al. Stent-assisted embolization of 100 middle cerebral artery aneurysms. J Neurosurg 2013 May;118(5):950-5.

\*Johnston SC, et al. for the CARAT Investigators. Predictors of rehemorrhage after treatment of ruptured intracranial aneurysms: the Cerebral Aneurysm Rupture After Treatment (CARAT) study. Stroke 2008 Jan;39(1):120-5.

\*Johnston SC, et al. Recommendations for the endovascular treatment of intracranial aneurysms: a statement for healthcare professionals from the Committee on Cerebrovascular Imaging of the American Heart Association Council on Cardiovascular Radiology. Stroke 2002 Oct;33(10):2536-44.

Kallmes DF, et al. International retrospective study of the pipeline embolization device: a multicenter aneurysm treatment study. AJNR Am J Neuroradiol 2015 Jan;36(1):108-15.

\*Kan P, et al. Early postmarket results after treatment of intracranial aneurysms with the pipeline embolization device: a multicenter experience. Neurosurgery 2012 Dec;71(6):1080-7.

\*Katsarudus VC, et al. Embolization of acutely ruptured and unruptured wide-necked cerebral aneurysms using the neuroform2 stent without pretreatment with antiplatelets: a single center experience. AJNR Am J Neuroradiol 2006 May;27(5):1123-8.

Killer-Oberpfalzer M, et al. European multicenter study for the evaluation of a dual-layer flow-diverting stent for treatment of wide-neck intracranial aneurysms: The European Flow-Redirection Intraluminal Device Study. AJNR Am J Neuroradiol 2018 March 15. [Epub ahead of print].

Kim SW, et al. Clinical and angiographic outcomes of aneurysms treated with two self-expanding stent-assisted coiling systems: a comparison of Solitaire AB and Enterprise VRD stents. J Cerebrovasc Endovasc Neurosurg 2015 Sep;17(3):149-56.

King B, et al. Clinical and angiographic outcomes after stent-assisted coiling of cerebral aneurysms with Enterprise and Neuroform stents: a comparative analysis of the literature. J Neurointerv Surg 2015 Dec;7(12):905-9.

\*Kis B. et al. Elective treatment of saccular and broad-necked intracranial aneurysms using a closed-cell nitinol stent (Leo). Neurosurgery 2006 Mar;58(3):443-50; discussion 443-50.

King B, et al. Clinical and angiographic outcomes after stent-assisted coiling of cerebral aneurysms with Enterprise and Neuroform stents: a comparative analysis of the literature. J Neurointerv Surg 2014 Oct 28 [Epub ahead of print].

\*Koebbe CJ, et al. Endovascular management of intracranial aneurysms: current experience and future advances. Neurosurgery 2006 Nov;59(5 Suppl 3):S93-102; discussion S3-13.

Lanzino G, et al. Coil embolization versus clipping in ruptured intracranial aneurysms: A meta-analysis of prospective controlled published studies. AJNR Am J Neuroradiol 2013 Sep;34(9):1764-8.

Lee KM, et al. Predictor and Prognosis of procedural rupture during coil embolization for unruptured intracranial aneurysm. J Korean Neurosurg Soc 2016 Jan;59(1):6-10.

\*Levine SD, Meyers PM. Application of new techniques and technologies: stenting for cerebral aneurysm. Clin Neurosurg 2007;54:64-9.

\*Li YD, et al. Endovascular treatment of recurrent intracranial aneurysms with re-coiling or covered stents. J Neurol Neurosurg Psychiatry 2010 Jan;81(1):74-9.

<p><b>SUBJECT: ENDOVASCULAR REPAIR (COIL EMBOLIZATION) OF INTRACRANIAL ANEURYSMS</b></p> <p><b>POLICY NUMBER: 7.01.81</b></p> <p><b>CATEGORY: Technology Assessment</b></p>	<p><b>EFFECTIVE DATE: 12/18/08</b></p> <p><b>REVISED DATE: 11/19/09, 11/18/10, 10/20/11, 09/20/12, 08/15/13, 07/17/14, 07/16/15, 06/16/16, 06/15/17, 05/17/18</b></p> <p><b>(ARCHIVED DATE: 09/16/99,</b></p> <p><b>EDITED DATE: 09/28/05, 11/16/06, 12/20/07)</b></p> <p><b>PAGE: 8 OF: 12</b></p>
---	---

Limbucci N, et al. Y-stent coiling of bifurcation aneurysms with Enterprise stent: long-term follow-up. J Neurointerv Surg 2016 Feb;8(2):158-62.

