

COVID VAE Dashboard

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Trainers:

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Leveraging Data for Surveillance of Vaccine-Associated Adverse Events (VAE) Following COVID-19 Vaccinations in the United States

2021 Syndromic Surveillance Symposium Training

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Natasha Close, PhD (Washington State Department of Health)



Introduction

Kathleen Hartnett, PhD

Session Plan

1. Zachary Stein: Query development
2. Michael Sheppard: Interactive dashboard development
3. Abigail Gates: Surveillance strategy
4. Natasha Close: Washington State Department of Health perspective



Query Development

Zachary Stein, MPH

Query Breakdown

Discharge diagnosis
codes

Highly-relevant terms

(vaccine
reaction, vaccine side
effect)

OR

Time + Vaccine + Effect

Time + Vaccine
(regardless of
effect)

Vaccine + Effect

Chief Complaint Terms

(, (^vaccin^,or,^immuniz^,or,(^shot^,and,(^flu^,or,flu^,or,^influenza^,or,
^shingles^,or,^pne^,or,^pna^,or,^tetn^,or,^tetanu^,or,^tdap^,or,^booster^,or,^td^,or,
^hvp^,or,^mmr^,or,^covid^,or,^corona^,)),),and,(^reaction^,or,^allerg^,or,^adverse^
,or,^side effect^,or,^had^,or,^received^,or,^got^,or,^was
given^,or,^after^,or,^post^,or,^last time^,or,^recent^,or,^since getting^,or,^since
receiving^,or,^since yesterday^,),or,
^shot^,AND,(^Reaction^,or,^Allergic^,or,^Adverse^,)),andnot,(^no vaccine^,or,^no
immuniz^,or,^immunization not carried^,or,^[;/]Z28.21^,or,^[;/]Z2821^,or,^[;/
]P55.1^,or,^[;/]P551^,or,^dog^,or,^cat^,or,^wound^,or,^up to date^,or,^ABO
isoimmunization of newborn^,or,^well child^,or,^well visit^,or,^encounter for
immunization^,or,^loss of consciousness^,or,^aftercare^,or,^UTD^,or,^up to
date^,or,^bite^,or,^air vac^,or,^denies any previous adverse reaction^,or,^did not
receive^,or,^poison ivy^,or,^allergic rhinitis^,or,^voiced no complaints^,)

Vaccine-Associated Adverse Event Discharge Diagnosis Codes

Notes	ICD-10	ICD-9	SNOMED
Adverse effect of, poisoning by, and underdosing of vaccines (bacterial, viral, and other) and biological substances	T50.A, T50.B, T50.Z	978, 979, 964.6	420113004, 408672009, 293125008, 293120003, 293118001, 293109003, 293116002, 293117006, 219075006, 219084006, 219088009, 293104008
Anaphylactic reaction and other serum reaction due to vaccination.	T80.52, T80.62	999.42, 999.52	15920121000119103
Infection and other complications (not elsewhere classified), following immunization	T88.0, T88.1	999.0, 999.39	47988006, 31935007
Postvaccination fever	R50.83	780.63	123471000119103
Postimmunization acute encephalopathy, encephalitis, myelitis, and encephalomyelitis	G04.32, G04.02	323.5	

