Policy Statement

The use of a multibiomarker disease activity score for rheumatoid arthritis (RA) (e.g., Vectra® score) is considered **investigational** in all situations.

**NOTE**: Refer to [Appendix A](#) to see the policy statement changes (if any) from the previous version.

Policy Guidelines

Coding

There is a specific CPT code for this test:

- **81490**: Autoimmune (rheumatoid arthritis), analysis of 12 biomarkers using immunoassays, utilizing serum, prognostic algorithm reported as a disease activity score

Description

Assessment of disease activity in rheumatoid arthritis is an important component of management with a goal of treatment to maintain low disease activity or achieve remission. There are a variety of instruments for measuring rheumatoid arthritis disease activity. The instruments use combinations of physical exam findings, radiologic results, and serum biomarkers to construct a disease activity score. A multibiomarker disease activity instrument is a disease activity measure that is comprised entirely of serum biomarkers. The Vectra test is a commercially available multibiomarker disease activity blood test that measures 12 biomarkers to construct a disease activity score. Concentrations of these 12 biomarkers are entered into a proprietary formula which, after adjustment by age, gender and adiposity (i.e., leptin) levels, generates a disease activity score (“adjusted MBDA score”) that ranges from 1 (low disease activity) to 100 (high disease activity).

Related Policies

- N/A

Benefit Application

Benefit determinations should be based in all cases on the applicable contract language. To the extent there are any conflicts between these guidelines and the contract language, the contract language will control. Please refer to the member’s contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.

Some state or federal mandates (e.g., Federal Employee Program [FEP]) prohibits plans from denying Food and Drug Administration (FDA)-approved technologies as investigational. In these instances, plans may have to consider the coverage eligibility of FDA-approved technologies on the basis of medical necessity alone.

Regulatory Status

Clinical laboratories may develop and validate tests in-house and market them as a laboratory service; laboratory-developed tests must meet the general regulatory standards of the Clinical
Laboratory Improvement Amendments. The Vectra® test (Crescendo Bioscience) is available under the auspices of Clinical Laboratory Improvement Amendments. Laboratories that offer laboratory-developed tests must be licensed by Clinical Laboratory Improvement Amendments for high-complexity testing. To date, the U.S. Food and Drug Administration has chosen not to require any regulatory review of this test.

**Rationale**

**Background**

**Rheumatoid Arthritis**

RA is characterized by chronic joint inflammation leading to painful symptoms, progressive joint destruction, and loss of function. The disorder is relatively common and associated with a high burden of morbidity for affected patients.

**Treatment**

Treatment of RA has undergone a shift from symptom management to a more proactive strategy of minimizing disease activity and delaying disease progression. The goal of treatment is to reduce the irreversible joint damage that occurs from ongoing joint inflammation and synovitis by keeping disease activity as low as possible. The availability of an increasing number of effective disease-modifying antirheumatic drugs has made the achievement of remission, or sustained low disease activity, a feasible goal for a large proportion of patients with RA. This treatment strategy has been called a tight control approach.

The concept of tight control in the management of RA has gained wide acceptance. Evidence from clinical trials has demonstrated that outcomes are improved with a tight control strategy, in which treatment targets are mainly based on measures of disease activity. In a systematic review, Schoels et al (2010) identified 7 studies that evaluated the efficacy of tight control. Four of these trials randomized patients to tight control using treatment targets or to routine management, two studies compared different treatment targets, and one study compared results from targeted treatment with historical controls. The treatment targets were heterogeneous, including symptom-based measures, joint scores on the exam, validated treatment activity measures, lab values, or combinations of these factors. In all 4 trials that randomized patients to tight control or routine management, there was a significant decrease in the Disease Activity Score (DAS) or its 28 joints version (DAS28) and in the likelihood of achieving remission for patients in the tight control group.

According to the American College of Rheumatology (ACR) guidelines, initial treatment of patients with RA is monotherapy (usually a disease-modifying antirheumatic drug). Treatment may progress to combination therapy if disease activity remains moderate or high despite monotherapy. Combination therapy may consist of additional disease-modifying antirheumatic drugs or the addition of tumor necrosis factors or non-tumor necrosis factors biologics.

**Selection of Disease Activity Assessment Tools**

For a strategy of tight control to be successful, reliable and valid measurement of disease activity is necessary. Numerous measurements exist that assess various aspects of RA disease activity, including patient self-report of symptom severity and functional capacity, physician examination of joints for swelling and tenderness, laboratory testing of serum biomarkers, and imaging. Various assessment tools exist that range from those that rely only on single types of measurements, to composite tools that combine information from multiple measurement sources. These assessment tools vary in their psychometric properties and their feasibility of implementation and these trade-offs must be considered in their selection for use. For example, although composite tools are more comprehensive, in some cases they may be less feasible for regular use.

Based on a systematic review (2019) of the psychometric properties of 46 tools, an ACR working group determined that the following 11 measures of disease activity fulfilled a minimum
standard for regular use in most clinical settings: Disease Activity Score (DAS), Routine Assessment of Patient Index Data 3 (RAPID3), Routine Assessment of Patient Index Data 5 (RAPID5), Clinical Disease Activity Index (CDAI), Disease Activity Score with 28 joints (DAS28-ESR/CRP), Patient Derived DAS28, Hospital Universitario La Princesa Index (HUPI), Multibiomarker Disease Activity Score (MBDA score, Vectra DA), Rheumatoid Arthritis Disease Activity Index (RADAI), Rheumatoid Arthritis Disease Activity Index 5 (RADAI-5), and the Simplified Disease Activity Index (SDAI). Additionally, using a modified Delphi process, the ACR working group further identified the following 5 measures as “preferred” for regular use in most clinical settings: the DAS28-ESR/CRP, CDAI, SDAI, RAPID3, and Patient Activity Scale-II.