Limbucci N, et al. Endovascular treatment of unruptured intracranial aneurysms by the Woven EndoBridge Device (WEB): Are there any aspects influencing aneurysm occlusion? World Neurosurg 2018 Jan;109:e183-e193.

\*Lubicz B, et al. Preliminary experience with the enterprise stent for endovascular treatment of complex intracranial aneurysms: potential advantages and limiting characteristics. Neurosurgery 2008 May;62(5):1063-9; discussion 1069-70.

\*Lubicz B, et al. Stenting is improving and stabilizing anatomical results of coiled intracranial aneurysms. Neuroradiol 2009 Jun;51(6):419-25.

\*Lubicz B, et al. Pipeline flow-diverter stent for endovascular treatment of intracranial aneurysms: preliminary experience in 20 patients with 27 aneurysms. World Neurosurg 2011 Jul-Aug;76(1):114-9.

Lubicz B, et al. Silk flow-diverter stent for the treatment of intracranial aneurysms: a series of 58 patients with emphasis on long-term results. AJNR Am J Neuroradiol 2015 Mar;36(3):542-6.

Lubicz B, et al. Stent-assisted coiling of wide-neck bifurcation aneurysms with a branch incorporated in the aneurysm base: long-term follow-up in 49 patients with 53 aneurysms. Neuroradiology 2017 June;59(6):619-624.

\*Lylyk P, et al. Curative endovascular reconstruction of cerebral aneurysms with the pipeline embolization device: the Buenos Aires experience. Neurosurgery 2009 Apr;64(4):632-42.

Malatesta E, et al. Endovascular treatment of intracranial aneurysms with flow-diverter stents: preliminary single-centre experience. Radiol Med Sep;118(6):971-83.

\*Mangubat EZ, et al. Initial experience with Neuroform EZ in the treatment of wide-neck cerebral aneurysms. Neurointervention 2012 Feb;7(1):34-9.

\*Martin AR, et al. The pipeline flow-diverting stent for exclusion of ruptured intracranial aneurysms with difficult morphologies. Neurosurgery 2011 Aug 9 [Epub ahead of print].

\*McAuliffe W, et al. Immediate and midterm results following treatment of unruptured intracranial aneurysms with the pipeline embolization device. AJNR Am J Neuroradiol 2012 Jan;33(1):164-70.

McDonald JS, et al. In-hospital outcomes associated with stent-assisted endovascular treatment of unruptured cerebral aneurysms in the USA. J Neurointerv Surg 2013 Jul 1;5(4):317-20.

\*Meckel S, et al. Endovascular treatment using predominantly stent-assisted coil embolization and antiplatelet and anticoagulation management of ruptured blood blister-like aneurysms. AJNR Am J Neuroradiol 2011 Apr;32(4):764-71.

\*Meyers PM, et al. Indications for the performance of intracranial endovascular neurointerventional procedures: a scientific statement from the American Heart Association Council on Cardiovascular Radiology and Intervention, Stroke Council, Council on Cardiovascular Surgery and Anesthesia, Interdisciplinary Council on Peripheral Vascular Disease, and Interdisciplinary Council on Quality of Care and Outcomes Research. Circulation 2009 Apr 28;119(16):2235-49.

\*Mocco J, et al. Treatment of intracranial aneurysms with the Enterprise stent: a multicenter study. J Neurosurg 2009 Jan;110(1):35-9.

Mohlenbruch MA, et al. The FRED flow-diverter stent for intracranial aneurysms: clinical study to assess safety and efficacy. AJNR Am J Neuroradiol 2015 Feb 26 [Epub ahead of print].

\*Molyneux AJ, et al. Risk of recurrent subarachnoid haemorrhage, death, or dependence and standardized mortality ratios after clipping or coiling of an intracranial aneurysm in the International Subarachnoid Aneurysm Trial (ISAT): long-term follow-up. Lancet Neurol 2009 May;8(5):427-33.