Entire VAE Query

(, (^vaccin^,or,^immuniz^,or,(^shot^,and,(^flu^,or,flu^,or,^influenza^,or,^shingles^,or,^pne^,or,^pna^,or,^tetn^,or,^tetanu^,or,^tdap^,or,^booster^,or,^td^,or,^hvp^,or,^mmr^,or,^covid^,or,^corona^,)),),and,(^reaction^,or,^allerg^,or,^adverse^,or,^side effect^,or,^had^,or,^received^,or,^got^,or,^was given^,or,^after^,or,^post^,or,^last time^,or,^recent^,or,^since getting^,or,^since receiving^,or,^since yesterday^),or,^shot^,AND,(^Reaction^,or,^Allergic^,or,^Adverse^,)),andnot,(^no vaccine^,or,^no immuniz^,or,^immunization not carried^,or,^[/]Z28.21^,or,^[/]Z2821^,or,^[/]P55.1^,or,^[/]P551^,or,^dog^,or,^cat^,or,^wound^,or,^up to date^,or,^ABO isoimmunization of newborn^,or,^well child^,or,^well visit^,or,^encounter for immunization^,or,^loss of consciousness^,or,^aftercare^,or,^UTD^,or,^up to date^,or,^bite^,or,^air vac^,or,^denies any previous adverse reaction^,or,^did not receive^,or,^poison ivy^,or,^allergic rhinitis^,or,^voiced no complaints^),or,^[/]T50[ABZ]^,or,^[/]T50.[ABZ]^,or,^[/]T80.52^,or,^[/]T8052^,or,^[/]T80.62^,or,^[/]T8062^,or,^[/]T88.[01]^,or,^[/]T88[01]^,or,^[/]R50.83^,or,^[/]R5083^,or,^[/]G04.32^,or,^[/]G0432^,or,^[/]G04.02^,or,^[/]G0402^,or,^[/]123471000119103[/]^,or,^[/]115920121000119100[/]^,or,^[/]219075006[/]^,or,^[/]219084006[/]^,or,^[/]293104008[/]^,or,^[/]293109003[/]^,or,^[/]293116002[/]^,or,^[/]293118001[/]^,or,^[/]293120003[/]^,or,^[/]293125008[/]^,or,^[/]31935007[/]^,or,^[/]408672009[/]^,or,^[/]47988006[/]^,or,^[/]219088009[/]^,or,^[/]293117006[/]^,or,^[/]420113004[/]^,or,^[/]97[89][/]^,or,^[/]97[89].[0-9][/]^,or,^[/]97[89][0-9][/]^,or,^[/]964.6[/]^,or,^[/]9646[/]^,or,^[/]999.0[/]^,or,^[/]9990[/]^,or,^[/]999.39[/]^,or,^[/]99939[/]^,or,^[/]999.[45]2[/]^,or,^[/]999[45]2[/]^,or,^[/]780.63[/]^,or,^[/]78063[/]^,or,^[/]323.5[/]^,or,^[/]323.5[12][/]^,or,^[/]3235[/]^,or,^[/]3235[12][/]^

