Percutaneous Patent Foramen Ovale (PFO) Closure (for Kansas Only)

Policy Number: CS329KS.02
Effective Date: February 1, 2026

Instructions for Use

Table of Contents **Page**

Related Policies

- Cardiac Event Monitoring (for Kansas Only)
- Omnibus Codes (for Kansas Only)

Application

This Medical Policy only applies to the state of Kansas.

Coverage Rationale

Note: This policy does not apply to individuals < 18 years of age and does not apply to atrial septal defect closure.

Percutaneous patent foramen ovale closure for the prevention of recurrent ischemic stroke is proven and medically necessary when used according to U.S. Food and Drug Administration (FDA) labeled indications, contraindications, warnings, and precautions and all of the following criteria are met:

- History of cryptogenic stroke confirmed by imaging; and
- A cardiologist and a neurologist agree that the stroke is likely embolic in nature; and
- Other causes of ischemic stroke have been ruled out, including but not limited to carotid disease, hypercoagulable states, or atrial fibrillation; and
- Individual is 18 to 60 years of age

Due to insufficient evidence of efficacy, percutaneous patent foramen ovale closure is unproven and not medically necessary for all other stroke or related neurological indications including but not limited to primary prevention of stroke, transient ischemic attacks, and migraine prevention.

Medical Records Documentation Used for Reviews

Benefit coverage for health services is determined by the federal, state, or contractual requirements, and applicable laws that may require coverage for a specific service. Medical records documentation may be required to assess whether the member meets the clinical criteria for coverage but does not guarantee coverage of the services requested.

The patient's medical record must contain documentation that fully supports the medical necessity for the requested services. This documentation includes, but is not limited to, relevant medical history, physical examination, and results of pertinent diagnostic tests or procedures. Documentation supporting the medical necessity should be legible, maintained in the patient's medical record, and must be made available upon request.

Applicable Codes

The following list(s) of procedure and/or diagnosis codes is provided for reference purposes only and may not be all inclusive. Listing of a code in this policy does not imply that the service described by the code is a covered or non-covered health service. Benefit coverage for health services is determined by federal, state, or contractual requirements and applicable laws that may require coverage for a specific service. The inclusion of a code does not imply any right to reimbursement or guarantee claim payment. Other Policies and Guidelines may apply.

CPT Code	Description
93580	Percutaneous transcatheter closure of congenital interatrial communication (i.e., Fontan fenestration, atrial septal defect) with implant

Description of Services

A stroke occurs when there is a loss of blood flow to the brain causing damage and tissue death. A transient ischemic attack occurs when the blood supply to the brain is blocked or interrupted for a short period of time but causes no permanent damage. There are two types of strokes: ischemic and hemorrhagic. An ischemic stroke is caused by a blood clot that blocks a blood vessel in the brain. A hemorrhagic stroke is caused by a blood vessel that breaks and bleeds into the brain. A cryptogenic stroke is a type of ischemic stroke in which a specific cause is not found. In some individuals, the cause of a cryptogenic stroke may be due to a blood clot traveling through a patent foramen ovale (PFO).

A PFO is a normal opening in the heart that is present in all people during fetal development. The opening is in the septal wall separating the left and right atria of the heart. Typically, this opening closes on its own after birth, but in some cases, the opening remains open throughout adulthood. For the majority of people with a PFO, the condition does not cause any problems and requires no treatment. However, in some people with a PFO, small blood clots that form in the peripheral venous system may cross from the right to the left circulation and cause ischemic stroke if they reach the cerebral arterial circulation. Prevention of recurrent cryptogenic stroke in people with a PFO may be achieved through antithrombotic/anticoagulation therapy, surgery, or percutaneous PFO closure. While surgery is theoretically one treatment option, it is rarely used for this indication due to the inherent risks of surgery. Additionally, surgery has not been studied in comparison with percutaneous closure (American Heart Association, 2017).

Percutaneous or transcatheter PFO closure devices use catheter technology to access the heart and close the PFO, without the need for open-heart surgery and cardiopulmonary bypass. Once in place, the device prevents blood and potentially blood clots from flowing between the heart's right and left atria.

Clinical Evidence

Stroke

In 2025, Hamodat et al. conducted a systematic review aimed at assessing and comparing the effectiveness of treatment strategies (medical therapy using antiplatelet agents, anticoagulants, and transcatheter device closure) to provide updated insights on the most effective approach to preventing recurrent cryptogenic stroke. After the systematic search, randomized controlled trials (RCTs) comparing patent foramen ovale (PFO) closure vs medical therapy among patients with cryptogenic stroke were eligible for review. A total of 7 RCTs including 4,539 participants were included in the review. The primary outcome showed a significant reduction in stroke incidence with PFO closure compared to medical therapy, with no stroke events in the PFO closure groups of two of the included trials. The incidence of transient ischemic attack (TIA) was consistently lower in the PFO closure groups. The safety profile of the PFO closure was underscored by the all-cause mortality being comparable between groups. It was found that PFO closure was associated with higher incidence of atrial fibrillation. A tailored risk assessment was necessary due to major bleeding risk varying. The authors concluded that PFO closure offers a significant advantage over medical therapy for the prevention of recurrent cryptogenic stroke and TIA. There was an observed increase in atrial fibrillation post closure which highlighted the need for additional research on long term implications and determined if anticoagulation would benefit subsets of individuals with PFO and history of stroke. The limitations of the review were that the included studies demonstrated significant heterogeneity in patient populations, short follow-up durations, and outcome definitions, which may limit the generalizability of findings. There was a lack of standardized reporting on anticoagulation timing and duration after PFO closure, evidence on long-term durability and device-related complications remained insufficient, and the lack of consistent data on cost-effectiveness and patient-reported outcomes represents a notable gap, especially for informing clinical and policy decisions.