<p><b>SUBJECT: ENDOVASCULAR REPAIR (COIL EMBOLIZATION) OF INTRACRANIAL ANEURYSMS</b></p> <p><b>POLICY NUMBER: 7.01.81</b></p> <p><b>CATEGORY: Technology Assessment</b></p>	<p><b>EFFECTIVE DATE: 12/18/08</b></p> <p><b>REVISED DATE: 11/19/09, 11/18/10, 10/20/11, 09/20/12, 08/15/13, 07/17/14, 07/16/15, 06/16/16, 06/15/17, 05/17/18</b></p> <p><b>(ARCHIVED DATE: 09/16/99,</b></p> <p><b>EDITED DATE: 09/28/05, 11/16/06, 12/20/07)</b></p> <p><b>PAGE: 9 OF: 12</b></p>
---	---

Monteith SJ, et al. Endovascular treatment of fusiform cerebral aneurysms with the Pipeline Embolization Device. J Neurosurg 2014 Apr;120(4):945-54.

\*Murayama Y, et al. Combined endovascular treatment for both intracranial aneurysm and symptomatic vasospasm. AJNR Am J Neuroradiol 2003 Jan;24(1):133-9.

\*Naggara ON, et al. Endovascular treatment of intracranial unruptured aneurysms: systematic review and meta-analysis of the literature on safety and efficacy. Radiology 2010 Sep;256(3):887-97.

\*Naggara ON, et al. Endovascular treatment of intracranial unruptured aneurysms: a systematic review of the literature on safety with emphasis on subgroup analyses. Radiology 2012 Jun;263(3):828-35.

\*National Institute for Clinical Excellence (NICE). Coil embolization of ruptured intracranial aneurysms. Interventional procedure guidance 106. London, UK: NICE; 2005 Jan [http://www.nice.org.uk/page.aspx?o=240348] accessed 4/3/18.

\*National Institute for Clinical Excellence (NICE). Coil embolization of unruptured intracranial aneurysms. Interventional procedure guidance 106. London, UK: NICE; 2005 Jan [http://www.nice.org.uk/page.aspx?o=240344] accessed 4/3/18.

\*Nelson PK, et al. The pipeline embolization device for intracranial treatment of aneurysms trial. AJNR Am J Neuroradiol 2011 Jan;32(1):34-40.

\*Ogilvy CS, et al. Neurointerventional procedures for unruptured intracranial aneurysms under procedural sedation and local anesthesia: a large-volume, single-center experience. J Neurosurg 2010 Apr 16 [Epub ahead of print].

O'Kelly CJ, et al. Canadian experience with the Pipeline embolization device for repair of unruptured intracranial aneurysms. AJNR Am J Neuroradiol 2012 Aug 2 [Epub ahead of print].

Park MS, et al. Pipeline embolization device with or without adjunctive coil embolization: analysis of complications from the InTePED registry. AJNR Am J Neuroradiol 2016 Jan 14.

\*Phillips TJ, et al. Safety of the Pipeline embolization device in treatment of posterior circulation aneurysms. AJNR Am J Neuroradiol 2012 Jun 7 [Epub ahead of print].

\*Peluso JPP, et al. Aneurysms of the vertebrobasilar junction: incidence, clinical presentation, and outcome of endovascular treatment. AJNR Am J Neuroradiol 2007 Oct;28(9):1747-51.

Phan K, et al. Meta-analysis of stent-assisted coiling versus coiling-only for the treatment of intracranial aneurysms. J Clin Neurosci 2016 Sept;31:15-22.

Piano M, et al. Midterm and long-term follow-up of cerebral aneurysms treated with flow diverter devices: a single-center experience. J Neurosurg 2013 Feb;118(2):408-16.

\*Pierot L, et al. Endovascular treatment of unruptured intracranial aneurysms: comparisons of safety of remodeling technique and standard treatment with coils. Radiology 2009 Jun;251(3):846-55.

\*Pierot L, et al. Endovascular treatment of intracranial aneurysms using Matrix coils: short-and mid-term results in ruptured and unruptured aneurysms. Neurosurgery 2009 Nov;63(5):850-7.

\*Pierot L, et al. Immediate anatomic results after the endovascular treatment of ruptured intracranial aneurysms: analysis in the CLARITY series. AJNR Am J Neuroradiol 2010 May;31(5):907-11.