**Vectra Test**

The Vectra Test is a commercially available multibiomarker disease activity (MBDA) test that is an approach to measuring RA disease activity that uses only serum biomarkers obtained through a laboratory blood draw. The manufacturer describes Vectra as a complement to clinical judgment. Although not explicitly stated, it appears that the test may be used as an adjunct to other disease activity measures, to potentially identify patients at high-risk of progression who would, therefore, benefit from a more aggressive treatment strategy.

The Vectra test measures the serum concentrations of the following 12 biomarkers: Interleukin-6 (IL-6), Tumor Necrosis Factor Receptor Type I (TNFRI), Vascular Cell Adhesion Molecule 1 (VCAM-1), Epidermal Growth Factor (EGF), Vascular Endothelial Growth Factor A (VEGF-A), YKL-40, Matrix Metalloproteinase 1 (MMP-1), and Matrix Metalloproteinase 3 (MMP-3), C-reactive protein (CRP), Serum Amyloid A (SAA), Leptin, and Resistin. The concentrations of these 12 biomarkers are measured in serum and, combined with age, gender and adiposity (i.e., leptin) information, are entered in a proprietary formula to generate a score on a scale of 1 to 100 that represents the level of RA disease activity.

Categories of scores were constructed to correlate with the DAS28-CRP scale:
- 45-100: high disease activity
- 30-44: moderate disease activity
- 1-29: low disease activity.

Prior to December 2017, the Vectra test was originally referred to as Vectra DA and the original MBDA score did not include adiposity (i.e., leptin) adjustment. However, as the current, commercially available version of the test includes the leptin-adjusted MBDA score (now called the “adjusted MBDA score”), the focus of this policy will primarily be on the leptin-adjusted Vectra test.

In the ACR working group’s systematic review reported by England et al (2019), they also graded feasibility of the RA disease activity measurement tools. Any measure not commercially available or requiring advanced imaging was graded as infeasible. All other measures started with 4 points (i.e., “++++”) and were downgraded by 1-point for each of the following implementation considerations: requiring a provider joint count, requiring a laboratory test, not possible to complete during a routine clinic visit, not possible to complete on the same day as the clinic visit. The ACR Working Group downgraded the feasibility of the Vectra DA by 3 points (i.e., score of “++++” decreased to “+”). This was due to its requirement of a laboratory test and because its result is not available on the same day as the clinic visit. Although the current, commercially available version of the Vectra test was not assessed in the 2019 ACR guideline, because it requires the same laboratory testing that is not available on the same days as the clinic visit, likely it would have a similar feasibility rating as the older version.

**Literature Review**

Evidence reviews assess whether a medical test is clinically useful. A useful test provides information to make a clinical management decision that improves the net health outcome. That is, the balance of benefits and harms is better when the test is used to manage the condition than when another test or no test is used to manage the condition.
Multibiomarker Disease Activity Testing in Rheumatoid Arthritis
Clinical Context and Test Purpose
The purpose of the multibiomarker disease activity (MBDA), specifically the Vectra, test in patients who have rheumatoid arthritis (RA) is to determine the level of disease activity (low, medium, or high) in order to inform treatment decisions.

The question addressed in this evidence review is: Does use of an MBDA (e.g., Vectra) test, alone or as an adjunct, to predict disease activity in patients with RA, improve health outcomes compared with the use of other American College of Rheumatology (ACR)-recommended measures of disease activity?

The following PICO was used to select literature to inform this review.

Populations
The relevant population of interest is individuals with RA who are being managed with a disease-modifying antirheumatic drug (DMARD) and/or biologic agents. Management of patients with RA has changed from treatment of symptoms to a tight control strategy. The objective of a tight control strategy is to minimize disease progression and joint damage by monitoring disease activity and treating aggressively if an increase in activity is predicted.

Interventions
Vectra provides a score indicating the level of disease activity, based on blood levels of the following 12 biomarkers: interleukin-6, tumor necrosis factor (TNF) receptor type I, vascular cell adhesion molecule 1, epidermal growth factor, vascular endothelial growth factor A, YKL-40 glycoprotein, matrix metalloproteinase 1, matrix metalloproteinase 3, C-reactive protein (CRP), serum amyloid A, leptin, and resistin. The current, commercially available version of the Vectra test is adjusted for patient age, gender, and adiposity, (i.e., leptin), now referred as the "adjusted MBDA score".

Scores range from 1 to 100 (1-29=low disease activity; 30-44=medium disease activity; 45-100=high disease activity).

Comparators
The reference standard for disease activity is radiographic progression at a set point in time, typically 3 months to one year. In addition, an ACR working group determined that the following 11 measures of disease activity fulfilled a minimum standard for regular use in most clinical settings: Disease Activity Score (DAS), Routine Assessment of Patient Index Data 3 (RAPID3), Routine Assessment of Patient Index Data 5 (RAPID5), Clinical Disease Activity Index (CDAI), Disease Activity Score with 28 joints (DAS28-ESR/CRP), Patient Derived DAS28, Hospital Universitario La Princesa Index (HUPI), the original and no longer commercially available Multibiomarker Disease Activity Score (MBDA score, Vectra DA), Rheumatoid Arthritis Disease Activity Index (RADA1), Rheumatoid Arthritis Disease Activity Index 5 (RADA1-5), and the Simplified Disease Activity Index (SDAI). Additionally, using a modified Delphi process, the ACR working group further identified the following 5 measures as “preferred” for regular use in most clinic settings: the DAS28-ESR/CRP, CDAI, DSAI, RAPID3, and Patient Activity Score-II.

