What Clinicians Need to Know about the Recent Updates to CDC’s Recommendations for COVID-19 Boosters

Clinician Outreach and Communication Activity (COCA) Call

Tuesday, October 26, 2021
Continuing Education

- Continuing education is not offered for this webinar.
To Ask a Question

- Using the Zoom Webinar System
  - Click on the “Q&A” button
  - Type your question in the “Q&A” box
  - Submit your question

- If you are a patient, please refer your question to your healthcare provider.

- If you are a member of the media, please direct your questions to CDC Media Relations at 404-639-3286 or email media@cdc.gov.
Today’s Presenters

- **Anne Hause, PhD**
  Vaccine Task Force
  COVID-19 Response
  Centers for Disease Control and Prevention

- **Kathleen Dooling, MD, MPH**
  Vaccine Task Force
  COVID-19 Response
  Centers for Disease Control and Prevention

- **Sujan Reddy, MD, MSc**
  Vaccine Task Force
  COVID-19 Response
  Centers for Disease Control and Prevention
Early Safety Monitoring for Additional COVID-19 Vaccine Doses: Reports to VAERS and v-safe

Clinician Outreach and Communication Activity (COCA) Call

October 26, 2021

Anne M. Hause, PhD MSPH
v-safe Team Co-Lead
COVID-19 Vaccine Task Force
CDC vaccine safety monitoring

• COVID-19 vaccines are being administered under the most intensive vaccine safety monitoring effort in U.S. history

• Strong, complementary systems are in place—both new and established

Full list of U.S. COVID-19 vaccine safety monitoring systems

CDC vaccine safety monitoring

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• Strong, complementary systems are in place—both new and established

Full list of U.S. COVID-19 vaccine safety monitoring systems

VAERS is **the nation’s early warning system** for vaccine safety

http://vaers.hhs.gov
VAERS accepts reports from everyone

Regardless of the plausibility of the vaccine causing the event or the clinical seriousness of the event

**Key strengths**
- Rapidly detects potential safety problems
- Can detect rare adverse events

**Key limitations**
- Passive surveillance system
- Inconsistent quality and completeness of information
- Reporting biases
- Generally, cannot determine cause and effect
Reports to VAERS following dose 3 mRNA or dose 2 Janssen COVID-19 vaccination, by age group and sex

<table>
<thead>
<tr>
<th>Age group, years</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12–17</td>
<td>34 (1)</td>
</tr>
<tr>
<td>18–49</td>
<td>1,225 (25)</td>
</tr>
<tr>
<td>50–64</td>
<td>1,304 (26)</td>
</tr>
<tr>
<td>≥65</td>
<td>2,427 (49)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,990</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sex</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>1,823 (37)</td>
</tr>
<tr>
<td>Female</td>
<td>3,153 (63)</td>
</tr>
<tr>
<td>Unknown</td>
<td>14 (&lt;1)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,990</strong></td>
</tr>
</tbody>
</table>

- Median age 64 years (interquartile range: 49-73)
- Majority (63%) among women

Includes data collected during August 12–October 10, 2021
Reports to VAERS following dose 3 mRNA or dose 2 Janssen COVID-19 vaccination, by race and ethnicity

- Most reports either
  - Unknown/not reported race or ethnicity (49%)
  - White, non-Hispanic race and ethnicity (41%)

<table>
<thead>
<tr>
<th>Race or ethnicity</th>
<th>mRNA, dose 3 (%)</th>
<th>Janssen, dose 2 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hispanic or Latino</td>
<td>207 (4)</td>
<td>4 (10)</td>
</tr>
<tr>
<td>Non-Hispanic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI/AN</td>
<td>21 (&lt;1)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Asian</td>
<td>101 (2)</td>
<td>1 (3)</td>
</tr>
<tr>
<td>Black or AA</td>
<td>115 (2)</td>
<td>4 (10)</td>
</tr>
<tr>
<td>NHPI</td>
<td>3 (&lt;1)</td>
<td>1 (3)</td>
</tr>
<tr>
<td>White</td>
<td>2,011 (41)</td>
<td>12 (31)</td>
</tr>
<tr>
<td>Multiracial</td>
<td>28 (1)</td>
<td>1 (3)</td>
</tr>
<tr>
<td>Other</td>
<td>24 (&lt;1)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Unknown/not reported</td>
<td>2,441(49)</td>
<td>16 (41)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,951</strong></td>
<td><strong>39</strong></td>
</tr>
</tbody>
</table>