\*Pierot L, et al. Similar safety in centers with low and high volumes of endovascular treatments for unruptured intracranial aneurysms: evaluation of the analysis of treatment by endovascular approach of unruptured aneurysms study. AJNR Am J Neuroradiol 2010 Jun;31(6):1010-4.

\*Pierot L, et al. Immediate results after endovascular treatment of unruptured intracranial aneurysms: analysis of the AETNA series. AJNR Am J Neuroradiol 2010 Jan;31(1):140-4.

<p><b>SUBJECT: ENDOVASCULAR REPAIR (COIL EMBOLIZATION) OF INTRACRANIAL ANEURYSMS</b></p> <p><b>POLICY NUMBER: 7.01.81</b></p> <p><b>CATEGORY: Technology Assessment</b></p>	<p><b>EFFECTIVE DATE: 12/18/08</b></p> <p><b>REVISED DATE: 11/19/09, 11/18/10, 10/20/11, 09/20/12, 08/15/13, 07/17/14, 07/16/15, 06/16/16, 06/15/17, 05/17/18</b></p> <p><b>(ARCHIVED DATE: 09/16/99,</b></p> <p><b>EDITED DATE: 09/28/05, 11/16/06, 12/20/07)</b></p> <p><b>PAGE: 10 OF: 12</b></p>
---	--

- \*Pierot L, et al. Remodeling technique for endovascular treatment of ruptured intracranial aneurysms had a higher rate of adequate postoperative occlusion than did conventional coil embolization with comparable safety. Radiology 2011 Feb;258(2):546-53.
- \*Pierot L, et al. Ruptured intracranial aneurysms: factors affecting the rate and outcome of endovascular treatment complications in a series of 782 patients CLARITY study). Radiology 2010 Sep;256(3):916-23.
- \*Poitin M, et al. Stent-assisted coiling of intracranial aneurysms: clinical and angiographic results in 216 consecutive aneurysms. Stroke 2010 Jan;41(1):110-5.
- \*Proust F, et al. Treatment of anterior communicating artery aneurysms: complementary aspects of microsurgical and endovascular procedures. J Neurosurg 2003 Jul;99(1):3-14.
- \*Raymond J, et al. Endovascular treatment of intracranial aneurysms with radioactive coils: initial clinical experience. Stroke 2003 Dec;34(12):2801-6.
- \*Ries T, et al. Long-term follow-up of cerebral aneurysms after endovascular therapy prediction and outcome of retreatment. AJNR Am J Neuroradiol 2007 Oct;28(9):1755-61.
- Ryu CW, et al. Complications in stent-assisted endovascular therapy of ruptured intracranial aneurysms and relevance to antiplatelet administration: a systematic review. AJNR Am J Neuroradiol 2015 Sep;36(9):1682-8.
- \*Saatci I, et al. Treatment of intracranial aneurysms using the Pipeline flow-diverter embolization device: a single-center experience with long-term follow-up results. AJNR Am J Neuroradiol 2012 Jul 19 [Epub ahead of print].
- \*Scott RB, et al. Improved cognitive outcomes with endovascular coiling of ruptured intracranial aneurysms: neuropsychological outcomes from the International Subarachnoid Aneurysms Trial (ISAT). Stroke 2010 Aug;41(8):1743-7.
- \*Sedat J, et al. Endovascular occlusion of intracranial wide-necked aneurysms with stenting (Neuroform) and coiling: mid-term and long-term results. Neuroradiology 2009 Jun;51(6):401-9.
- \*Shapiro M, et al. Stent-supported aneurysm coiling: a literature survey of treatment and follow-up. AJNR Am J Neuroradiol 2012 Jan;33(1):159-63.
- \*Siddiqui MA, et al. Horizontal stent-assisted coil embolization of wide-necked intracranial aneurysms with the Enterprise stent- a case series with early angiographic follow-up. Neuroradiology 2009 Jun;51(9):411-8.
- Strauss I, et al. Silk flow diverter in the treatment of complex intracranial aneurysms: a single-center experience with 60 patients. Acta Neurochir (Wien) 2016 Feb;158(2):247-54.
- Sturiale CL, et al. Endovascular treatment of intracranial aneurysms in elderly patients: a systematic review and meta-analysis. Stroke 2013 Jul;44(7):1897-902.
- Sturiale CL, et al. Endovascular treatment of the posterior cerebral artery aneurysms: single center experience and a systematic review. World Neurosurg 2016 Apr 5 [Epub ahead of print].
- \*Suzuki S, et al. Endovascular treatment of middle cerebral artery aneurysms with detachable coils: Angiographic and clinical outcomes in 115 consecutive patients. Neurosurgery 2009 May;64(5):876-88.
- \*Tahtinen OI, et al. Wide-necked intracranial aneurysms: treatment with stent-assisted coil embolization during acute (<72 hours) subarachnoid hemorrhage- experience in 61 consecutive patients. Radiology 2009 Oct;253(1):199-208.
- \*The International Subarachnoid Aneurysm Trial (ISAT): a position statement from the Executive Committee of the American Society of Interventional and Therapeutic Neuroradiology and the American Society of Neuroradiology. AJNR Am J Neuroradiol 2003 Aug;24(7):1404-8.