Outcomes
The goal of treating patients with RA is to improve quality of life and to prevent progression of the disease. Progression of disease causes irreversible joint damage.
If Vectra correctly assesses disease activity as low, the clinician may maintain medications at the same level or consider tapering the patient's medication.

If Vectra correctly assesses disease activity as moderate or high, the clinician may be more aggressive in disease management, by either increasing doses of current medications, switching medications, or adding medications to the treatment plan.

If Vectra incorrectly assesses disease activity as low, the clinician may maintain or decrease medication levels, which will allow progression of the disease and further joint damage.

If Vectra incorrectly assesses disease activity as moderate or high, the clinician may continue to manage the patient with higher levels of medication than is necessary to prevent disease progression, exposing the patient to unnecessary toxins. DMARDs may affect the liver, stomach, and intestines. Biologic agents may increase the risk of infection, lymphoma, and skin cancer. The test may be run as often as a clinician needs disease activity information, typically every 3 to 6 months. A test immediately after diagnosis may serve as a baseline measurement.

For purposes of assessing Vectra against the reference standard of radiographic progression, 1 year is the typical timeframe.

**Study Selection Criteria**

For the evaluation of the clinical utility of a multibiomarker disease activity test (e.g., Vectra), studies would need to use the current commercially available version of the test (including the “adjusted MBDA score”) as either an adjunct or a replacement to current disease activity measures to manage treatment decisions in patients with RA. Outcomes would be quality of life and measures of disease progression.

In the absence of direct evidence for the clinical utility of Vectra, evidence for clinical validity is evaluated, in which we can make inferences on clinical utility. For the evaluation of clinical validity, studies would need to compare the current commercially available version of Vectra (including the “adjusted MBDA score”) used as an adjunct or as a replacement to ACR-recommended disease activity measures, with radiographic progression as a reference standard. Prognostic studies should report the probability of the outcome measure (with precision) by risk group. Studies reporting other measures (e.g., odds ratios) may be included but are less informative.

**Clinically Valid Review of Evidence**

**Vectra Test with “adjusted MBDA score”**

Evidence on the evaluation of clinical validity of the current commercially available version of the Vectra test (including the “adjusted MBDA score”) in patients with RA, consists of 2 retrospective cohort studies (Table 1). A study by Curtis et al (2019) evaluated the clinical validity of the Vectra test in predicting radiographic progression at 1 year using a convenience sample of combined data from 533 patients enrolled in either the Optimized Treatment in early Rheumatoid Arthritis (OPERA) randomized controlled trial (RCT) or the Brigham Rheumatoid Arthritis Sequential Study (BRASS) cohort study. The clinical validity of the Vectra test was compared to that of the original Vectra DA test and other measures of DA in patients with RA, consists of 2 retrospective cohort studies (Table 1). A study by Curtis et al (2019) evaluated the clinical validity of the Vectra test in predicting radiographic progression at 1 year using a convenience sample of combined data from 533 patients enrolled in either the Optimized Treatment in early Rheumatoid Arthritis (OPERA) randomized controlled trial (RCT) or the Brigham Rheumatoid Arthritis Sequential Study (BRASS) cohort study. The clinical validity of the Vectra test was compared to that of the original Vectra DA test and other measures of DA (Table 2). Among the various disease activity measures assessed, only the new Vectra test (relative risk [RR] 8.38; 95% CI, 1.15 to 60.8), the original Vectra Disease Activity (DA) test (RR 5.39; 95% CI, 1.3 to 22.29), and CRP (RR 4.15; 95% CI, 1.58 to 10.95) significantly differentiated between the risk of radiographic progression for the high risk groups versus the low risk groups. Based on these outcomes, the study authors concluded that the new Vectra test (“adjusted MBDA score”) may offer “improved clinical utility” over the original and not commercially available Vectra DA test.

Although the overlapping confidence intervals suggest at least similar prognostic performance to other DA measures, they indicate uncertainty as to whether Vectra provides prognostic performance superior to the original Vectra DA or CRP. Additionally, the low proportions of
patients with radiographic progression in the moderate to high risk patient groups (3.9% to 9.3% for the new Vectra test and 3.5% to 9.7% for the original Vectra DA test group) do not support the use of the test to “rule in” moderate- to high-risk disease. These low rates of patients with radiographic progression in the moderate to high risk patient groups suggest that 9 out of 10 patients identified as moderate or high risk could receive intensification of therapy unnecessarily. Likely this is due at least in part to the fact that the overall prevalence of radiographic progression was notably low in this study cohort (6.3%). Although the results from this study by Curtis et al (2018) are initially supportive of the Vectra test’s ability to predict radiographic progression at 1 year, its numerous relevance, design, and conduct limitations (Tables 3 and 4) provide an insufficient basis to conclude the clinical validity of the Vectra test.