Includes data collected during August 12–October 10, 2021 for persons aged 12 years and older. Hispanic also includes persons identified of Hispanic ethnicity of unknown race. Abbreviations: AI/AN = American Indian/Alaska Native; AA = African American; NHPI = Native Hawaiian or other Pacific Islander.
Reports to VAERS following dose 3 mRNA or dose 2 Janssen COVID-19 vaccination

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Non-serious reports</th>
<th>Serious reports*</th>
<th>Total reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pfizer-BioNTech</td>
<td>3,351 (95%)</td>
<td>160 (5%)</td>
<td>3,511</td>
</tr>
<tr>
<td>Moderna</td>
<td>1,325 (92%)</td>
<td>115 (8%)</td>
<td>1,440</td>
</tr>
<tr>
<td>Janssen</td>
<td>39 (100%)</td>
<td>0 (0%)</td>
<td>39</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,715 (94%)</strong></td>
<td><strong>275 (6%)</strong></td>
<td><strong>4,990</strong></td>
</tr>
</tbody>
</table>

- Regardless of manufacturer, ≥92% of reports non-serious

Includes data collected during August 12–October 10, 2021 for persons aged 12 years and older.
* Per federal law, includes reports of hospitalization, prolongation of existing hospitalization, life threatening condition, permanent disability, congenital deformity or birth defect, or death.
Most frequently reported adverse events to VAERS following dose 3 mRNA or dose 2 Janssen COVID-19 vaccination, by seriousness

Includes data collected during August 12–October 10, 2021 for persons aged 12 years and older. * Per federal law, includes reports of hospitalization, prolongation of existing hospitalization, life threatening condition, permanent disability, congenital deformity or birth defect, or death. ** Not mutually exclusive.

<table>
<thead>
<tr>
<th>Serious* (n = 275)</th>
<th>Non-serious (n= 4,715)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rank</strong></td>
<td><strong>Adverse event</strong></td>
</tr>
<tr>
<td>1</td>
<td>Extra dose administered</td>
</tr>
<tr>
<td>2</td>
<td>Fever</td>
</tr>
<tr>
<td>3</td>
<td>Shortness of breath</td>
</tr>
<tr>
<td>4</td>
<td>Blood test</td>
</tr>
<tr>
<td>5</td>
<td>Fatigue</td>
</tr>
</tbody>
</table>
Reports of death to VAERS following dose 3 mRNA or dose 2 Janssen COVID-19 vaccination

- Median age = 79 years (IQR: 69 – 88)
- Median time from third dose to death = 2 days (IQR: 0 – 9)

<table>
<thead>
<tr>
<th>Preliminary impression of cause of death*</th>
<th>mRNA, dose 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>No cause specified</td>
<td>8</td>
</tr>
<tr>
<td>Found dead</td>
<td>4</td>
</tr>
<tr>
<td>Respiratory and/or cardiac arrest</td>
<td>3</td>
</tr>
<tr>
<td>Stroke</td>
<td>3</td>
</tr>
<tr>
<td>COVID-19 disease</td>
<td>3</td>
</tr>
<tr>
<td>Pneumonia; sepsis</td>
<td>2</td>
</tr>
<tr>
<td>Pulmonary embolism</td>
<td>2</td>
</tr>
<tr>
<td>Miscellaneous other†</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

Includes data collected during August 12–October 10, 2021. Abbreviations: IQR = interquartile range. * Based upon physician review of initial report and available documentation, including death certificates. † Cardiomyopathy, congestive heart failure, acute leukemia, renal failure/end stage renal disease, general decompensation/end stage disease.
Reports to VAERS of co-administration of COVID-19 and other vaccines

