

VAERS Analyzer

Bridging Patient Language and Medical Documentation

AI-powered analysis system for the Vaccine Adverse Event Reporting System (VAERS), the national early warning system established in 1990 to detect vaccine safety concerns. Our system maps patient language to medical terminology, revealing hidden patterns in adverse event reports submitted to CDC and FDA.

Key Features:

- Real-time Claude AI agents
- VAERS & FDA integration
- MCP Protocol

The Real Problem

Same Symptom, Different Words

"I had a fever"

vs

"Pyrexia"

vs

"Temperature of 101°F"

⚠ All the same thing - but how do we know?

Who Needs This?



Public Health Officials

"Are 1,000 people reporting the same new symptom using different words?"



Individual Patients

"Did anyone else experience what I'm experiencing? Is this a documented issue?"

The Current Reality

VAERS Reports Use Natural Language

- "My arm was sore and red"
- "Injection site erythema with pain"
- "Redness and soreness at shot location"

FDA Documents Use Medical Terms

- "Injection site reactions"
- "Erythema"
- "Local reactions"

How do we connect these?

Real Examples from Our Data

Injection Site Reactions

VAERS Says	FDA Says
"Injection site vasculitis"	"cellulitis", "injection site reactions"
"Vaccination site joint pain"	"injection site reactions", "arthralgia"
"Injection site joint movement impairment"	"injection site reactions", "joint stiffness"

Real Examples: Allergic Reactions

Allergic Symptoms

VAERS Says	FDA Says
"Throat tightness"	"anaphylaxis", "swelling"
"Pharyngeal swelling"	"anaphylaxis", "angioedema"
"Swelling face"	"facial swelling", "angioedema"

Real Examples: Systemic Reactions

Whole-Body Symptoms

VAERS Says	FDA Says
"Body temperature increased"	"fever", "pyrexia"
"Feeling hot"	"fever", "flushing"
"Burning sensation"	"injection site burning", "pain"

What This Enables

For Public Health Monitoring

Before:

- 500 reports of "throat tightness"
- 300 reports of "pharyngeal swelling"
- 200 reports of "difficulty swallowing"

After:

|  1,000 reports of potential anaphylaxis

What This Enables

For Individual Patients

Your Symptom: "My face feels hot and tingly"

Find Similar Reports:

- "Facial flushing" (243 reports)
- "Face hot" (189 reports)
- "Burning sensation face" (97 reports)
- "Facial paraesthesia" (156 reports)

 **Total: 685 people with similar experiences**

Our Solution: Two-Part AI System

Pre-Processing: Building the Foundation

- Extract FDA adverse events from package inserts
- **Create mappings** for common symptoms using Claude AI
- **Build crosswalk** between patient language and medical terms
- **Validate** mappings with real VAERS reports

Real-Time Processing: Handle Anything New

- **MCP Claude agents** analyze new symptoms on the spot
- **No pre-mapping needed** - works with any input
- **Context-aware** - uses symptom text for better matching
- **Instant results** - no waiting for batch processing

How It Works

Pre-Processed Mappings

```
"Injection site vasculitis" → "cellulitis", "injection site reactions"  
"Body temperature increased" → "fever", "pyrexia"  
"Throat tightness" → "anaphylaxis", "swelling"
```

Real-Time Agent Analysis

```
New symptom: "My arm feels like it's on fire"  
↓  
Claude Agent analyzes in context  
↓  
Maps to: "injection site burning", "pain", "inflammation"
```

How You Use It - On Our Website

Option 1: Browse & Analyze Real Reports

View actual VAERS reports from the CDC/FDA database with AI analysis:

VAERS 2548069 | 77 years • female • SC

- **Vaccines:** VARZOS
- **Symptoms:** Injection site pain, Injection site erythema, Injection site nodule
- **Onset:** 4 days after vaccination

Click "View Details" to see:

- Which symptoms match FDA adverse events
- AI-powered symptom mapping
- Similar reports and patterns

Option 2: Check Any VAERS Report

Enter a VAERS ID

1. Input any VAERS ID (e.g., 2548069)
2. **System fetches** the official report
3. **AI analyzes** all symptoms
4. **Shows matches** to FDA adverse events

Example Output

VAERS Report 2548069:

- ✓ "Injection site pain" → Matches FDA: "injection site pain"
- ✓ "Injection site erythema" → Matches FDA: "injection site erythema"
- ✓ "Injection site nodule" → Matches FDA: "injection site nodule"

Option 3: Describe Your Own Symptoms

Natural Language Input

Type symptoms in your own words:

"I have a headache and my arm is really sore where I got the shot. Also feeling super tired."

System Response

Your symptoms analyzed:

- ✓ "headache" → Known FDA adverse event
- ✓ "arm is really sore" → Maps to "injection site pain"
- ✓ "super tired" → Maps to "fatigue"

Similar reports found: 2,847 people reported this combination

Real-Time Agent in Action

When You Enter Something New

Your input: "It feels like ants crawling under my skin"

Claude Agent Process:

1. No exact match in pre-processed mappings
2. Agent analyzes: sensation + location + description
3. Medical knowledge: "formication" / "paraesthesia"
4. Checks FDA terms: Maps to "tingling", "numbness"
5. Returns: "Unusual sensation, possibly nerve-related"

Impact: Finding Hidden Patterns

Case Study: Myocarditis

⚠️ Different ways patients reported heart inflammation:

- "Chest pain" (2,341 reports)
- "Heart inflammation" (892 reports)
- "Myocarditis" (423 reports)
- "Pericarditis" (198 reports)
- "Heart racing" (1,205 reports)

✅ **Total: 5,059 potential cardiac events**
(vs 423 if only counting "myocarditis")

Key Achievements

Data Quality

- **Standardized** naming across systems
- **Cleaned** data types (Y/N → true/false)
- **Validated** symptom mappings using real reports
- **Connected** patient language to medical terms

Hybrid AI Approach

- **Pre-processed mappings** for common symptoms
- **Real-time agents** for novel descriptions
- **Context-aware** analysis using full symptom text
- **No training required** - works out of the box

Featured on Our Website

Browse Real VAERS Reports

Explore actual reports with AI-powered analysis:

VAERS 2547741 | 58 years • male • CA

- **Vaccines:** COVID19
- **Symptoms:** Pain, Magnetic resonance imaging abnormal, Arthritis reactive... +3 more

VAERS 2547788 | 59 years • female • GA

- **Vaccines:** COVID19-2
- **Symptoms:** Influenza virus test negative, Malaise, Streptococcus test negative... +3 more

System Information

About VAERS

- **1990:** VAERS Established
- **CDC + FDA:** Co-Managed By
- **Public Access:** Open Reporting
- National early warning system

Our Innovation

- **Real-time Claude AI agents**
- **VAERS & FDA integration**
- **MCP Protocol**
- **Symptom mapping system**

Future Vision

Systematic Mapping Framework

- **Standardized evaluation criteria** for symptom similarity
- **Confidence scoring** for mapping quality
- **Hierarchical symptom taxonomies** (specific → general)
- **Cross-validation** against multiple medical ontologies

Evaluation & Quality Metrics

- **Inter-rater reliability** for mapping consistency
- **Sensitivity/specificity** testing for agent performance
- **Benchmark datasets** for systematic comparison
- **Automated quality assessment** of new mappings

Questions & Discussion

Thank you!

Try it yourself at: <https://vaers-analyzer.vercel.app/>