In 2021, updated clinical validity data on the Vectra test with an adjusted MBDA score was published by Curtis and coworkers using combined data from 953 patients enrolled in the OPERA, BRASS, Leiden Early Arthritis Clinic (EAC), and SWEFOT (Swedish Farma therapy) cohorts. The adjusted MBDA score was validated in the Leiden and SWEFOT cohorts and compared with conventional disease activity measures across all 4 cohorts. Among the various baseline disease activity measures, only the adjusted MBDA score (odds ratio [OR] 1.05; 95% CI, 1.03 to 1.06), seropositivity (OR 6.20; 95% CI, 2.90 to 16.1), CRP (OR 1.57; 95% CI, 1.29 to 1.91), baseline joint damage (total Shape score [TSS]) (OR 1.01; 95% CI, 1.00 to 1.01), and DAS28-CRP (OR 1.24; 95% CI, 1.05 to 1.46) were significantly predictive of radiographic progression. Risk ratios (95% CI) for change in TSS > 5 units were 2.62 (0.59 to 11.6; p = .24) and 9.37 (2.34 to 37.5; p = 2.65 \times 10^{-6}) in the moderate and high adjusted MBDA score categories compared to the low category. The risk ratio was 4.47 (2.54 to 7.87; p = 5.26 \times 10^{-10}) for the high category compared to combined low and moderate categories. Adjusted MBDA scores from the combined cohorts were cross-classified with conventional disease activity measures to evaluate discordances. The frequency of radiographic progression was low when the adjusted MBDA score was low and highest when high regardless of DAS28-CRP, CRP, swollen joint count, and CDAI score categories. These trends were not observed within conventional disease activity measures.

However, while individual analysis of the 4 cohorts with cross-classification by DAS28-CRP and adjusted MBDA score were generally consistent with these trends, they should be interpreted with caution due to the limited number of progressors. Overall, the frequency of radiographic progression corresponded more consistently with the category of adjusted MBDA score than the category of DAS28-CRP, CRP, swollen joint count, or CDAI scores. Bivariable logistic regression analysis identified the adjusted MBDA score as the strongest single, independent predictor of radiographic progression. A risk curve for radiographic progression for change in TSS > 5 was generated for the adjusted MBDA score. While the risk of radiographic progression exceeded 40% at the highest adjusted MBDA score in the model, at the high-risk cutoff score (>44) the risk of radiographic progression is less than 10%. While the Leiden and SWEFOT cohorts contributed a higher proportion of patients with radiographic progression in the moderate and high risk groups, there continues to be insufficient support for the use of the test to “rule in” moderate- to high-risk disease. Furthermore, given the high prevalence of discordant results across conventional disease activity measures, the position of the adjusted MBDA score in the clinical management pathway is unclear. Study relevance, design, and conduct limitations are summarized in Tables 3 and 4.

### Table 1. Characteristics of Vectra (“adjusted MBDA score”) Clinical Validity Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Study Population</th>
<th>Design</th>
<th>Outcome Measure</th>
<th>Threshold(s) for Risk Categories of Index Test</th>
<th>Timing of Enrollment with respect to course of disease</th>
<th>Binding of Assessors</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curtis et al (2019)</td>
<td>OPERA, BRASS cohorts</td>
<td>Retrospective cohorts with</td>
<td>RP (mTSS &gt; 5 units) at 1 y</td>
<td>Low (&lt;30), moderate (30-44), OPERA: RA &lt; 6 months</td>
<td>OPERA: Yes</td>
<td>OPERA involved treatment-naive patients</td>
<td></td>
</tr>
<tr>
<td>Curtis et al. (2021)</td>
<td>OPERA, BRASS, Leiden EAC, SWEFOT cohorts</td>
<td>Retrospective cohorts with convenience samples</td>
<td>RP (mTSS &gt; 5 units) at 1y</td>
<td>Low (&lt;30), moderate (30-44), and high (&gt;44)</td>
<td>OPERA, BRASS: see above</td>
<td>OPERA, BRASS: see above</td>
<td>SWEFOT: RA &lt; 12 months</td>
</tr>
</tbody>
</table>
Table 2. Results of Vectra (“adjusted MBDA score”) Clinical Validity Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Initial N</th>
<th>Final N</th>
<th>Excluded Samples</th>
<th>RP Prevalence</th>
<th>Study Population in Risk Group, n (%)</th>
<th>Clinical Validity: Proportion of Patients with RP, % (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Low Risk</td>
<td>Intermedi ate Risk</td>
</tr>
<tr>
<td>Curtis et al (2019)</td>
<td>604</td>
<td>533</td>
<td>49 (9%)</td>
<td></td>
<td></td>
<td>90 (16.9%)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.3%</td>
</tr>
<tr>
<td>Original Vectra DA</td>
<td>111</td>
<td>NR</td>
<td>NR</td>
<td></td>
<td></td>
<td>111 (20.8%)</td>
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<tr>
<td>(unadjusted, not</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>commercially</td>
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<tr>
<td>available)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curtis et al (2021)</td>
<td>163</td>
<td>NR</td>
<td>NR</td>
<td>17.2%</td>
<td></td>
<td>25 (15.3%)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>23/79 (29.1%)</td>
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<tr>
<td>SWEFOT</td>
<td>235</td>
<td>NR</td>
<td>NR</td>
<td>18.3%</td>
<td></td>
<td>3 (1.3%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>42/20 (20.5%)</td>
</tr>
<tr>
<td>OPERA</td>
<td>154</td>
<td>NR</td>
<td>NR</td>
<td>8.4%</td>
<td></td>
<td>4 (2.6%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>13/13 (9.9%)</td>
</tr>
<tr>
<td>BRASS</td>
<td>401</td>
<td>NR</td>
<td>NR</td>
<td>5.2%</td>
<td></td>
<td>87 (21.7%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>14/16 (8.3%)</td>
</tr>
<tr>
<td>Combined</td>
<td>953</td>
<td>NR</td>
<td>NR</td>
<td>11.0%</td>
<td></td>
<td>119 (12.5%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15.8% (NR)</td>
</tr>
</tbody>
</table>

