Prior Authorization Review Panel
MCO Policy Submission

A separate copy of this form must accompany each policy submitted for review.
Policies submitted without this form will not be considered for review.

Plan: Keystone First	**Submission Date**: 3/1/2024
Policy Number: ccp.1462	**Effective Date:** 7/2020 **Revision Date:** February 1, 2024
Policy Name: Embrace 2 watch for seizure detection	

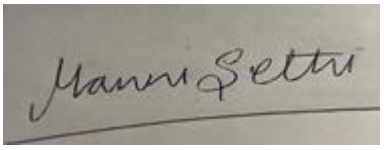
Type of Submission – Check all that apply:

New Policy
X Revised Policy*
Annual Review – No Revisions
Statewide PDL

***All revisions to the policy must be highlighted using track changes throughout the document.**

Please provide any clarifying information for the policy below:

See tracked changes below.

Name of Authorized Individual (Please type or print): Manni Sethi, MD, MBA, CHCQM	**Signature of Authorized Individual:** 

Keystone First
Family of Health Plans

Embrace 2 watch for seizure detection

Clinical Policy ID: CCP.1462

Recent review date: 2/2024

Next review date: 6/2025

Policy contains: Embrace 2 watch; epilepsy, seizure monitoring; wristband.

Keystone First has developed clinical policies to assist with making coverage determinations. Keystone First's clinical policies are based on guidelines from established industry sources, such as the Centers for Medicare & Medicaid Services (CMS), state regulatory agencies, the American Medical Association (AMA), medical specialty professional societies, and peer-reviewed professional literature. These clinical policies along with other sources, such as plan benefits and state and federal laws and regulatory requirements, including any state- or plan-specific definition of "medically necessary," and the specific facts of the particular situation are considered by Keystone First when making coverage determinations. In the event of conflict between this clinical policy and plan benefits and/or state or federal laws and/or regulatory requirements, the plan benefits and/or state and federal laws and/or regulatory requirements shall control. Keystone First's clinical policies are for informational purposes only and not intended as medical advice or to direct treatment. Physicians and other health care providers are solely responsible for the treatment decisions for their patients. Keystone First's clinical policies are reflective of evidence-based medicine at the time of review. As medical science evolves, Keystone First will update its clinical policies as necessary. Keystone First's clinical policies are not guarantees of payment.

Coverage policy

The Embrace 2 watch (Empatica Inc., Cambridge, Massachusetts) for seizure detection is investigational/not clinically proven and, therefore, not medically necessary.

Limitations

No limitations were identified during the writing of this policy.

Alternative covered services

Traditional methods for seizure diagnosis in people with epilepsy.

Background

Approximately three million American adults and 470,000 children have epilepsy, defined as active epilepsy (self-reported doctor-diagnosed epilepsy and under treatment or with recent seizures within 12 months of interview) or current epilepsy (parent-reported doctor-diagnosed epilepsy and current epilepsy) (Zack, 2017). The national prevalence is 1.2% and nearly three times as high (3.43%) in the Medicaid population (Helmers, 2015).

A Centers for Disease Control and Prevention analysis of National Health Interview Surveys of U.S. adults with self-reported epilepsy revealed that 67% had seen a neurologist or an epilepsy specialist in the past year, and 90% took epilepsy medication. However, only 44% of those taking medication reported controlled seizures. Higher prevalence of active epilepsy and poorer seizure control was found in adults with low family income, unemployment, and those divorced, separated, or widowed (Tian, 2018). Thus, a need to develop means of better controlling seizures exists.

Embrace automatically transmits data to the Alert app on its paired smartphone, using Bluetooth. The phone and the Embrace device must always be less than 30 feet apart, with no obstructions like walls and doors, making it relatively simple to use at night. It represents an alternative to an electroencephalogram and is more convenient. In the event of an alert signal, the Alert app immediately sends the information to the patient's caregiver.