In a systematic review and meta-analysis, Asghar et al. (2025) aimed to determine the incidence of long-term adverse outcomes in adults who underwent transcatheter PFO closure, with comparisons to findings from RCTs. A total of 2,432 records were reviewed including 13 prospective and 12 retrospective cohort studies. The average follow up lengths ranged from 4 to 12.3 years with sample sizes from 74 to 1,533 participants. The incidence of stroke was 0.34 per 100 person-years (I^2 = 67%). This was similar to rates from 4 RCTs that were used for comparison (0.35 per 100 person-years, I^2 = 51%). The authors found that there was a significant improvement in heterogeneity once the study with one of the largest follow-ups was removed. The authors concluded that real-world PFO closure studies with long-term follow-up report similar outcomes as RCTs. Although, future observational studies should include more rigorous reporting of follow-up strategies and explore different long-term adverse outcomes. The limitations of the review and analysis consisted of the inability to complete a meta-analysis of outcomes such as the development of atrial fibrillation and flutter as was originally planned due to inconsistent reporting on outcomes other than recurrent stroke in observational studies. The GRADE system was not utilized to assess uncertainty of evidence as the authors were not evaluating the efficacy of PFO closure in comparison with medical therapy.

Eichelmann et al. (2024) studied the recurrence of stroke PFO closure vs drug therapies for individuals over 60 years of age and a follow-up of 5 years. Included in the study were 342 individuals who were over 60 years of age, experienced a cryptogenic stroke, and were accepted for a PFO closure procedure. A total of 143 individuals proceeded with the procedure (group A). The average follow-up time was 5.5 ±1.5 years. All individuals in group B refused PFO occlusion and had persistent shunt in the follow-up period [n = 199 (100%)]. In group A, seven individuals were diagnosed with residual shunt during echocardiography examination (5%). A new onset of atrial fibrillation occurred in seven individuals in group A (5%) and six in group B (3%), with a p value of 0.117. Recurrent stroke occurred in three individuals in group A (2%) and 11 in group B (6%), with a p value of 0.021. One individual died of unknown reason (1%), and two individuals were lost due to neurological death (1%) in group B; none in group A died during the follow-up period. The study is limited by a lack of randomization, a small sample size, retrospective results, and a possible recall bias due to parts of the follow-up being collected via telephone contact with individuals and physicians. The authors concluded that further large, randomized studies are needed to evidently recommend PFO closure for individuals > 60 years of age and those with other reasons for arterial embolism.

In a 2023 systematic review and meta-analysis of RCTs, Kolokathis and colleagues evaluated the net clinical benefit (NCB) between PFO closure and medical treatment. The outcomes measured were the NCB-1 (cumulative incidence of stroke, major bleeding, atrial fibrillation/flutter, and serious procedural or device complications), NCB-2, and NCB-3 (NCB-1 using a weighted factor of 0.5 and 0.25 for atrial fibrillation/flutter events, respectively). Each component outcome of the NCB was measured as a secondary outcome. The review results showed no difference between PFO closure and medical treatment, according to NCB-1, NCB-2, and NCB-3 rates. A significant decrease in stroke was seen (44%; 95% CI, 21%-60%), which favored the PFO closure arm. An increase in atrial fibrillation/flutter (4.04 times; 95% CI, 1.57-8.89) was seen in the PFO closure group compared with the medical treatment group. The meta-regression analysis showed a reduction in NCB-1 with PFO closure, which increased as the proportion of individuals treated with the Amplatzer™ device increased (p = 0.02). A decrease in NCB-1, NCB-2, and NCB-3 was seen when PFO closure increased as the proportion of individuals treated with substantial PFO size increased (p = 0.03). The limitations of the study include NCB being calculated as a sum of events, which implies that duplication was not avoided for individuals with stroke/transient ischemic attack (TIA) and other events during the follow-up period. The weighted factors of 0.5 and 0.25 used to calculate NCB-2 and NCB-3 were arbitrary, and the sample size was relatively small. No standardization in the medical regimens was applied in the medical treatment and post procedure in the PFO closure arm. The limited number of RCTs should be interpreted cautiously, and the quality of evidence is low, with an increased risk for bias and imprecision problems. The authors concluded that no NCB with PFO closure vs medical treatment was observed. A significant relative decrease of 44% in stroke in the PFO closure arm occurred.

In a 2022 meta-analysis, Krittanawong and associates sought to investigate the differences in outcomes of previous trials addressing the optimal treatment strategy for individuals with a PFO. The following studies were included: RESPECT (Carroll et al., 2013) (NCT00465270), PC (Meier et al., 2013) (NCT00166257), CLOSURE I (Furlan et al., 2012) (NCT00201461), DEFENSE-PFO (Lee et al., 2018) (NCT01550588), REDUCE (Søndergaard et al., 2017) (NCT00738894), and CLOSE (Mas et al., 2017) (NCT00562289). Included in the six studies were 3,558 individuals (1,889 who underwent PFO closure and 1,669 who had medical therapy only). The results showed a median follow-up period of 3.8 years (range, 2-5.9 years); 46.2% were female, 4.1% had diabetes, 24.8% were smokers, 24.4% had hypertension, and 25.6% had hypercholesterolemia. Recurrent TIA (risk ratio, 0.63; 95% CI, 0.37-1.07; p = 0.07; I^2 = 0.00%) and recurrent stroke (risk ratio, 0.38; 95% CI, 0.13-1.11; p = 0.07; I^2 = 54.37%) were not statistically significantly different between the PFO closure and optimal medical therapy groups. Additionally, no significant difference between PFO closure and medical therapy on recurrent stroke was observed in the subgroup of those with an atrial septal aneurysm and those with a significant shunt size. The limitations of the analysis include a small sample size, heterogeneity in the inclusion criteria, and a focus on recurrent stroke/TIA, with no analysis of bleeding or surgical complications. The authors