Table 3. Study Relevance Limitations

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>Intervention</th>
<th>Comparator</th>
<th>Outcomes</th>
<th>Duration of Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curtis et al (2019)</td>
<td>2. Position in clinical pathway unclear; 4. Unclear if population with low-risk of clinical progression is representative of intended use</td>
<td>3. Not consistent with current use, which is as an adjunct to other disease activity measures</td>
<td>3. Rationale for selecting radiographic progression definition not provided</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curtis et al (2021)</td>
<td>2. Position in clinical pathway unclear; 4. Unclear if population with low-risk of clinical progression is representative of intended use</td>
<td>3. Unclear how discordant test results impact use of test as an adjunct to other disease activity measures</td>
<td>3. Rationale for selecting radiographic progression definition not provided</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The study limitations stated in this table are those notable in the current review; this is not a comprehensive gaps assessment.

a Population key: 1. Intended use population unclear; 2. Clinical context is unclear; 3. Study population is unclear; 4. Study population not representative of intended use.
b Intervention key: 1. Classification thresholds not defined; 2. Version used unclear; 3. Not intervention of interest (e.g., older version of test, not applied as intended).
c Comparator key: 1. Classification thresholds not defined; 2. Not compared to credible reference standard; 3. Not compared to other tests in use for same purpose.
d Outcomes key: 1. Study does not directly assess a key health outcome; 2. Evidence chain or decision model not explicated; 3. Key clinical validity outcomes not reported (see template Results tables); 4. Reclassification of diagnostic or prognostic risk categories not reported; 5. Adverse events of the test not described (excluding minor discomforts and inconvenience of venipuncture or noninvasive tests).
e Follow-Up key: 1. Follow-up duration not sufficient with respect to natural history of disease (true positives, true negatives, false positives, false negatives cannot be determined).

Table 4. Study Design and Conduct Limitations

<table>
<thead>
<tr>
<th>Study</th>
<th>Selection</th>
<th>Blinding</th>
<th>Delivery of Test</th>
<th>Selective Reporting</th>
<th>Data Completeness</th>
<th>Statistical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curtis et al (2019)</td>
<td>2. Selection not random or consecutive (i.e., convenience)</td>
<td>1. Not blinded to results of reference or other comparator tests in some patients</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curtis et al (2021)</td>
<td>2. Selection not random or consecutive (i.e., convenience)</td>
<td>1. Not blinded to results of reference or other comparator tests in some patients</td>
<td>1. Incomplete reporting of confidence intervals</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The study limitations stated in this table are those notable in the current review; this is not a comprehensive gaps assessment.
a Selection key: 1. Selection not described; 2. Selection not random or consecutive (ie, convenience).
Original Vectra DA Test (not commercially available)

Numerous studies of the validity of the original Vectra DA test (not commercially available) have been conducted based on records and archived samples from RCTs and cohorts. Although the Original Vectra DA test is no longer commercially available, for historical purposes, here we will provide a summary of the key findings from these studies.

The majority of the studies of the original Vectra DA have been previously summarized in 3 recent systematic reviews and pooled analyses. Overall, findings from the most comprehensive and rigorous review (Johnson et al, 2019) indicated that although the original Vectra DA test has shown a positive correlation with other disease activity measures, results from studies comparing MBDA with radiographic progression are inconsistent. This review reported on the results of a systematic review of 22 studies of the clinical validity of the original Vectra DA test. Among those, 9 studies evaluated the ability of the original Vectra DA to predict radiographic progression. Studies were highly heterogeneous in their radiographic progression thresholds and definitions, analytic methods, and results. For example, for the comparison of patients with a Vectra DA high-risk score versus patients with Vectra DA low-risk scores, the range of RRs of radiographic progression was 1.04 to 14.30, and were significant in only 6 studies. Additionally, results of 8 studies that reported correlations of Vectra DA with other RA disease activity measures were included in a meta-analysis (N=3,242). The original Vectra DA test demonstrated modest correlations with the DAS28-CRP (r = 0.41; 95% CI 0.36 to 0.46) and the DAS28-ESR (r = 0.48, 95% CI 0.38 to 0.58). It demonstrated weaker correlations with the SDAI (r = 0.26, 95% CI 0.19 to 0.33), CDAI (r = 0.35, 95% CI 0.26 to 0.43), and RAPID3 (r = 0.23, 95% CI 0.19 to 0.27). Systematic review authors expressed concern that inadequate information about sample handling prevented them from ruling out the potential confounding effects of biased biomarker measurement due to variation in collection, processing, and storage of serum samples. The authors concluded that the findings need further validation in light of the high level of variability in methods and results.

The second most comprehensive systematic review was reported by England et al (2019), which detailed the results of an ACR working group’s systematic review of the psychometric properties of 46 RA disease activity measurement tools. The objective of this ACR review was to determine which measures of disease activity fulfilled a minimum standard for regular use in most clinical settings. The ACR’s definition of minimum standard was (1) that the tool provided a numerical value, (2) categorized to ≥3 disease states that separate low, moderate, and high disease activity, (3) was feasible for regular measurement in the clinic, and (4) possessed adequate psychometric properties. The ACR defined the adequacy of psychometric properties as having a level of evidence that suggested at least moderate positive results in hypothesis testing plus 1 of the following: (a) level of evidence suggesting at least moderate positive results in at least 1 of the following additional areas: internal consistency, reliability, measurement error, content validity, structural validity, or responsiveness; (b) level of evidence suggesting at least limited positive results in at least 2 of those additional areas (1 of which must be responsiveness), or, (c) a defined minimum important difference/minimum clinically important difference. The ACR systematic review included 14 studies of the original version of the MBDA test, Vectra DA, that were published between 2012 and 2016. The review by England et al (2019) provided data abstraction of performance characteristic results from the individual studies, but did not draw...
any conclusions about specific clinical validity measures. Based on an overall qualitative assessment of the findings, including correlations and associations to other DA measures and radiographic progression, the ACR workgroup concluded that the original Vectra DA met their criteria for a moderate level of hypothesis testing, based on consistent findings in multiple studies of fair methodologic quality.