The U.S. Food and Drug Administration (2018a, 2018b) issued approval to Empatica to market Embrace to adults on February 5, 2018 and to children age 6 and older on December 20, 2018 for use as an adjunct to seizure monitoring in home or healthcare settings during periods of rest. In both approvals, the wrist device senses electrodermal activity and motion that may be associated with tonic clonic seizures in patients with epilepsy or at risk for having epilepsy. Fluctuations in the skin occur from alterations in the brain during a convulsive seizure. The sensors in the wrist device gauge electrodermal activity signals to determine sympathetic nervous system activity related to the amount of sweating that occurs

Findings

The American Epilepsy Society and the American Academy of Neurology have not issued guidelines related to seizure detecting devices (American Academy of Neurology 2021; The American Epilepsy Society, 2022).A guideline from the International League Against Epilepsy found a high level of evidence for the accuracy of automated detection of generalized tonic-clonic and focal-to-bilateral tonic-clonic seizures, with moderate evidence levels for other types of seizures. The International League Against Epilepsy the considered the use of clinically validated wearables for detecting generalized tonic-clonic seizures and focal to bilateral tonic-clonic seizures in situations where significant safety concerns exist, particularly for unsupervised patients, with the aim of enabling rapid intervention within five minutes. However, this recommendation is considered weak and conditional (Beniczky, 2021)..

For seizure types other than generalized tonic-clonic seizures and focal to bilateral tonic-clonic seizures, the current evidence does not support clinical use of these devices, necessitating further research and development. Key areas requiring attention include improving device performance, reducing false alarm rates, conducting robust clinical validation studies, assessing clinical outcomes, and conducting in-field studies to refine technology impact evaluation. Given the rapidly evolving nature of this field, the guidelines recommend periodic updates and revisions to incorporate new evidence and advancements (Beniczky, 2021).

Early attempts to develop a system of detecting seizures using a home-based wristband were not always successful. The SmartWatch was used in people ages 5 – 41 who had seizures in an epilepsy monitoring unit. Of 191 seizures, the SmartWatch detected 16% of the total, 31% of the generalized tonic-clonic seizures, and 34% of seizures associated with rhythmic arm movements (Patterson, 2015).

Prior to developing the Embrace 2 watch, Empatica conducted studies with earlier versions of wristbands to detect seizures. One model automatically detected tonic-clonic seizures based on electrodermal activity and accelerometry with a wrist-worn biosensor. Based on 4,213 hours of recordings from 80 participants, the device detected 94% of seizures (15 of 16) from seven participants with 130 false alarms (0.74/day) (Poh, 2012).

Another such study included 69 participants at six sites, using three wristbands to record electrodermal activity and accelerometer signals. Wristbands included the company's E3, E4, and iCalm devices. Over 5,928 hours, 55 convulsive epileptic seizures from 22 participants were detected. The most effective of the three models had a sensitivity of 94.55% and a false alarm rate of 0.2% (Onorati, 2017).

A review by Empatica staff noted that the company's Embrace and E4 wristbands are the first commercially available multimodal wristbands that detect physiological properties of ongoing generalized tonic-clonic seizures. The article found that sensitivity to seizures from these wristbands has steadily ranged from 92% to 100% during

their use, while over time, false alarm rates in inpatient settings have fallen from about 2.0 per day to between 0.2 – 1.0 per day (Regalia, 2019).

Regulatory approval of Embrace for adults was based on a multicenter clinical trial of 135 participants with epilepsy admitted for continuous monitoring via video electroencephalography for 272 days. These participants also wore the Embrace smartwatch simultaneously. Three independent epileptologists had clinically affirmed 40 seizures in the 135 participants. After collecting 6,500 hours of data, Embrace detected all 40 (100%) of the generalized tonic-clonic seizures (U.S. Food and Drug Administration, 2018a).

Approval for use in pediatric epilepsy was based on 141 participants in an epilepsy monitoring unit, 80 of whom were between the ages of 6 and 21. Embrace detected all but one of 54 (98%) of generalized tonic-clonic seizures. The overall false alarm rates were 0.67% for adults and 1.35% for children (U.S. Food and Drug Administration, 2018b).