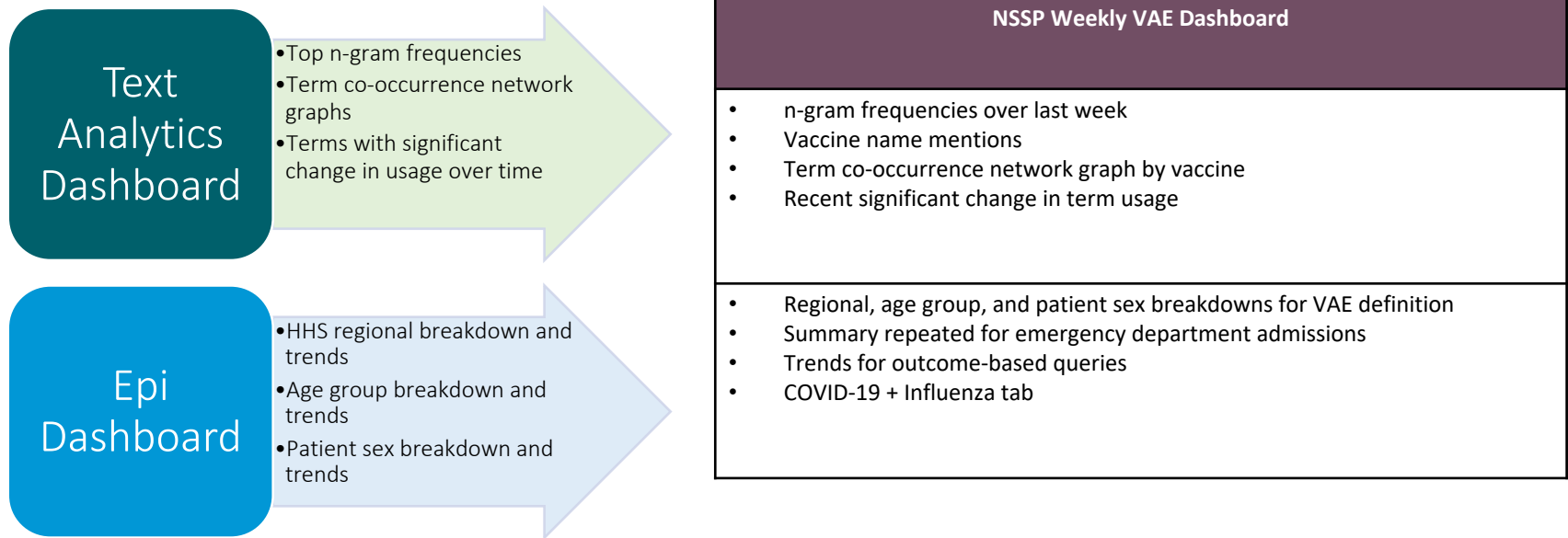
Thoughts and Complementary Queries

- This query was developed early, prior to the availability of COVID-19 vaccines
- Changes in query language can make this more specific to COVID-19 vaccines
 - ^Covid^,or,^Corona v^,or,^Coronav^,or,^moderna^,or,^Pfizer^,or,^Phizer^,or,^Johnson^,or,^Janssen^
 - ^;CDC Vaccine-Associated Adverse Events v1;^,andnot,^;CDC Coronavirus-DD v1;^
- Complementary queries play a large role as COVID-19 VAE symptoms are identified
- Vaccine status in the Chief Complaint will cause issues for these types of queries
 - Do we assume everything mentioned in the CC is relevant to the visit and categorize these as VAE?

Dashboard Development

Michael Sheppard, MS

Fusion of NSSP's Text Analytics and Epi Interactive Dashboard for VAE



Flexdashboard for R Markdown

R package to convert a standard R Markdown document into an interactive html dashboard: <https://rstudio.github.io/flexdashboard/articles/using.html>

- Standard R Markdown syntax integrated with level 2 markdown headers to define column or row layouts
- Allows for interactive reporting – plotly, leaflet, and other JavaScript-based visualizations
- Developer designs layout and determines user's experience/how they interact with the dashboard
- Ideal for interactive dashboards that do not need to be hosted on a server.