Finally, Curtis et al (2019) conducted a pooled analysis on data from studies of Vectra DA and radiographic progression. To be included in the analysis, the cohort studies needed to have patient-level data, more than 100 patients, and the following measures: Vectra DA scores (low/moderate/high: <30, 30-44, >44), DAS28-CRP (low/moderate/high: <2.67, >2.67 to 4.09, >4.09), and CRP (low/moderate/high: <10, >10 to 30, >30 mg/L). Four studies containing 5 cohorts (n=929 patients) were included in the analysis. Relative risks for radiographic progression at 1 year for each of the measures were calculated based on high vs not high (low and moderate combined) categories. Of the 3 measures, Vectra DA scores best predicted radiographic progression, with a relative risk of 4.6 (95% CI: 2.4 to 8.9, p<0.001), though DAS28-CRP and CRP alone also reliably predicted radiographic progression, with a relative risk of 1.7 (95% CI: 1.1 to 2.6, p=0.02) and 1.7 (95% CI: 1.2 to 2.4, p=0.002), respectively.

Additionally, findings were also mixed across 3 studies published subsequent to the above-described systematic review and pooled analyses. For example, in a post hoc analysis of 3 cohort studies by Roodenrijs et al (2018) of 57 RA patients treated with rituximab 1000 mg and methylprednisolone 200 mg, among those with an original Vectra DA score of low, moderate, and high MBDA scores, radiographic progression (change in SHS ≥ 5) was observed in 0 (0%), 0 (0%), and 5 (56%) patients, respectively. Additionally, change in the original Vectra DA score from baseline to 6 months was significantly associated with European League Against Rheumatism (EULAR) response (good or moderate) versus non-response at 6 months (OR 0.93; 95%CI, 0.88 to 0.98 per unit change). This association remained statistically significant even after adjustment by age, gender, smoking status, rheumatoid factor (RF) status, and autoantibodies against citrullinated peptides (ACPA) status (OR 0.89; 95%CI, 0.81 to 0.98 per unit change). However, in contrast, in the Dose REDuction Strategies of Subcutaneous TNF Inhibitors trial (DRESS) RCT by Bouman et al (2017), among 167 randomized, radiographic progression occurred in 31% in the dose tapering group and in 16% in the usual care group and the original Vectra DA score was not predictive of successful tapering, flare occurrence, or radiographic progression.

**Section Summary: Clinically Valid**

Evidence for the clinical validity of the current commercially available version of the Vectra test (including the “adjusted MBDA score”) in patients with RA, consists of 2 retrospective cohort studies that correlated it with other measures of disease activity and with radiographic progression. Results from the 4 cohorts analyzed in these studies have shown that Vectra may be predictive of radiographic progression at 1 year. However, its low positive predictive value (PPV) (4.4% to 15.8%) indicates that 9 out of 10 patients identified as moderate- to high-risk disease could unnecessarily receive intensification of therapy. Additionally, the numerous study relevance, design, and conduct limitations provide an insufficient basis to conclude the clinical validity of the Vectra test.

Evidence for the clinical validity of the original Vectra DA test consists of analyses of archived serum samples from RCTs as well as prospective cohort studies that have correlated the original Vectra DA with other measures of disease activity and with radiographic progression. Results from studies comparing the original Vectra DA with other disease activity measures have shown a positive correlation; however, results from studies comparing the original Vectra DA with radiographic progression are inconsistent. Only 1 study reported sensitivity and specificity, with a PPV of 21% indicating that 4 out of 5 patients identified as positive would receive intensification of therapy unnecessarily.
Currently, MBDA is used as an adjunct to other disease activity measures. The incremental benefit of MBDA when used as an adjunct to other disease activity measures is unclear given the high prevalence of discordant results across conventional measures of disease activity. Thus, the position of the Vectra test in the management pathway is unclear. Overall, the evidence is insufficient to conclude the clinical validity of Vectra compared with ACR-recommended measures of disease activity.

**Clinically Useful**
A test is clinically useful if the use of the results informs management decisions that improve the net health outcome of care. The net health outcome can be improved if patients receive correct therapy, more effective therapy, or avoid unnecessary therapy, or testing.

**Review of Evidence**

**Direct Evidence**
Direct evidence of clinical utility is provided by studies that have compared health outcomes for patients managed with and without the test. Because these are intervention studies, the preferred evidence would be from RCTs.

To demonstrate clinical utility, there should be evidence that the Vectra score is at least as good a measure of disease activity as other available measures or that the Vectra score demonstrates an incremental benefit when used as an adjunct with other disease activity measures. To demonstrate equivalence with other measures directly, an RCT comparing health outcomes of 2 groups, 1 group managed using the Vectra test and the other group managed by another disease activity measure is needed.

To directly demonstrate an incremental benefit when used as an adjunct, an RCT should compare health outcomes in patients receiving treatment guided by the Vectra test plus a disease activity measure with outcomes in patients receiving treatment guided only by the other disease activity measure. No RCTs were identified. No studies of the current commercially available Vectra test (“updated MBDA score”) were identified. Below is a retrospective study that evaluated the original Vectra DA test and medication use among patients with RA.

Curtis et al (2018) used Medicare data from 2011 to 2015 to study the original Vectra DA test (not commercially available) scores and biologic and Janus kinase inhibitors use among patients with RA. The database contained 60,596 patients with RA who had the original Vectra DA testing results. Among patients not currently taking biologics (n=33,728), statistically significant differences in adding or switching medications were detected based on the original Vectra DA scores: 9.0% of patients with low scores, 11.8% with moderate scores, and 19.7% with high scores. Similarly, among patients currently taking biologics, statistically significant differences in switching medications were detected among the different levels of scores: 5.2% of patients with low scores, 8.3% with moderate scores, and 13.5% with high scores.