A survey of 221 persons with epilepsy showed most were interested in using seizure detectors; 58% consider smartwatches and bracelets/rings as the most acceptable type of detector, and 61% stated they would wear the smartwatch continuously (Herrera-Fortin, 2020).

In 2022, we added one new study and a guideline to the policy, with no policy changes required. An updated guideline from the International League Against Epilepsy and the International Federation of Clinical Neurophysiology issued a weak recommendation for use of validated, wearable automated seizure detection devices for selected patients (especially unsupervised patients), when accurate detection of generalized tonic-clonic seizures and focal-to-bilateral tonic-clonic seizures can result in rapid intervention (Beniczky, 2021). However, they identified only one study of the Embrace device (Onorati, 2017), the results of which requires evaluation of clinical utility in a nonclinical setting.

A new prospective, nonrandomized, multi-center study evaluated the Embrace device for detecting primary and secondary generalized tonic-clonic seizures in a cohort independent from the original cohort used to develop the device algorithm (Onorati, 2021). The study population comprised 85 pediatric participants aged 6 to 20 years, and 67 adults aged 21 to 63 years. The study setting was in an epilepsy monitoring unit. Device performance complied with regulatory requirements for minimum sensitivity and false alarm rates, but device utility and impact on patient outcomes needs to be established outside of a clinical setting.

In 2023, we updated the references and added two systematic reviews, which confirm previous findings. No policy changes are warranted.

A systematic review of 28 studies examined the sensitivity and false alarm rates of wearable devices for automated seizure detection, including five studies of wrist worn devices measuring electrodermal activity. Within this review, a meta-analysis of 23 studies (n = 1,269) focused on devices that detect tonic-clonic seizures seizure activity, categorized by device type. Compared to wearable surface devices, wrist-worn devices has similar mean sensitivity for detecting tonic–clonic seizures (.93 versus .90), but a higher false alarm rate (2.5/24 h versus .96/24 h). The authors recommended further research focusing on reducing false alarm rates, detecting other seizure types and psychogenic nonepileptic seizures, and longer recording in the community (Naganur, 2022).

A systematic review of 23 observational studies (n = 3,299) examined the preferences and user experiences of people with epilepsy, caregivers, and healthcare workers regarding automated wearable seizure detection devices. Accuracy, design, comfort, and cost strongly influenced user acceptance for wearable technology. Participants desired real-time detection with a latency of not more than 15 minutes from seizure occurrence, along with at least 90% sensitivity and low false alarm rates. There was a greater acceptance toward wristwatches. The authors stressed the need to incorporate user perspectives and experiences in developing wearable devices for seizure detection, particularly in community-based settings (Sivathamboo, 2022).

In 2024, we updated the references and added one systematic review, which confirms previous findings. No policy changes were warranted.

A systematic review that primarily analyzed seven phase three studies (n = 577) tested the ability of wearable seizure detection devices and their accuracy metrics like sensitivity and false alarm rates. High-level evidence from studies supported the use of wearable devices for automated detection of tonic-clonic seizures when significant safety concerns exist, with a reported sensitivity of 79.4-96% and false alarm rates of 0.20-1.92 per 24 hours. The researchers also suggested longer-term usage studies of these devices in real-world community settings (Larsen, 2023).

References

On November 29, 2023, we searched PubMed and the databases of the Cochrane Library, the U.K. National Health Services Centre for Reviews and Dissemination, the Agency for Healthcare Research and Quality, and the Centers for Medicare & Medicaid Services. Search terms were “Wearable Electronic Devices”[MAJR],” “Embrace,” “empatica,” “epilepsy,” “seizure monitoring,” and “wrist devices.” We included the best available evidence according to established evidence hierarchies (typically systematic reviews, meta-analyses, and full economic analyses, where available) and professional guidelines based on such evidence and clinical expertise.

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Policy updates

6/2020: initial review date and clinical policy effective date: 7/2020

2/2021: Policy references updated.

2/2022: Policy references updated.

2/2023: Policy references updated.

2/2024: Policy references updated.