- Most common vaccines co-administered with COVID-19 vaccines*
  - Vaccine not specified (n = 442)
  - Influenza (total = 204; inactivated = 127)
  - Zoster (n = 61)

- Most commonly reported adverse events
  - Typically “extra dose” or “expired product” administered
  - Systemic symptoms: reflect known adverse events (headache, fatigue, fever, etc.)
  - Unique to zoster: “herpes zoster”, “vaccination failure”

- Surveillance for adverse events is ongoing

Includes data collected during December 14, 2020–October 10, 2021.
* 605,095 reports were of COVID-19 vaccine with no other vaccine administered
Active safety monitoring for COVID-19 vaccines

**v-safe** is a CDC smart phone-based monitoring program for COVID-19 vaccine safety in the U.S.

- Uses text messaging and web surveys to check in with vaccine recipients after vaccination
- Can register at any time: after first, second, or third dose
- Solicits participants' reports on how they feel after COVID-19 vaccination
  - Local injection site reactions (i.e., pain, redness, swelling)
  - Systemic reactions (i.e., fatigue, headache, joint pain)
  - Health impacts (unable to perform normal daily activities, missed school or work, or received care)
Smartphone-based active safety monitoring

Key strengths

▪ Easy and quick
▪ Active outreach
▪ Longitudinal data

Key limitations

▪ Voluntary enrollment
▪ Requires smartphone
▪ Generally, cannot determine cause and effect
Demographic summary of 274,167 v-safe participants who reported an additional dose

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>% of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>61.8</td>
</tr>
<tr>
<td>Male</td>
<td>37.3</td>
</tr>
<tr>
<td>Unknown</td>
<td>0.9</td>
</tr>
<tr>
<td>Age group (years)</td>
<td></td>
</tr>
<tr>
<td>0-17</td>
<td>0.05</td>
</tr>
<tr>
<td>18-49</td>
<td>26.6</td>
</tr>
<tr>
<td>50-64</td>
<td>23.0</td>
</tr>
<tr>
<td>65-74</td>
<td>38.9</td>
</tr>
<tr>
<td>75-84</td>
<td>10.5</td>
</tr>
<tr>
<td>≥85</td>
<td>0.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>% of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity</td>
<td></td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>6.3</td>
</tr>
<tr>
<td>Not Hispanic/ Latino</td>
<td>90.1</td>
</tr>
<tr>
<td>Unknown</td>
<td>3.5</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>AI/AN</td>
<td>0.4</td>
</tr>
<tr>
<td>Asian</td>
<td>5.6</td>
</tr>
<tr>
<td>Black or AA</td>
<td>5.0</td>
</tr>
<tr>
<td>NHPI</td>
<td>0.3</td>
</tr>
<tr>
<td>White</td>
<td>83.7</td>
</tr>
<tr>
<td>Multiracial</td>
<td>1.4</td>
</tr>
<tr>
<td>Other</td>
<td>1.8</td>
</tr>
<tr>
<td>Unknown</td>
<td>1.9</td>
</tr>
</tbody>
</table>

Includes participants who completed at least one survey in the first week after additional dose, data collected during August 12–October 10, 2021
Abbreviations: AI/AN = American Indian/Alaska Native; NHPI = Native Hawaiian or other Pacific Islander; AA=African American.
Patterns of vaccination for 274,167 v-safe participants who reported an additional dose

<table>
<thead>
<tr>
<th>Additional dose</th>
<th>Primary series</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Moderna (%)</td>
</tr>
<tr>
<td>Moderna</td>
<td>13,719 (98.5)</td>
</tr>
<tr>
<td>Pfizer-BioNTech</td>
<td>207</td>
</tr>
<tr>
<td>Janssen</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>13,933</td>
</tr>
</tbody>
</table>