concluded that the meta-analysis did not demonstrate superior clinical outcomes with PFO closure compared with optimal medical therapy alone at the short- and long-term follow-ups.

In 2022, Tejada et al. sought to investigate the clinical practice for a PFO and analyze the variables for decision-making on selecting participants for this procedure through a prospective, observational, multicentric survey. Included were all the cases of cryptogenic stroke/TIA associated with a PFO, with the closure being analyzed according to age (≤/> 60 years) and the characteristics of the PFO. The exploration resulted in a group of 488 participants aged ≤ 60 years, 143 (29.3%) of whom underwent PFO closure, and a > 60-years-old group that included 124 participants, with 24 (19%) having PFO closure. The variables included for the ≤ 60-years-old group were the detection of a high-risk PFO [odds ratio (OR), 4.11; CI, 2.6-6.5; p < 0.001], criteria for paradoxical embolism (OR, 2.61; CI, 1.28-5.28; p = 0.008), and previous use of antithrombotics (OR, 2.67; CI, 1.38-5.18; p = 0.009). The > 60-years-old group variables were history of pulmonary thromboembolism, predisposition to thromboembolic disease, paradoxical embolism criteria, and a high-risk PFO. The limitations of the study include variability in the interpretation of some studies due to study design, potential for bias, small sample size, and short follow-up. A larger sample size may have achieved greater validity for specific groups (aged > 60 years, TIA, and a low-risk PFO). The authors concluded that in clinical practice, the main factor for indicating percutaneous closure in individuals with cryptogenic stroke associated with a PFO is the detection of a high-risk PFO (large shunt or interatrial septal aneurysm). Other important factors include a history of thromboembolic disease, satisfaction of the criteria for paradoxical embolism, and prior use of antithrombotics.

A systematic review and meta-analysis of RCTs compared the safety and efficacy of percutaneous PFO closure (with medical therapy) vs those of medical therapy alone in individuals with cryptogenic stroke or TIA. Among 3,627 individuals, 1,829 were allocated to PFO closure and 1,798 to medical treatment. The mean follow-up was 3.7 years. Results showed a significant reduction in ischemic stroke recurrence using the two currently US Food and Drug Administration–approved PFO closure devices. One study using the older STARFlex device showed no improvement. Combined data across all studies showed no significant reduction in all-cause mortality or TIA. New-onset atrial fibrillation occurred more frequently (five-fold) in the PFO group but resolved in 72% of cases within 45 days (Ntaios et al., 2018).
The following studies were included in the review:

- CLOSE (Mas et al., 2017) – used several PFO closure devices, including the two currently US Food and Drug Administration–approved devices
- REDUCE (Søndergaard et al., 2017) – GORE® HELEX® (product discontinued) or GORE® CARDIOFORM Septal Occluder
- RESPECT (Carroll et al., 2013; Saver et al., 2017) – Amplatzer™ PFO Occluder
- PC Trial (Meier et al., 2013) – Amplatzer™ PFO Occluder
- CLOSURE I (Furlan et al., 2012) – STARFlex (no longer on the market)

Mas et al., 2017, Søndergaard et al., 2017, Saver et al., 2017, Meier et al., 2013, and Furlan et al., 2012 are all included in the 2023 systematic review and meta-analysis authored by Kolokathis et al.

Two other meta-analyses reached similar conclusions (Garg et al., 2018; Turc et al., 2018).

In a small RCT (DEFENSE-PFO) published after the Ntaois et al. (2018) meta-analysis, Lee et al. (2018) reported that device closure, in addition to medical therapy, prevented secondary stroke events following cryptogenic stroke in participants with a high-risk PFO. A high-risk PFO was defined as a PFO with atrial septal aneurysm, hypermobility, or a PFO size of ≥ 2 mm. The ClinicalTrials.gov number is NCT01550588.

In a 2018 Hayes Health Technology Assessment, a comparative effectiveness review was conducted for transcatheter closure of a PFO for prevention of recurrent cryptogenic stroke. The results suggest that the transcatheter closure of a PFO may be as effective as medical therapy at preventing recurrent stroke or other cerebrovascular events in those with a PFO and cryptogenic stroke or TIA. There is some evidence that PFO closure is associated with a lower recurrence of stroke or other cerebrovascular events than medical therapy alone. The risk of developing device- or procedure-related complications is relatively low. PFO closure and medical therapy have similar rates of complications, with the exception of atrial fibrillation, which may occur more frequently in those treated with PFO closure (updated in 2022).

Migraine Prevention Evidence to support using PFO closure for treating migraines is insufficient. Several randomized trials, especially sham-controlled trials, have failed to reach their primary end point of cessation or reduction in migraine days. Observational studies included in the review below are subject to biases and confounding.