- Only requires R Markdown code to be knit on a routine basis (can be an automated job) and delivery to intended recipients as a simple html file.



Demonstration



Surveillance Strategy

Abigail Gates, MSPH

Monitoring for Trends

- Driven by VAE dashboard
 - Highlights routinely shared with partners
 - Respond to outcome-specific investigations
 - Thrombosis and thrombocytopenia
 - Stroke
 - Cerebral venous sinus thrombosis
 - Pulmonary embolism
 - Myocarditis
 - Pericarditis

National Syndromic Surveillance Program (NSSP) weekly emergency department visits for vaccine-associated adverse events, December 1, 2020 through October 19, 2021

Background Regional Breakdown Age Group Breakdown Patient Sex Breakdown n-gram Frequencies over Last Week Vaccine Name Mentions Recent Significant Change in Term Usage Emergency Department Admissions Outcome Based Queries COVID-19 + Influenza

Purpose

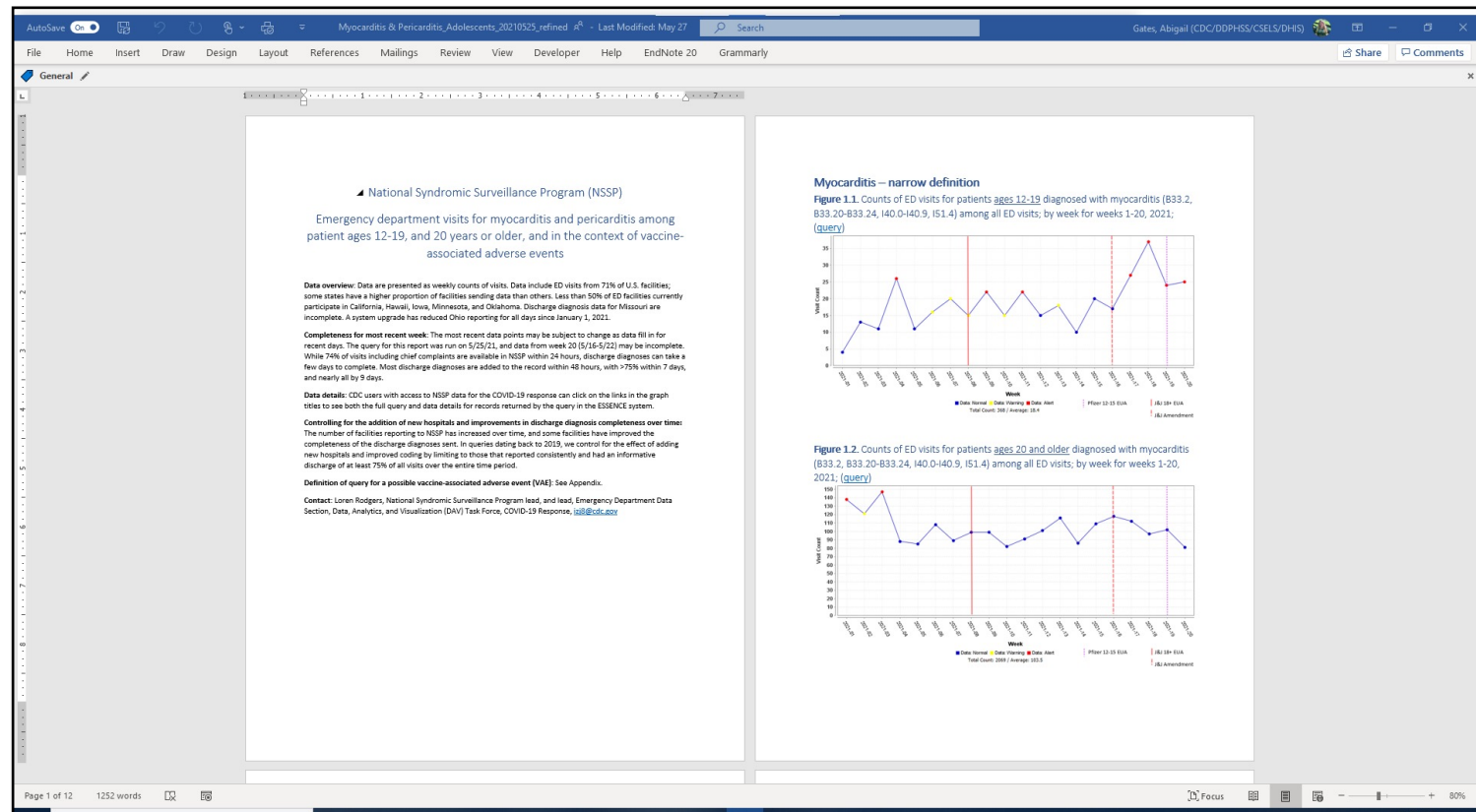
To monitor vaccine-associated adverse events (VAE) following vaccination in emergency departments (ED) using data from the National Syndromic Surveillance Program (NSSP). A combination of chief complaint terms and administrative diagnostic codes (ICD-10) capture any adverse event following COVID-19 vaccination. Note: **This definition negates for all discharge diagnosis codes that comprise the CDC Coronavirus-DD v1 definition.**