<p><b>SUBJECT: ENDOVASCULAR REPAIR (COIL EMBOLIZATION) OF INTRACRANIAL ANEURYSMS</b></p> <p><b>POLICY NUMBER: 7.01.81</b></p> <p><b>CATEGORY: Technology Assessment</b></p>	<p><b>EFFECTIVE DATE: 12/18/08</b></p> <p><b>REVISED DATE: 11/19/09, 11/18/10, 10/20/11, 09/20/12, 08/15/13, 07/17/14, 07/16/15, 06/16/16, 06/15/17, 05/17/18</b></p> <p><b>(ARCHIVED DATE: 09/16/99,</b></p> <p><b>EDITED DATE: 09/28/05, 11/16/06, 12/20/07)</b></p> <p><b>PAGE: 11 OF: 12</b></p>
---	--

- Toma AK, et al. Early single centre experience of flow diverting stents for the treatment of cerebral aneurysms. Br J Neurosurg 2013 Oct;27(5):622-8.
- Tse MM, et al. Current status of Pipeline embolization device in the treatment of intracranial aneurysms: a review. World Neurosurg 2013 Dec;80(6):829-35.
- Van der Schaaf I, et al. Endovascular coiling versus neurosurgical clipping for patients with aneurysmal subarachnoid haemorrhage (Review). The Cochrane Collaboration 2009 issue 1. [http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD003085.pub2/abstract;jsessionid=E62161663EE536A0759409C752AA4B2C.d01t01] accessed 4/3/18.
- Van Rooj WJ, et al. Endovascular treatment of intracranial aneurysms in the flow diverter era: frequency of use and results in a consecutive series of 550 treatments in a single centre. Interv Neuroradiol 2014 Sep;20(4):428-35.
- \*Vanninen R, et al. Ruptured intracranial aneurysms: acute endovascular treatment with electrolytically detachable coils - a prospective randomized study. Radiology 1999 May;211(2):325-36.
- \*Vendrell JF, et al. Endovascular treatment of 174 middle cerebral artery aneurysms: clinical outcome and radiologic results at long-term follow-up. Radiology 2009 Oct;253(1):191-8.
- \*Wajnberg E, et al. Single-center experience with the neuroform stent for endovascular treatment of wide-necked intracranial aneurysms. Surg Neurol 2009 Dec;72(6):612-9.
- Wakhloo AK, et al. Surpass flow diverter in the treatment of intracranial aneurysms: a prospective multicenter study. AJNR Am J Neuroradiol 2015 Jan;36(1):98-107.
- Wang Y, et al. Endovascular treatment of paraclinoid aneurysms: 142 aneurysms in one centre. J Neurointerv Surg 2013 Nov;5(6):552-6.
- Wang F, et al. Stent-assisted coiling and balloon-assisted coiling in the management of intracranial aneurysms: a systematic review and meta-analysis. J Neurol Sci 2016 May 15;364:160-6.
- \*Weber W, et al. A new self-expanding nitinol stent (Enterprise) for the treatment of wide-necked intracranial aneurysms: initial clinical and angiographic results in 31 aneurysms. Neuroradiology 2007 Jul;49(7):555-61.
- \*Wells-Roth D, et al. Endovascular procedures for treating wide-necked aneurysms. Neurosurg Focus 2005;18(2) E7.
- \*White PM, et al. Endovascular coiling of cerebral aneurysms using “bioactive” or coated-coil technologies: a systematic review of the literature. AJNR Am J Neuroradiol 2009 Feb;30(2):219-26.
- \*Willinsky RA, et al. Clinical and angiographic follow-up of ruptured intracranial aneurysms treated with endovascular embolization. AJNR Am J Neuroradiol 2009 May;30(5):1035-40.
- Withers K, et al. Pipeline™ embolization device for the treatment of complex intracranial aneurysms: a NICE Technology Guidance. Appl Health Econ Health Policy 2013 Feb;11(1):5-13.
- \*Yahia AM, et al. Thromboembolic events associated with Neuroform stent in endovascular treatment of intracranial aneurysms. J Neuroimaging 2010 Apr;20(2):113-7.
- \*Yahia AM, et al. Progressive occlusion of aneurysms in Neuroform Stent-assisted treatment of intracranial aneurysms. J Neurol Neurosurg Psychiatry 2011 Mar;82(3):278-82.
- \*Yang PF, et al. Preliminary experience and short-term follow-up of treatment of wide-necked or fusiform cerebral aneurysms with a self-expanding, closed-cell, retractable stent. J Clin Neurosci 2010 Jul;17(7):837-41.
- Yavuz K, et al. Double stent-assisted coil embolization treatment for bifurcation aneurysms: immediate treatment results and long-term angiographic outcome. AJNR Am J Neuroradiol 2013 Sep;34(9):1778-84.