Silalahi and Hariyanto (2024) aimed to analyze the efficacy and safety of PFO closure for mitigating migraine symptoms through a systematic review and meta-analysis of randomized trials and observational studies. The review incorporates evidence that examines the comparison between PFO closure and control, with outcome data related to migraine. The

outcomes measured were standardized mean difference (SMD) and OR for presentation of the outcomes. The results of the meta-analysis showed higher reduction of monthly migraine attacks from baseline (SMD, -0.34; 95% CI, -0.51 to -0.18; $p < 0.0001$; I^2, 19%) and monthly migraine days from baseline (SMD, -0.30; 95% CI, -0.53 to -0.08; $p = 0.009$; I^2, 0%) among those with PFO closure than controls. However, the complete resolution of migraine (especially based on the evidence from RCTs; $p = 0.24$), Headache Impact Test (HIT-6) score ($p = 0.08$), and Migraine Disability Assessment Survey (MIDAS) score ($p = 0.15$) did not differ significantly between the two groups of intervention. The majority of adverse events reported were atrial fibrillation and access site infection/bleeding that only occurred in small proportions of individuals (< 5%). The limitations of the study include a short follow-up period (3-12 months), with the exception of one RCT that had an extended follow-up period of up to 60 weeks. The review suggested efficacy of PFO closure in reducing monthly migraine attacks and monthly migraine days. However, PFO closure was not effective in achieving complete resolution of migraine and improving HIT-6 or MIDAS scores, especially based on the findings from RCTs. In terms of safety, PFO closure demonstrates a commendable safety profile, with adverse events being documented in only a limited percentage of individuals. Although the study suggests better efficacy of PFO closure in reducing monthly migraine attacks and days, with a similar safety profile compared with the control, it is recommended to conduct carefully designed RCTs, with a substantial sample size and an extended period of follow-up, to confirm the results of this study. (Downson et al., 2009; Mattle et al., 2016; and Tobis et al., 2017, previously cited, are included in this review.)

In 2023, Tang et al. aimed to monitor the incidence of migraine nonremission after PFO closure and discuss the relevant risk factors through a retrospective analysis involving 139 individuals diagnosed with a PFO and associated migraine who underwent PFO closure. Individuals were evaluated using the HIT-6™ and classified with a score higher than 55 points before closure. The HIT-6™ score was reevaluated 1 to 6 months after the intervention. The HIT-6™ was defined as headache remission (n = 93) and > 55 as headache nonremission (n = 46). A logistic regression model was developed to show the risk factors of headache nonremission after PFO closure. The authors concluded that age and serum phosphorus level were risk factors for continuous headache after PFO closure; history of smoking, atrial fibrillation, platelet-to-lymphocyte ratio, and interventricular septal thickness were independent risk factors. Migraineurs with such clinical characteristics have a higher risk of unremitting headaches after PFO closure. This study's findings may permit more precise identification of individuals with migraines who can benefit from PFO closure in future clinical works, which in turn could considerably improve the effectiveness of PFO closure for treating migraine. The limitations of the study include the limited size of samples included in the study and retrospective design. Prospective studies that include larger samples must be conducted in the future to obtain more reliable results and conclusions.

In a 2022 systematic review and meta-analysis conducted by Wang and associates, the association between PFO closure and reduction of migraine burden was explored. A total of 1,754 individuals from three randomized clinical trials and nine case-control studies were eligible for inclusion. Of the selected literature, seven reported nonrecurrence of migraine, four reported reduced migraine frequency and days, five reported HIT-6™ score, and four reported MIDAS score. The results showed a significant association of PFO closure with a reduced risk of migraine recurrence by 4.47 (95% CI, 2.94-6.80; I^2, 12%), frequency of migraine by 0.35 (95% CI, 0.17-0.53; I^2, 0%) and monthly migraine days by 0.28 (95% CI, 0.10-0.46), and decreased score on the HIT-6™ (SMD, 1.23; 95% CI, 0.52-1.95; I^2, 93%) with PFO closure. The limitations of the study include a combination of experimental and observational studies, recall and reporting bias, heterogenicity, and a limited number of published studies. The authors concluded that the combined evidence confirmed that migraine could be efficiently improved after transcatheter PFO closure for those individuals at risk for paroxysmal embolism or visual aura. To confirm the prognostic values of PFO closure to improve migraine burden, more significant, multicenter, prospective RCTs are needed.

In a 2022 publication, Zhang et al. conducted a systematic review and meta-analysis to assess the utility and safety of PFO closure in individuals with migraine with or without aura. In total, three RCTs (MIST, PRIMA, and PREMIUM, outlined below), one pooled study, and eight retrospective case series, including 1,165 individuals, met the inclusion criteria. The results showed that PFO closure reduced monthly migraine attacks and days compared with the control intervention. A subgroup analysis showed complete resolution of migraine in those with aura, particularly those with frequent aura. For individuals with migraines without aura, PFO closure did not significantly reduce migraine days or result in complete headache cessation. A low incidence of adverse events occurred in all three RCTs and included pericardial effusion, retroperitoneal bleed, access site bleeding, and device-related events that resulted in atrial fibrillation. These were transient and recoverable, and some were routine following occlusion surgery. The authors concluded that PFO closure is safe and effective, especially for migraine with aura. This study is limited by the retrospective nature of the majority of the included studies, heterogeneous postsurgical therapy, protocols for assessing outcome, and different devices used.