Data are stratified by HHS Region, NCHS Age Group and Patient Sex. These trends are based on ED visits between December 1, 2020 – October 19, 2021.

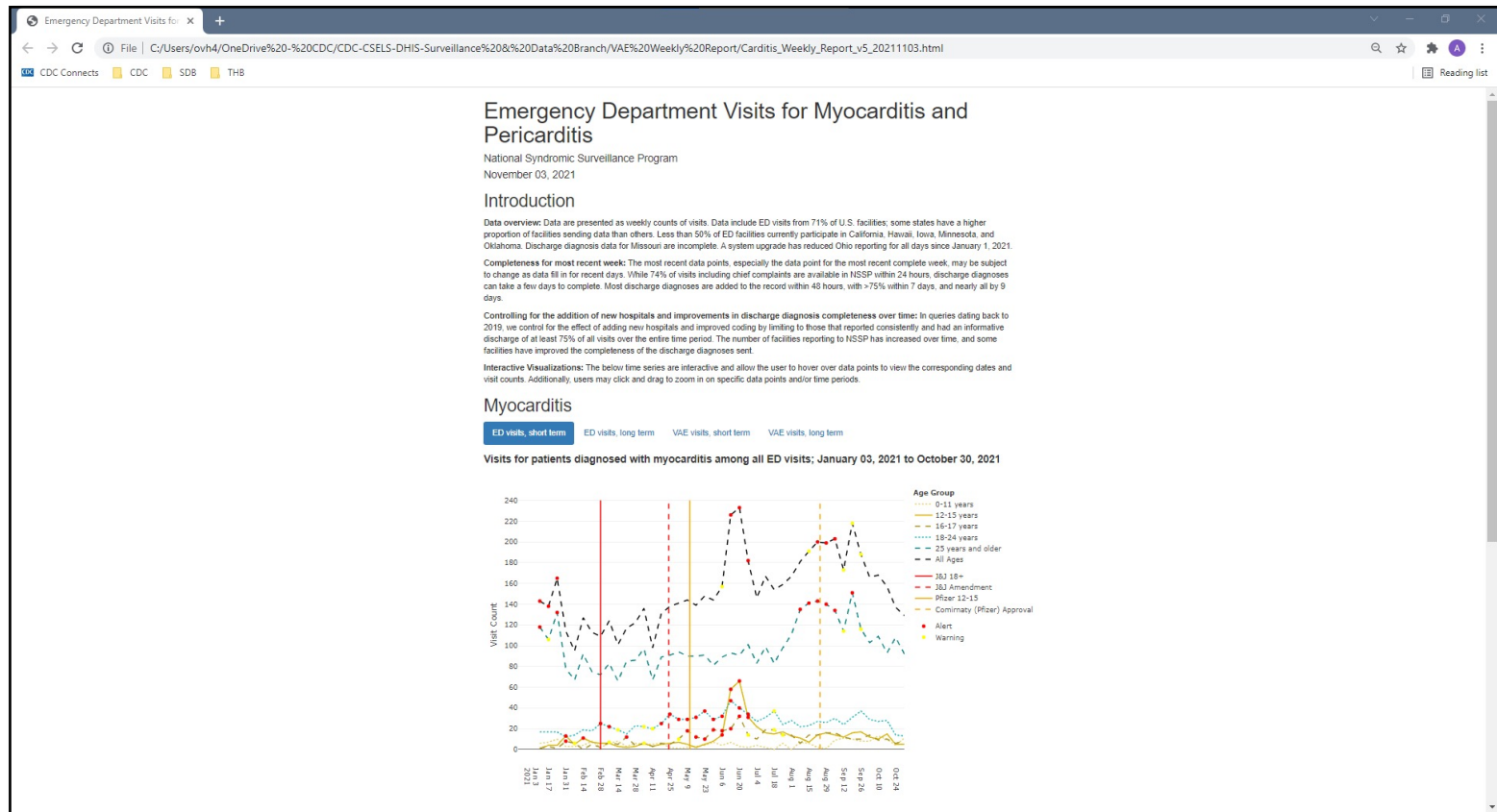
Anaphylaxis
Thrombosis and Thrombocytopenia
Stroke
Pulmonary Embolism
Carditis