Includes participants who completed at least one survey in the first week after additional dose, data collected during August 12–October 10, 2021
* Includes persons who received Janssen as their primary series and one additional dose of vaccine from the listed manufacturers
Top 10 solicited reactions reported at least once 0-7 days after dose 3 of Moderna or Pfizer-BioNTech vaccine

Includes 273,046 participants who completed at least one survey in the first week after additional dose, data collected during August 12–October 10, 2021
Reactions and health impact events reported at least once in days 0-7 after Pfizer-BioNTech vaccination, by dose

Includes 188,514 participants who completed at least one survey in the first week after each dose, data collected during August 12–October 10, 2021

* Dose 2 compared to dose 3: statistically significant difference (p-value <0.05) using multivariable generalized estimating equations model that accounted for the correlation between registrants and adjusted for demographic variables.
Reactions and health impact events reported at least once in days 0-7 after Moderna vaccination, by dose

Includes 8,153 participants who completed at least one survey in the first week after each dose, data collected during August 12–October 10, 2021

* Dose 2 compared to dose 3: statistically significant difference (p-value <0.05) using multivariable generalized estimating equations model that accounted for the correlation between registrants and adjusted for demographic variables.
Summary of v-safe 65,247 v-safe participants who reported co-administration of COVID-19 and other vaccines

- Most (89.9%) participants were aged 18-74 years
- 89.8% of co-administration occurred with dose 3 COVID-19 vaccine
- Surveillance is ongoing

<table>
<thead>
<tr>
<th>Age group</th>
<th>% of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-17</td>
<td>1.4</td>
</tr>
<tr>
<td>18-49</td>
<td>31.8</td>
</tr>
<tr>
<td>50-64</td>
<td>23.9</td>
</tr>
<tr>
<td>65-74</td>
<td>34.2</td>
</tr>
<tr>
<td>75-84</td>
<td>8.0</td>
</tr>
<tr>
<td>≥85</td>
<td>0.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dose number</th>
<th>% of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.3</td>
</tr>
<tr>
<td>2</td>
<td>3.8</td>
</tr>
<tr>
<td>3</td>
<td>89.8</td>
</tr>
</tbody>
</table>

Includes 65,247 participants who completed at least one survey in the first week after each dose, data collected during June 19–October 10, 2021. Collection of co-administration data in v-safe began June 19, 2021.
Limitations of early safety monitoring for an additional COVID-19 vaccine dose

- v-safe population likely not representative of the vaccinated U.S. population
- Additional dose recipients likely included immunocompromised and non-immunocompromised persons
- Approximately half of mRNA third doses are among persons aged ≥65 years
- At this time, data are limited to:
  - Determine patterns of adverse events after dose 2 Janssen or an additional dose from a manufacturer different from the primary series
  - Identify rare adverse events
- Complete medical review of deaths following vaccination reported to VAERS is dependent on availability of medical records, death certificates, and autopsy reports, which may be delayed or not available
Summary

- No unexpected patterns of adverse events were identified
- ≥92% of VAERS reports following dose 3 of COVID-19 vaccination were non-serious
  - Vaccination errors and systemic symptoms were most commonly reported
- Over 270,000 v-safe registrants reported an additional dose
  - Most reported a primary mRNA vaccine series followed by dose 3 from the same manufacturer
  - For Pfizer-BioNTech, local and systemic reactions were reported less frequently following dose 3 than dose 2
  - For Moderna, local reactions were reported slightly more frequently and systemic reactions slightly less frequently following dose 3 than dose 2

Next steps

- VAERS and v-safe will continue to monitor safety of additional doses of COVID-19 vaccination
- The Vaccine Safety Datalink (VSD) will incorporate additional doses of COVID-19 vaccination into its ongoing safety monitoring
- The Clinical Immunization Safety Assessment (CISA) Project will continue to be available to consult on clinically complex adverse events following additional dose of COVID-19 vaccination
- CDC will update the Advisory Committee on Immunization Practices (ACIP) as additional data become available
What can you do for vaccine safety?