Mojadidi et al. (2021) conducted a pooled analysis of individual-level data from two randomized migraine trials (the PRIMA and PREMIUM trials, outlined below) to assess the efficacy and safety of percutaneous device closure as a therapy for episodic migraine with or without aura at 12 months. Overall, 337 individuals were randomized: 176 to device PFO closure and 161 to medical management only. Since the two trials used different end points, all were selected for the efficacy end

points of this pooled analysis and included responder rate; mean reduction in monthly migraine days, defined as ≥ 50% reduction in monthly migraine attacks; mean reduction in monthly migraine attacks; and the percentage of those who experienced complete cessation of migraine. Additionally, a subgroup analysis was performed in individuals who have migraines with aura, particularly frequent aura (defined as aura occurring in 50% or more of the migraine attacks). The safety end point was major procedure- and device-related adverse events. The results in the PFO closure group showed (1) a significant reduction in monthly migraine days at 12 months, with a mean reduction of monthly migraine days 1.2 greater than that in the control group; (2) no statistical difference in responder rate; (3) a significant mean reduction in migraine attacks; and (4) a higher rate of complete migraine cessation than that with medical therapy. In individuals with migraine with aura and frequent aura compared with controls, a significant reduction in migraine days was observed, and the responder rate was not significantly greater. Complete headache cessation occurred in 12 of 114 (11%) in the PFO closure group compared with one of 111 (0.9%) in the control group. In individuals without aura, complete headache cessation occurred in two of 43 (5%) in the PFO closure group compared with none in the control group. Nine procedure-related and four device-related adverse events occurred. Procedure-related adverse events would be expected with any right heart catheterization, including hematoma and transient hypotension. The most common device-related adverse event was paroxysmal atrial fibrillation. All of the events were transient. The authors concluded that despite the clinical trials failing to reach primary end points, individual data support that PFO closure reduces migraine burden in select individuals at 12 months, and it is not known if the benefit extends beyond this time. This pooled analysis increases the power of the two trials assessed, and PFO closure for treating migraine, especially with frequent aura, warrants further evaluation. The findings are limited by the inclusion of selected studies.

In the CLOSE-MIG study, Mas et al. (2021) conducted a planned substudy in individuals with migraines enrolled in the CLOSE RCT. Of 473 individuals randomized to PFO closure or antiplatelet therapy, 145 had migraines (75 with aura and 70 without aura). Overall, 67 individuals were randomized to PFO closure and antiplatelet therapy and 78 to antiplatelet therapy alone. The primary outcome was the mean annual number of migraine attacks. Secondary outcomes were the proportion of those with cessation of migraine attacks during the follow-up period, proportion of individuals who used migraine-preventive treatment during follow-up, and proportion of those with substantial to severe migraine-related disability at 2 years. During a mean follow-up of approximately 5 years, PFO closure plus antiplatelet therapy did not significantly reduce the mean annual number of migraine attacks compared with antiplatelet therapy alone in individuals with migraine both with and without aura. No statistically significant differences were observed between treatment groups regarding cessation of migraine attacks, migraine-related disability at 2 years, and use of migraine-preventive drugs.

In the PREMIUM study, Tobis et al. (2017) randomly assigned participants who had a PFO and medically intractable migraine with or without aura to undergo closure with the Amplatzer™ PFO Occluder (n = 123) or a sham procedure (n = 107). Both groups also received medical therapy. The procedure was generally safe, with only one device-related serious adverse event occurring during 1 year of follow-up. No difference was observed between the groups in the percentage of responders (primary efficacy end point), defined as those having at least a 50% reduction in migraine attacks per month in months 10 through 12 after randomization. However, the PFO closure group had a lower mean number of headache days per month (included in the 2022 Wang et al. systematic review and meta-analysis).

In the multicenter, prospective, randomized, open-label, international PRIMA trial, Mattle et al. (2016) investigated the effect of percutaneous PFO closure in participants with migraines refractory to medical treatment. Participants were randomized to PFO closure using the Amplatzer™ PFO Occluder (n = 53) or medical treatment (n = 54). The primary end point was the reduction in monthly migraine days during months 9 to 12 after randomization compared with a 3-month baseline phase. The trial was terminated prematurely because of slow enrollment. Overall, 83 participants (40 Occluder, 43 control) completed a 12-month follow-up. The mean migraine days at baseline was 8 (±4.7 SD) in the closure group and 8.3 (±2.4) in the controls. Findings on the primary end point were inconclusive, with -2.9 days after PFO closure vs -1.7 days in the control group. In those with refractory migraine with aura and a PFO, closure did not reduce overall monthly migraine days (included in the 2022 Wang et al. systematic review and meta-analysis).

In the MIST study, Dowson et al. (2009) evaluated the effectiveness of PFO closure to resolve refractory migraine headaches. Overall, 147 participants were randomized to transcatheter PFO closure with the STARFlex implant (n = 74) or to a sham procedure (n = 73). Participants were followed up for 6 months. The primary efficacy end point was the cessation of migraine headache 91 to 180 days after the procedure. No significant difference between implant and sham groups was observed in the primary end point of migraine headache cessation (three of 74 vs three of 73, respectively). Secondary end points also were not achieved (included in the 2022 Wang et al. systematic review and meta-analysis).