<p><b>SUBJECT: ENDOVASCULAR REPAIR (COIL EMBOLIZATION) OF INTRACRANIAL ANEURYSMS</b></p> <p><b>POLICY NUMBER: 7.01.81</b></p> <p><b>CATEGORY: Technology Assessment</b></p>	<p><b>EFFECTIVE DATE: 12/18/08</b></p> <p><b>REVISED DATE: 11/19/09, 11/18/10, 10/20/11, 09/20/12, 08/15/13, 07/17/14, 07/16/15, 06/16/16, 06/15/17, 05/17/18</b></p> <p><b>(ARCHIVED DATE: 09/16/99,</b></p> <p><b>EDITED DATE: 09/28/05, 11/16/06, 12/20/07)</b></p> <p><b>PAGE: 12 OF: 12</b></p>
---	--

Yavuz K, et al. Endovascular treatment of middle cerebral artery aneurysms with flow modification with the use of the pipeline embolization device. AJNR Am J Neuroradiol 2014 Mar;35(3):529-35.

Ye HW, et al. Comparison between Solitaire™ AB and Enterprise stent-assisted coiling for intracranial aneurysms. Exp Ther Med 2015 Jul;10(1):145-53.

Ye G, et al. Meta-analysis of the efficacy and prognosis of intracranial aneurysm treated with flow diverter devices. J Mol Neurosci 2016 May;59(1):158-67.

Zhao KJ, et al. Reconstruction of saccular and dissected intracranial aneurysms using Solitaire™ AB stents. PLoS One 2013;8(2):e57253.

Zhang X, et al. Endovascular treatment of intracranial aneurysms with LVIS device: a systematic review. J Neurointerv Surg 2017 June;9(6):553-557.

Zhao B, et al. Stent-assisted coiling versus coiling alone of poor-grade ruptured intracranial aneurysms: a multicenter study. J Neurointerv Surg 2017 Feb;9(2):165-168.

Zhao G, et al. Efficacy of flow-diverting devices for cerebral aneurysms: a systematic review and meta-analysis. World Neurosurg 2016 Jan;85:252-62.

**KEY WORDS:**

Enterprise stent, Guglielmi coil, Intracranial aneurysm, Neuroform stent, Pipeline Embolization Device (PED), Transcatheter intracranial embolization.

---



---

## CMS COVERAGE FOR MEDICARE PRODUCT MEMBERS

---



---

Based on our review, endovascular repair using coil embolization, as a method of treating intracranial aneurysms is not addressed in National or Regional Medicare coverage determinations or policies.