a query designed to

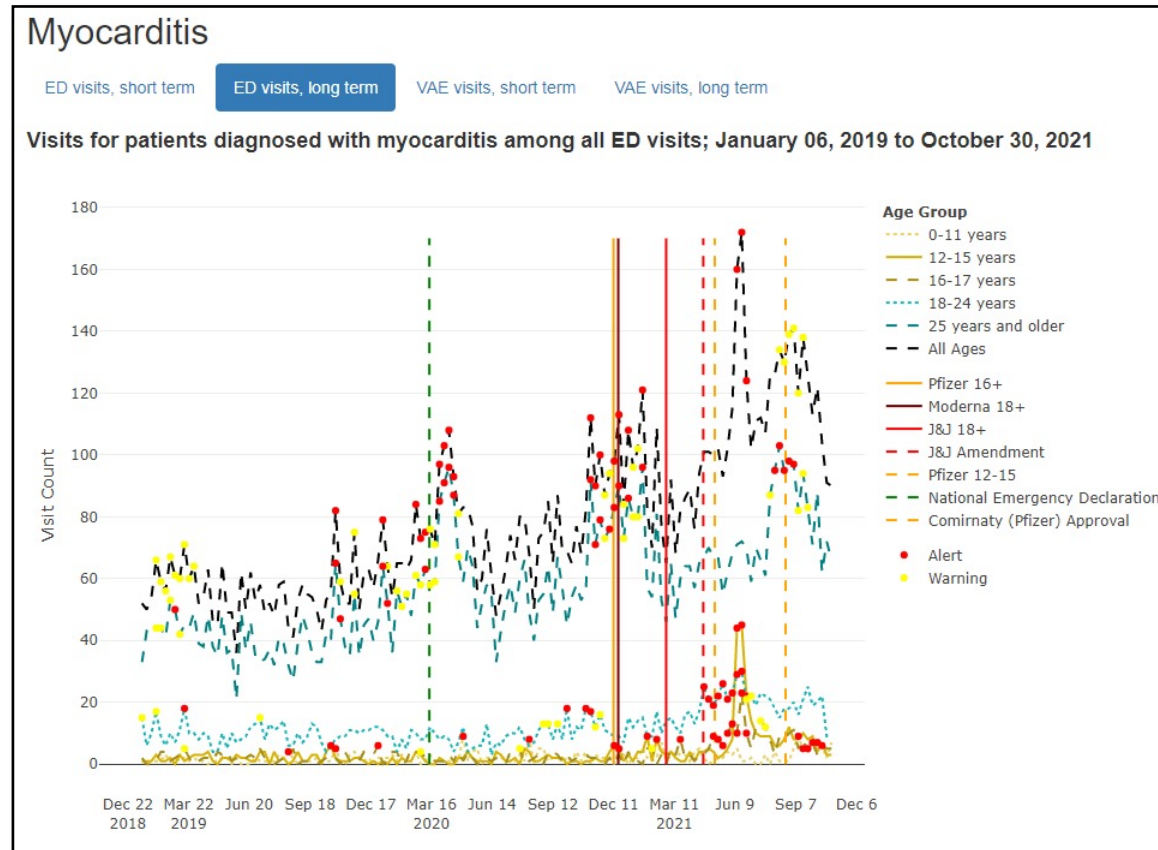
Myocarditis Analysis



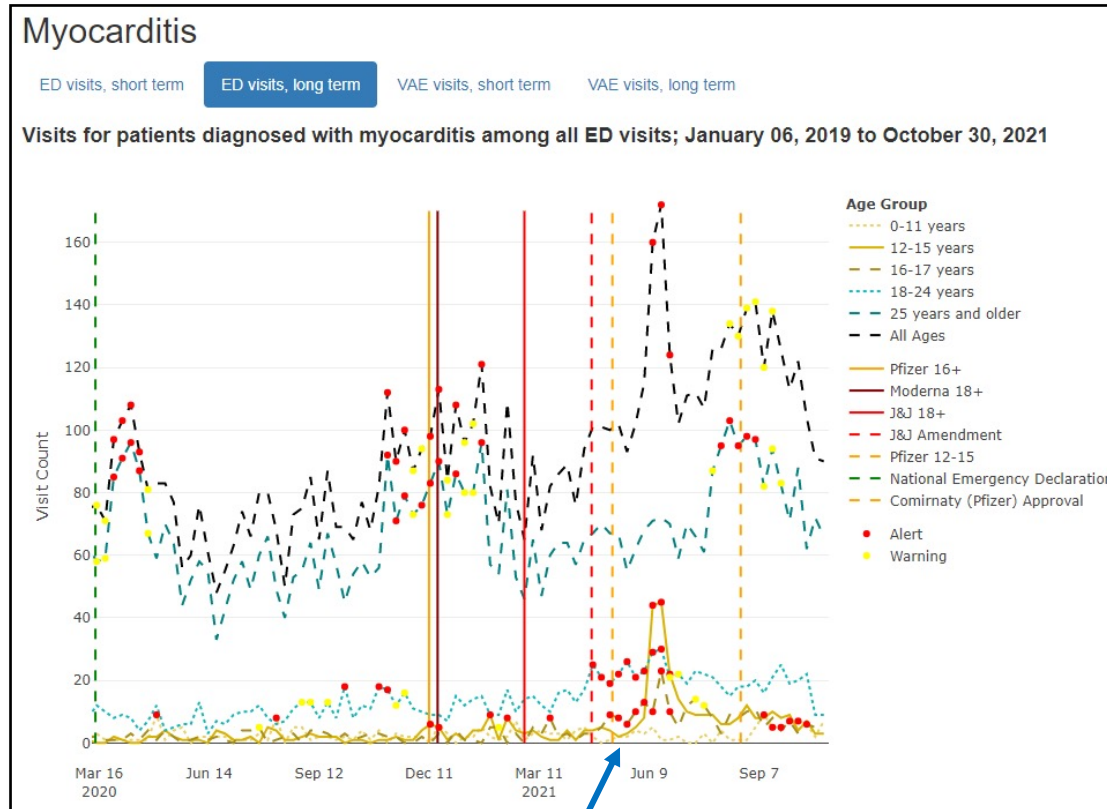
Myocarditis Analysis



Myocarditis Analysis: Emergency Department Visits

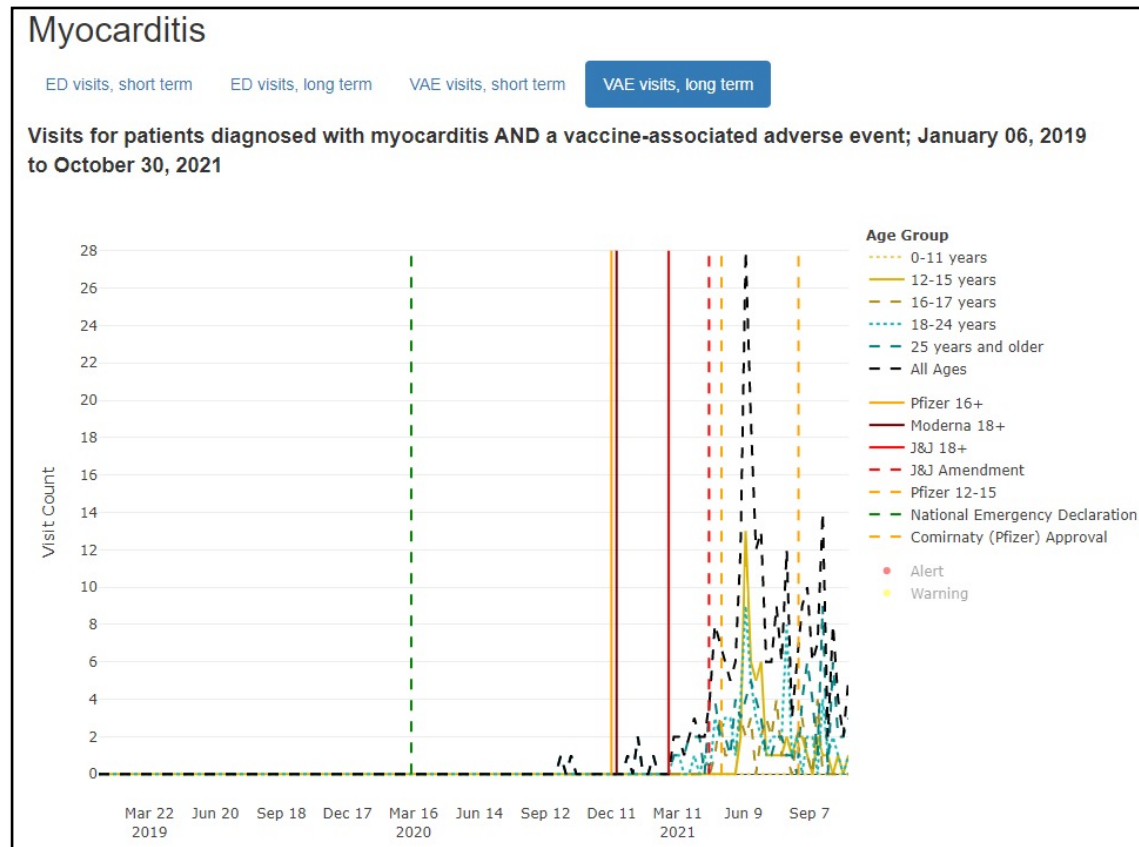


Myocarditis Analysis: Emergency Department Visits

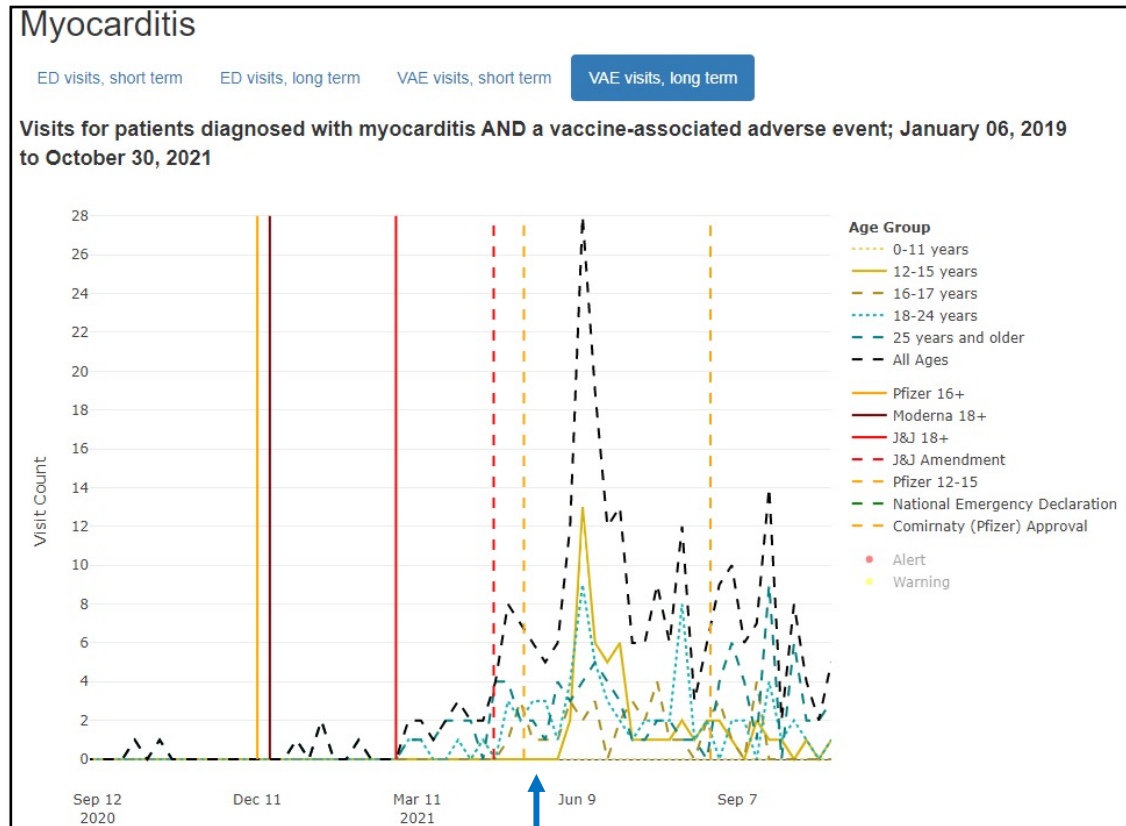


Timepoint of NSSP analysis following concerns of myocarditis occurring in adolescents after COVID-19 vaccination

Myocarditis Analysis: VAE visits



Myocarditis Analysis: VAE visits



Timepoint of NSSP analysis following concerns of myocarditis occurring in adolescents after COVID-19 vaccination

Lessons Learned and Other Investigations

- Media attention
 - Anaphylaxis
 - Pulmonary embolism
 - Abnormal vaginal bleeding
 - Syncope and anxiety
- Questions from jurisdictions
 - General VAE conditions
 - Lyme carditis
- Visits for children under age 12 prior to authorization for ages 5-11