Clinical Practice Guidelines

American Academy of Neurology (AAN)

An AAN practice advisory (Messé et al., 2020) makes the following recommendations for transcatheter PFO closure:

- In patients younger than 60 years with a PFO and embolic-appearing infarct and no other mechanism of stroke identified, clinicians may recommend closure following a discussion of potential benefits (reduction of stroke recurrence) and risks (procedural complication and atrial fibrillation). Level C.
- Clinicians may inform patients that the presence of a large shunt probably is associated with the benefit from closure. Conversely, there is probably less likelihood of the benefit in patients with a small shunt or a non−embolic-appearing single, small, deep infarct, and it is uncertain whether atrial septal aneurysm in the absence of a large shunt influences the likelihood of benefitting from PFO closure. Level C.
- PFO closure may be offered in other populations, such as patients who are aged 60 to 65 years, with a very limited degree of traditional vascular risk factors (e.g., hypertension, diabetes, hyperlipidemia, smoking) and no other mechanism of stroke detected following a thorough evaluation, including prolonged monitoring for atrial fibrillation. Level C.
- PFO closure may be offered to younger patients (i.e., aged < 30 years) with a single, small, deep stroke (< 1.5 cm), large shunt, and absence of any vascular risk factors that would lead to intrinsic small vessel diseases such as hypertension, diabetes, or hyperlipidemia. Level C.
- In a patient for whom PFO closure is being considered, a shared decision-making approach between clinicians and the patient should be used and explore how well the patient's attributes match those included in the positive PFO closure trials and the patient's preferences and concerns regarding the risk of stroke recurrence and risk of adverse events. Level B.

Level B indicates a recommendation that should be made. In most circumstances, adherence to the recommendation will likely improve health-related outcomes.

Level C represents a recommendation that may be made. In some circumstances, adherence to the recommendation might improve health-related outcomes.

American Heart Association/American Stroke Association (AHA/ASA)

The AHA/ASA guidelines for the secondary prevention of stroke state that it is reasonable to percutaneously close a PFO in patients who meet each of the following criteria: age 18 to 60 years, nonlacunar stroke, no other identified cause, and high-risk PFO features (Kleindorfer et al., 2021).

The AHA/ASA guidelines for the primary prevention of stroke state that given the uncertainties and relatively low risk of initial stroke caused by a PFO and the potential risk with antithrombotic therapy or invasive treatments, no treatment is recommended for the primary prevention of stroke in patients with a PFO (Meschia et al., 2014).

American Society of Echocardiography

In 2023, the American Society of Echocardiography stated that percutaneous closure of a PFO is indicated for select patients with an embolic-appearing ischemic stroke and no other specific cause or mechanism after a thorough evaluation (Little et al., 2023).

National Institute for Health and Care Excellence (NICE)

A NICE report concluded that evidence on the safety of percutaneous PFO closure to prevent recurrent cerebral embolic events shows serious but infrequent complications. Evidence of its efficacy is adequate (NICE, 2013).

A NICE report concluded that evidence on the efficacy of percutaneous PFO closure for recurrent migraine is inadequate in quality and quantity. The evidence on safety shows a small incidence of well-recognized but sometimes serious adverse events, including device embolization and device prolapse (each reported in less than 1% of patients) (NICE, 2010).

Society for Cardiovascular Angiography and Interventions (SCAI)

The evidence-based 2022 SCAI Guidelines for the Management of PFO make key recommendations for PFO closure to prevent PFO-associated stroke. Thirteen recommendations are made, based on five clinical scenarios, including recommendations for those with or without a history of stroke, combined antiplatelet and anticoagulant therapy, and other less common conditions such as platypnea-orthodeoxia syndrome, thrombophilia, and diving-related decompression illness. The SCAI also states that the decision to perform PFO closure on anyone for any clinical scenario should be highly individualized and nuanced in the context of a multidisciplinary team. Furthermore, the following recommendations are made:

- PFO closure is recommended to prevent recurrent PFO-associated stroke (strong recommendation).

- In patients experiencing migraines without a prior PFO-associated stroke, the guidelines suggest against the routine use of PFO closure for the treatment of migraines (conditional recommendation, moderate certainty of evidence).
- In patients with systemic embolism and without a prior PFO-associated stroke, in whom other embolic etiologies have been excluded, the SCAI guideline panel suggests PFO closure rather than medical therapy alone (conditional recommendation, very low certainty of evidence).
- In patients with a history of TIA and without a prior PFO-associated stroke, the SCAI guideline panel suggests against PFO closure (conditional recommendation, very low certainty of evidence).

U.S. Food and Drug Administration (FDA)

This section is to be used for informational purposes only. FDA approval alone is not a basis for coverage.

Transcatheter patent foramen ovale (PFO) closure is a procedure and, therefore, is not subject to FDA regulation. However, the devices designed for PFO occlusion are subject to FDA regulation. These devices are regulated by the premarket approval process and are classified as transcatheter septal occluders (product code MLV).

The Amplatzer™ PFO Occluder (Abbott) received FDA premarket approval (P120021) on October 28, 2016. The device is indicated for percutaneous transcatheter closure of a PFO to reduce the risk of recurrent ischemic stroke in individuals, predominantly between the ages of 18 and 60 years, who have had a cryptogenic stroke due to a presumed paradoxical embolism, as determined by a neurologist and cardiologist following an evaluation to exclude known causes of ischemic stroke. Additional information is available at: https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfPMA/pma.cfm. (Accessed September 10, 2025)

As a supplement to the original premarket approval, the Amplatzer™ Talisman™ PFO Occluder received FDA premarket approval (P120021, S020) on September 27, 2021. The device is a line extension of the current Amplatzer™ PFO Occluder product family.