- Report adverse events following vaccination to VAERS even if you aren’t sure if the vaccination caused the adverse event
- Enroll yourself in v-safe
- Healthcare providers, encourage your patients to enroll in v-safe
- Parents and guardians, you can enroll your children in v-safe

Please get involved, your participation matters
Acknowledgements

- VAERS and v-safe teams
- James Baggs
- Paige Marquez
- John Su
- Tanya Myers
- David Shay
- Tom Shimabukuro
- Julianne Gee
Thank you!

For more information, contact CDC
1-800-CDC-INFO (232-4636)

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.
Evidence to Recommendation Framework:
Moderna & Janssen
COVID-19 Vaccine Booster Dose

Kathleen Dooling, MD, MPH
COCA Call, October 26, 2021
The following recipients of mRNA COVID-19 vaccine primary series **should receive** a single booster dose ≥6 months after completion of the primary series:
- ≥65 years
- ≥18 years and reside in long-term care settings
- 50-64 years with certain underlying medical conditions

The following recipients of mRNA COVID-19 vaccine primary series **may receive** a single booster dose ≥6 months after completion of the primary series based on their individual risks and benefits:
- 18-49 years with certain underlying medical conditions
- 18-64 years at increased risk for SARS-CoV-2 exposure and transmission because of occupational or institutional setting
#2) CDC recommends the following population receive a booster dose following Janssen COVID-19 primary vaccination

- People aged ≥18 years, ≥2 months after receipt of the initial Janssen dose

Any of the authorized COVID-19 vaccine boosters (Pfizer-BioNTech, Moderna, Janssen) can be used following any of the primary series vaccination

“Heterologous boosting”

a.k.a “Mix and Match”
Number of people fully vaccinated in the U.S. by COVID-19 vaccine series type

- **Pfizer-BioNTech 2-dose**: 104,672,981
- **Moderna 2-dose**: 69,603,147
- **J&J/Janssen single dose**: 15,096,805
- **Unknown 2-dose**: 114,860

Total number of people fully vaccinated: 189,487,793

Daily trends in number of COVID-19 cases in the United States

January 23, 2020 – October 17, 2021

44,857,861 total cases

Pfizer-BioNTech booster dose recommended

Daily trends in number of hospitalized COVID-19 cases in the United States

New Hospitalizations for COVID-19 with a 7-Day Moving Average, August 2020-October 2021

Age-adjusted weekly COVID-19-associated hospitalization rates among adults by week of admission and age group* — COVID-NET, January 24–August 28, 2021

18-49 years

50-64 years

≥65 years

14x higher

15x higher

9x higher

*Data are preliminary and case counts and rates for recent hospital admissions are subject to lag. As data are received each week, prior case counts and rates are updated accordingly.
†Cumulative rate ratio from January 24 – August 28, 2021.
COVID Data Tracker: https://covid.cdc.gov/covid-data-tracker/#covidnet-hospitalizations-vaccination
## Long COVID-19 and risk in vaccinated people

- Prevalence of post-COVID-19 conditions, among vaccinated and unvaccinated, reported from 5%–80%\(^1\)

- Prevalence of long COVID-19 among fully vaccinated persons who develop COVID-19 ranges from 5% (U.K. adults)\(^2\) to 19% (Israeli healthcare workers)\(^3\)

- Among COVID-19 cases in a U.K. study, odds of long COVID-19 were reduced by half among fully vaccinated compared to unvaccinated\(^2\)

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Magnitude of vaccine effectiveness (VE) against infection or hospitalization by Delta predominance and study, by risk group

### ≥ 65 years of age

- **COVID-NET (mRNA)**
- **NYS (all products)**
- **VISION (Moderna)**
- **NYS (all products)**
- **VISION (Pfizer)**
- **NHSN (mRNA)**

### Underlying medical conditions

- **VISION (Pfizer)**
- **IVY ≥1 underlying condition (all products)**

### Frontline workers

- **HEROES-RECOVER (mRNA)**

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Vaccine effectiveness (%)