**Chain of Evidence**
Indirect evidence on clinical utility rests on clinical validity. If the evidence is insufficient to demonstrate test performance, no inferences can be made about clinical utility. Because there is insufficient evidence that the Vectra score is clinically valid, direct evidence is needed to prove clinical utility. No trials were identified that provided direct evidence of clinical utility.

**Section Summary: Clinically Useful**
There are no RCTs comparing the use of the Vectra test with the “updated MBDA score” or the original Vectra DA score with an alternative method of measuring disease activity. Additionally, there are no RCTs of Vectra or Vectra DA as an adjunct to other disease activity measures compared with using the disease activity measures alone. Absent direct evidence for clinical utility, a chain of evidence could be constructed with indirect evidence proving clinical validity. However, there is insufficient evidence that Vectra or Vectra DA are clinically valid.
Summary of Evidence

Vectra Test with Adjusted Multibiomarker Disease Activity Score

For individuals who have RA who receive the current commercially available Vectra test ("adjusted MBDA score") as an adjunct or as a replacement of other disease activity measures, the evidence includes 2 studies that analyzed archived serum samples using combined data from RCTs and cohort studies. Relevant outcomes are test validity, other test performance measures, symptoms, change in disease status, functional outcomes, and quality of life. Analyses comparing Vectra with other previously validated disease activity measures such as the DAS28 or to radiographic progression, consisted mostly of correlations. However, the PPVs that individuals with Vectra moderate- to high-risk disease scores had radiographic progression were low, at 4.4% and 15.8%, respectively. Additionally, due to numerous study relevance, design, and conduct limitations, the body of evidence on the Vectra test is insufficient to determine whether it is as good as or better than other disease activity measures. Given the high prevalence of discordant results across conventional measures of disease activity, the position of the Vectra test in the management pathway is unclear. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

Original Vectra Disease Activity Test

For individuals who have RA who receive the original Vectra DA test as an adjunct or as a replacement of other disease activity measures, the evidence includes analyses of archived serum samples from RCTs and prospective cohort studies. Relevant outcomes are test validity, other test performance measures, symptoms, change in disease status, functional outcomes, and quality of life. Analyses comparing Vectra DA with other previously validated disease activity measures such as the DAS28 or to radiographic progression, consisted mostly of correlations, with only 1 study providing sensitivity, specificity, and PPV and negative predictive value (NPV). The PPV from this study was 21%. Other analyses of archived serum samples evaluated the use of Vectra DA to predict treatment response. Results from those analyses were inconsistent. The body of evidence on the Vectra DA test is insufficient to determine whether it is as good as or better than other disease activity measures. Additionally, there is no evidence evaluating Vectra DA as an adjunct to other disease activity measures. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

Supplemental Information

The purpose of the following information is to provide reference material. Inclusion does not imply endorsement or alignment with the evidence review conclusions.

Practice Guidelines and Position Statements

Guidelines or position statements will be considered for inclusion in ‘Supplemental Information’ if they were issued by, or jointly by, a US professional society, an international society with US representation, or National Institute for Health and Care Excellence (NICE). Priority will be given to guidelines that are informed by a systematic review, include strength of evidence ratings, and include a description of management of conflict of interest.

American College of Rheumatology

In its 2019 guidelines on the treatment of rheumatoid arthritis, the American College of Rheumatology identified the following 11 measures of disease activity as fulfilling a minimum standard for regular use in most clinical settings: Disease Activity Score (DAS), Routine Assessment of Patient Index Data 3 (RAPID3), Routine Assessment of Patient Index Data 5 (RAPID5), Clinical Disease Activity Index (CDAI), Disease Activity Score with 28 joints (DAS28-ESR/CRP), Patient Derived DAS28, Hospital Universitario La Princesa Index (HUPI), Multibiomarker Disease Activity Score (MBDA score, Vectra DA), Rheumatoid Arthritis Disease Activity Index (RADAI), Rheumatoid Arthritis Disease Activity Index 5 (RADAI-5), Simplified Disease Activity Index (SDAI). Although the original Vectra DA test was included in this list, the current commercially available version of the test that is now called Vectra and that includes the leptin-adjusted MBDA score (now called the “adjusted MBDA score”) was not addressed in the 2019 ACR
2.04.119 Multibiomarker Disease Activity Blood Test for Rheumatoid Arthritis
Page 14 of 18

This is because evidence on Vectra with the adjusted MBDA score was published subsequent to the ACR review end date.

**National Institute for Health and Care Excellence**
Published in 2018 and updated in 2020, the National Institute for Health and Care Excellence guidance on the management of adult patients with rheumatoid arthritis does not include a discussion on the use of a multibiomarker disease activity blood test to monitor patients.28

**U.S. Preventive Services Task Force Recommendations**
Not applicable.

**Medicare National Coverage**
There are no Medicare national coverage determinations for the Vectra test. In the absence of a national coverage determination, coverage decisions are left to the discretion of local Medicare carriers.

**Ongoing and Unpublished Clinical Trials**
Some currently ongoing trials that might influence this review are listed in Table 5.