The GORE® CARDIOFORM Septal Occluder (W.L. Gore) received FDA premarket approval (P050006/S060) on July 31, 2017. The device is indicated for the percutaneous transcatheter closure of the following defects of the atrial septum:
- Ostium secundum atrial septal defects
- A PFO to reduce the risk of recurrent ischemic stroke in individuals, predominantly between the ages of 18 and 60 years, who have had a cryptogenic stroke due to a presumed paradoxical embolism, as determined by a neurologist and cardiologist following an evaluation to exclude known causes of ischemic stroke

  Additional information is available at:
  https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpma/pma.cfm?id=P050006S060.
  (Accessed September 10, 2025).

References

Asghar A, Canthiya L, Khachatrian A, et al. Long-term cerebrovascular outcomes of patients undergoing percutaneous patent foramen ovale closure in observational studies: a systematic review and meta-analysis. J Stroke Cerebrovasc Dis. 2025 Feb;34(2):108189.Carroll JD, Saver JL, Thaler DE, et al. RESPECT Investigators. Closure of patent foramen ovale versus medical therapy after cryptogenic stroke. n Engl J Med. 2013 Mar 21;368(12):1092-100.

Dowson A, Mullen MJ, Peatfield R, et al. Migraine Intervention With STARFlex Technology (MIST) trial: a prospective, multicenter, double-blind, sham-controlled trial to evaluate the effectiveness of patent foramen ovale closure with STARFlex septal repair implant to resolve refractory migraine headache. Circulation. 2008 Mar 18;117(11):1397-404. Erratum in: Circulation. 2009 Sep 1;120(9):e71-2.

Eichelmann A, Kubini R, Nachoski D, et al. Patent foramen ovale closure versus drug therapy in patients over 60 years and a follow-up of 5 years. Clin Cardiol. 2024 Feb;47(3):e24251.

Furlan AJ, Reisman M, Massaro J, et al. CLOSURE I Investigators. Closure or medical therapy for cryptogenic stroke with patent foramen ovale. n Engl J Med. 2012 Mar 15;366(11):991-9.

Garg L, Haleem A, Varade S, et al. Patent foramen ovale closure in the setting of cryptogenic stroke: a meta-analysis of five randomized trials. J Stroke Cerebrovasc Dis. 2018 Sep;27(9):2484-2493.

Hamodat O, Almuzainy S, Yahya R, Koniali S. Comparison of Patent Foramen Ovale Closure vs Medical Therapy for the Prevention of Recurrent Cryptogenic Stroke: A Systematic Review. J Saudi Heart Assoc. 2025 Mar 29;37(2):5.

Hayes, Inc. Comparative Effectiveness Review. Transcatheter closure of patent foramen ovale for prevention of recurrent cryptogenic stroke. Lansdale, PA: Hayes, Inc.; May 2018; updated June 2022.

Kleindorfer DO, Towfighi A, Chaturvedi S, et al. 2021 Guideline for the prevention of stroke in patients with stroke and transient ischemic attack: a guideline from the American Heart Association/American Stroke Association. Stroke. 2021 Jul;52(7):e364-e467. Erratum in: Stroke. 2021 Jul;52(7):e483-e484.

Kolokathis K, Thomopoulos C, Tsioufis K. Net clinical benefit of PFO closure versus medical treatment in patients with cryptogenic stroke: A systematic review and meta-analysis. Hellenic J Cardiol. 2023 Mar-Apr;70:46-52.

Krittanawong C, Virk HUH, Kumar A, et al. Meta-analysis comparing percutaneous closure versus medical therapy for patent foramen ovale. Am J Cardiol. 2022 Jun 1;172:174-177.

Lee PH, Song JK, Kim JS, et al. Cryptogenic stroke and high-risk patent foramen ovale: the DEFENSE-PFO trial. J Am Coll Cardiol. 2018 May 22;71(20):2335-2342.

Little SH, Rigolin VH, Garcia-Sayan E, et al. Recommendations for special competency in echocardiographic guidance of structural heart disease interventions: from the American Society of Echocardiography. J Am Soc Echocardiogr. 2023 Apr;36(4):350-365.

Mas JL, Derumeaux G, Guillon B, et al. CLOSE Investigators. Patent foramen ovale closure or anticoagulation vs. antiplatelets after stroke. n Engl J Med. 2017 Sep 14;377(11):1011-1021.

Mas JL, Guillon B, Charles-Nelson A, et al. CLOSE investigators. Patent foramen ovale closure in stroke patients with migraine in the CLOSE trial. The CLOSE-MIG study. Eur J Neurol. 2021 Aug;28(8):2700-2707.

Mattle HP, Evers S, Hildick-Smith D, et al. Percutaneous closure of patent foramen ovale in migraine with aura, a randomized controlled trial. Eur Heart J. 2016 Jul 7;37(26):2029-36.

Meier B, Kalesan B, Mattle HP, et al. PC Trial Investigators. Percutaneous closure of patent foramen ovale in cryptogenic embolism. n Engl J Med. 2013 Mar 21;368(12):1083-91.

Meschia JF, Bushnell C, Boden-Albala B, et al. American Heart Association Stroke Council; Council on Cardiovascular and Stroke Nursing; Council on Clinical Cardiology; Council on Functional Genomics and Translational Biology; Council on Hypertension. Guidelines for the primary prevention of stroke: a statement for healthcare professionals from the American Heart Association/American Stroke Association. Stroke. 2014 Dec;45(12):3754-832.