- COVID-19 boosters
- Visits related to both COVID-19 and influenza vaccinations occurring together



State Perspective – Washington State Department of Health

Natasha Close, PhD

Many Roads to the Same Goal...

1. Trend monitoring
2. Active case finding
3. Observational studies



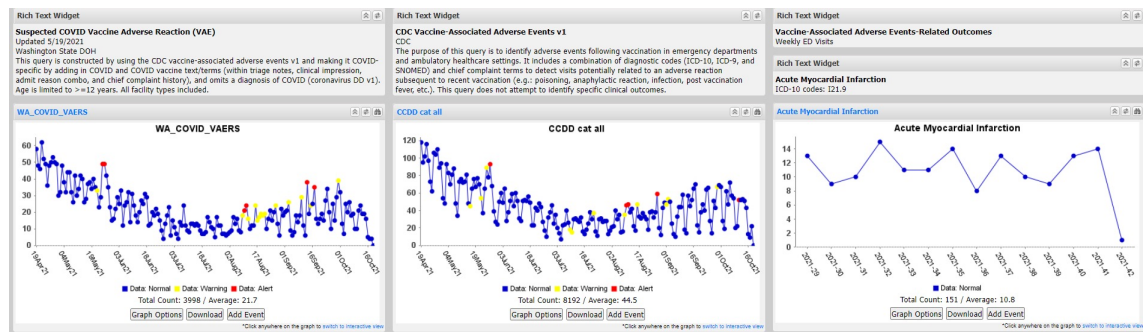
Trend Monitoring

Goals:

- Identify issues
- Assess baseline of outcomes of concern
- Assess likelihood and magnitude of VAE

Strategy: myESSENCE Dashboard, queries include:

- General VAE
- General COVID-related VAE
- Specific outcomes of interest (e.g., myocarditis, Guillain-Barré)
- “Standard” outcomes of interest (N=15)



Active Case Finding

■ Goals:

- Generate Vaccine Adverse Event Reporting System (VAERS) reports
- Identify patients for case investigation

■ Strategy:

- Generate identified linelists from syndromic for VAE encounters
 - Review clinical features for likelihood of VAE
 - Match to VAERS reports to identify those already reported
 - Match to Immunization Information System (IIS) to get vaccine history to further assess plausibility



Observational Studies

- Goal:
 - Assess association of vaccination to potential VAE
- Strategy:
 - Case-control study to assess myocarditis and pericarditis



Challenges

- Increasing comfort with syndromic surveillance data
- Time and resources to operationalize all the good ideas
- Technical struggles
- Determining the most fruitful approach(es)





For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

National Syndromic Surveillance Program

Community of Practice

Resources that Advance the Science and
Practice of Syndromic Surveillance

2021

Syndromic Surveillance Symposium

Week of November 15, 2021



KAHUINA
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