### Table 5. Summary of Key Trials

<table>
<thead>
<tr>
<th>NCT No.</th>
<th>Trial Name</th>
<th>Planned Enrollment</th>
<th>Completion Date</th>
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<tbody>
<tr>
<td>Ongoing</td>
<td>Impact of Guided Care with the Vectra DA Multi-Biomarker Disease Activity (MBDA) Blood Test on Clinical Outcomes and Pharmaceutical Utilization in Patients with Rheumatoid Arthritis: a Prospective Randomized Study (CareFirst)</td>
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<td>Mar 2021 (recruiting)</td>
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<tr>
<td>NCT03810144a</td>
<td>Vectra InVolved Informed Decision Outcome Study (VIVID): A Prospective Randomized Controlled Trial Evaluating the Effect of Guided Care With Vectra Compared to Treatment as Usual in Patients With Rheumatoid Arthritis</td>
<td>1200</td>
<td>Oct 2021 (recruiting)</td>
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<tr>
<td>NCT02832297a</td>
<td>Prospective Outcomes Study: Vectra® DA Guided Care Compared to Usual Care</td>
<td>318</td>
<td>Aug 2022 (recruiting)</td>
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</table>

NCT: national clinical trial.

a Denotes industry-sponsored or cosponsored trial.

### References


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**Documentation for Clinical Review**

- No records required

**Coding**

This Policy relates only to the services or supplies described herein. Benefits may vary according to product design; therefore, contract language should be reviewed before applying the terms of the Policy.

The following codes are included below for informational purposes. Inclusion or exclusion of a code(s) does not constitute or imply member coverage or provider reimbursement policy. Policy Statements are intended to provide member coverage information and may include the use of some codes for clarity. The Policy Guidelines section may also provide additional information for how to interpret the Policy Statements and to provide coding guidance in some cases.

<table>
<thead>
<tr>
<th>Type</th>
<th>Code</th>
<th>Description</th>
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<tr>
<td><strong>CPT®</strong></td>
<td>81490</td>
<td>Autoimmune (rheumatoid arthritis), analysis of 12 biomarkers using immunoassays, utilizing serum, prognostic algorithm reported as a disease activity score</td>
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<tr>
<td><strong>HCPCS</strong></td>
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**Policy History**

This section provides a chronological history of the activities, updates and changes that have occurred with this Medical Policy.

<table>
<thead>
<tr>
<th>Effective Date</th>
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<tbody>
<tr>
<td>09/30/2015</td>
<td>New Policy Adoption</td>
</tr>
<tr>
<td>08/01/2016</td>
<td>Policy revision without position change</td>
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<tr>
<td>08/01/2017</td>
<td>Policy revision without position change</td>
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<tr>
<td>08/01/2018</td>
<td>Policy title change from Vectra® DA Blood Test for Rheumatoid Arthritis</td>
</tr>
<tr>
<td>08/01/2019</td>
<td>Policy revision without position change</td>
</tr>
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</table>
Definitions of Decision Determinations

**Medically Necessary:** Services that are Medically Necessary include only those which have been established as safe and effective, are furnished under generally accepted professional standards to treat illness, injury or medical condition, and which, as determined by Blue Shield, are: (a) consistent with Blue Shield medical policy; (b) consistent with the symptoms or diagnosis; (c) not furnished primarily for the convenience of the patient, the attending Physician or other provider; (d) furnished at the most appropriate level which can be provided safely and effectively to the patient; and (e) not more costly than an alternative service or sequence of services at least as likely to produce equivalent therapeutic or diagnostic results as to the diagnosis or treatment of the Member’s illness, injury, or disease.

**Investigational/Experimental:** A treatment, procedure, or drug is investigational when it has not been recognized as safe and effective for use in treating the particular condition in accordance with generally accepted professional medical standards. This includes services where approval by the federal or state governmental is required prior to use, but has not yet been granted.

**Split Evaluation:** Blue Shield of California/Blue Shield of California Life & Health Insurance Company (Blue Shield) policy review can result in a split evaluation, where a treatment, procedure, or drug will be considered to be investigational for certain indications or conditions, but will be deemed safe and effective for other indications or conditions, and therefore potentially medically necessary in those instances.

**Prior Authorization Requirements (as applicable to your plan)**

Within five days before the actual date of service, the provider must confirm with Blue Shield that the member’s health plan coverage is still in effect. Blue Shield reserves the right to revoke an authorization prior to services being rendered based on cancellation of the member’s eligibility. Final determination of benefits will be made after review of the claim for limitations or exclusions.

Questions regarding the applicability of this policy should be directed to the Prior Authorization Department at (800) 541-6652, or the Transplant Case Management Department at (800) 637-2066 ext. 3507708 or visit the provider portal at www.blueshieldca.com/provider.

Disclaimer: This medical policy is a guide in evaluating the medical necessity of a particular service or treatment. Blue Shield of California may consider published peer-reviewed scientific literature, national guidelines, and local standards of practice in developing its medical policy. Federal and state law, as well as contract language, including definitions and specific contract provisions/exclusions, take precedence over medical policy and must be considered first in determining covered services. Member contracts may differ in their benefits. Blue Shield reserves the right to review and update policies as appropriate.
## Appendix A

<table>
<thead>
<tr>
<th>POLICY STATEMENT</th>
<th>BEFORE</th>
<th>AFTER</th>
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<tbody>
<tr>
<td><strong>Policy Statement:</strong></td>
<td>Multibiomarker Disease Activity Blood Test for Rheumatoid Arthritis 2.04.119</td>
<td>Multibiomarker Disease Activity Blood Test for Rheumatoid Arthritis 2.04.119</td>
</tr>
<tr>
<td><strong>Policy Statement:</strong></td>
<td>The use of a multibiomarker disease activity score for rheumatoid arthritis (RA) (e.g., Vectra® score) is considered <strong>investigational</strong> in all situations.</td>
<td>The use of a multibiomarker disease activity score for rheumatoid arthritis (RA) (e.g., Vectra® score) is considered <strong>investigational</strong> in all situations.</td>
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