Messé SR, Gronseth GS, Kent DM, et al. Practice advisory update summary: Patent foramen ovale and secondary stroke prevention: Report of the Guideline Subcommittee of the American Academy of Neurology. Neurology. 2020; reaffirmed 2023 July 14;94(20):876-885. Available at: https://www.aan.com/Guidelines/home/GuidelineDetail/991. Accessed September 10, 2025.

Mojadidi MK, Kumar P, Mahmoud AN, et al. Pooled analysis of PFO occluder device trials in patients with PFO and migraine. J Am Coll Cardiol. 2021 Feb 16;77(6):667-676.

National Institute for Health and Care Excellence (NICE). Percutaneous closure of patent foramen ovale to prevent recurrent cerebral embolic events. IPG 472. December 2013.

National Institute for Health and Care Excellence (NICE). Percutaneous closure of patent foramen ovale for recurrent migraine. IPG 370. December 2010.

Ntaios G, Papavasileiou V, Sagris D, et al. Closure of patent foramen ovale versus medical therapy in patients with cryptogenic stroke or transient ischemic attack: updated systematic review and meta-analysis. Stroke. 2018 Feb;49(2):412-418.

Saver JL, Carroll JD, Thaler DE, et al. RESPECT Investigators. Long-term outcomes of patent foramen ovale closure or medical therapy after stroke. n Engl J Med. 2017 Sep 14;377(11):1022-1032.

Silalahi TDA, Hariyanto TI. Efficacy and safety of patent foramen ovale closure for mitigating migraine: a systematic review and meta-analysis of randomized trials and observational studies. Ther Adv Neurol Disord. 2024 Sep 25;17:17562864241271033.

Society for Cardiovascular Angiography and Interventions (SCAI). Guidelines for the Management of Patent Foramen Ovale. May 2022.

Søndergaard L, Kasner SE, Rhodes JF, et al. Gore REDUCE Clinical Study Investigators. Patent foramen ovale closure or antiplatelet therapy for cryptogenic stroke. n Engl J Med. 2017 Sep 14;377(11):1033-1042.

Tang YJ, Su G, Zhang WW, et al. Analysis of risk factors related to the efficacy of foramen ovale closure as a therapy for migraine. Int Heart J. 2023 Mar 31;64(1):28-35.

Tejada García J, Lara Lezama LB, de la Fuente Blanco R, et al. Selection of patients for percutaneous closure in nonlacunar cryptogenic stroke associated with patent foramen ovale. Data from the NORDICTUS cooperative registry. Neurologia (Engl Ed). 2022 Nov 5:S2173-5808(22)00145-6.

Tobis JM, Charles A, Silberstein SD, et al. Percutaneous closure of patent foramen ovale in patients with migraine: the PREMIUM trial. J Am Coll Cardiol. 2017 Dec 5;70(22):2766-2774.

Turc G, Calvet D, Guérin P, et al. CLOSE Investigators. Closure, anticoagulation, or antiplatelet therapy for cryptogenic stroke with patent foramen ovale: systematic review of randomized trials, sequential meta-analysis, and new insights from the CLOSE study. J Am Heart Assoc. 2018 Jun 17;7(12). pii: e008356.

Wang YL, Wang FZ, Zhang Y, et al. Association of migraine with patent foramen ovale closure: A systematic review and meta-analysis. Int J Cardiol Heart Vasc. 2022 Mar 18;39:100992.

Zhang Y, Wang H, Liu L. Patent foramen ovale closure for treating migraine: a meta-analysis. J Interv Cardiol. 2022 Feb 2;2022:6456272.

Policy History/Revision Information

Date	Summary of Changes

02/01/2026	**Medical Records Documentation Used for Reviews**
	• Added language to indicate:
	  ○ Benefit coverage for health services is determined by the federal, state, or contractual requirements, and applicable laws that may require coverage for a specific service
	  ○ Medical records documentation may be required to assess whether the member meets the clinical criteria for coverage but does not guarantee coverage of the service requested
	  ○ The patient's medical record must contain documentation that fully supports the medical necessity for the requested services
	  ○ This documentation includes but is not limited to relevant medical history, physical examination, and results of pertinent diagnostic tests or procedures
	  ○ Documentation supporting the medical necessity should be legible, maintained in the patient's medical record, and must be made available upon request
	Supporting Information
	• Updated *Clinical Evidence*, *FDA*, and *References* sections to reflect the most current information
	• Archived previous policy version CS329KS.01

Instructions for Use

This Medical Policy provides assistance in interpreting UnitedHealthcare standard benefit plans. When deciding coverage, the federal, state, or contractual requirements for benefit plan coverage must be referenced as the terms of the federal, state, or contractual requirements for benefit plan coverage may differ from the standard benefit plan. In the event of a conflict, the federal, state, or contractual requirements for benefit plan coverage govern. Before using this policy, check the federal, state, or contractual requirements for benefit plan coverage. UnitedHealthcare reserves the right to modify its policies and guidelines as necessary. This Medical Policy is provided for informational purposes. It does not constitute medical advice.

UnitedHealthcare uses InterQual® for the primary medical/surgical criteria, and the American Society of Addiction Medicine (ASAM) criteria for substance use disorder (SUD) services, in administering health benefits. If InterQual® does not have applicable criteria, UnitedHealthcare may also use UnitedHealthcare Medical Policies that have been approved by the Kansas Department of Health and Environment. The UnitedHealthcare Medical Policies are intended to be used in connection with the independent professional medical judgment of a qualified health care provider and do not constitute the practice of medicine or medical advice.