Pre-Delta

Delta

NHSN: [https://www.cdc.gov/mmwr/volumes/70/wr/mm7034e3.htm](https://www.cdc.gov/mmwr/volumes/70/wr/mm7034e3.htm)

COVID-NET: CDC unpublished

IVY: CDC unpublished data

NYS: [https://www.cdc.gov/mmwr/volumes/70/wr/mm7034e1.htm](https://www.cdc.gov/mmwr/volumes/70/wr/mm7034e1.htm)


SUPERNOVA: [https://www.cdc.gov/mmwr/volumes/70/wr/mm7037e3.htm](https://www.cdc.gov/mmwr/volumes/70/wr/mm7037e3.htm)

HEROES-RECOVER: [https://www.cdc.gov/mmwr/volumes/70/wr/mm7037e4.htm](https://www.cdc.gov/mmwr/volumes/70/wr/mm7037e4.htm)

COVID-19 NET: CDC unpublished

VISION: [https://www.cdc.gov/mmwr/volumes/70/wr/mm7037e2.htm](https://www.cdc.gov/mmwr/volumes/70/wr/mm7037e2.htm)

NYS: [https://www.cdc.gov/mmwr/volumes/70/wr/mm7034e1.htm](https://www.cdc.gov/mmwr/volumes/70/wr/mm7034e1.htm)

HEROES-RECOVER: [https://www.cdc.gov/mmwr/volumes/70/wr/mm7034e4.htm](https://www.cdc.gov/mmwr/volumes/70/wr/mm7034e4.htm)

Underlying medical conditions

NHSN: [https://www.cdc.gov/mmwr/volumes/70/wr/mm7034e3.htm](https://www.cdc.gov/mmwr/volumes/70/wr/mm7034e3.htm)

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HEROES-RECOVER: [https://www.cdc.gov/mmwr/volumes/70/wr/mm7037e4.htm](https://www.cdc.gov/mmwr/volumes/70/wr/mm7037e4.htm)

COVID-19 NET: CDC unpublished

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NYS: [https://www.cdc.gov/mmwr/volumes/70/wr/mm7034e1.htm](https://www.cdc.gov/mmwr/volumes/70/wr/mm7034e1.htm)

HEROES-RECOVER: [https://www.cdc.gov/mmwr/volumes/70/wr/mm7034e4.htm](https://www.cdc.gov/mmwr/volumes/70/wr/mm7034e4.htm)

Underlying medical conditions

≥ 65 years of age

Frontline workers

Underlying medical conditions
Vaccine effectiveness against **infection** over time
Adults ≥18 years of age


Keehner J, Horton LE, Binkin NJ et al. Resurgence of SARS-CoV-2 Infection in a Highly Vaccinated Health System Workforce. NEJM, September 1, 2021. DOI: 10.1056/NEJMc2112981
Vaccine effectiveness against hospitalization by month
Adults ≥18 years of age

- Tenforde, et al.*
- Rosenberg, et al.
- Puranik, et al. (Pfizer)
- Puranik, et al. (Moderna)
- Bajema et al.

* February estimates from platform’s May 2021 MMWR


Vaccine effectiveness against **hospitalization** over time

Adults ≥16 years of age


Summary

- More than 189 million people in the U.S. are fully vaccinated (~57% total population)
- Hospitalization rates are ~9X-15X higher in unvaccinated as compared to vaccinated adults
- Moderna COVID-19 Vaccine (37% of fully vaccinated people)
  - Infection: Declines in VE against infection over time and during Delta period
  - Hospitalization: Minimal to no declines in VE against hospitalization in younger adults and mild declines observed in some for platforms among older adults
- Janssen COVID-19 Vaccine (8% of fully vaccinated people)
  - Lower VE compared to mRNA vaccines, but most study platforms show persistent VE over time against infection and hospitalization, even among older adults
Evidence to Recommendations Framework
Booster doses of COVID-19 vaccines

Benefits and Harms
Modern booster ≥6 months after primary series

Summary of GRADE

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Importance</th>
<th>Design (# of studies)</th>
<th>Findings</th>
<th>Evidence type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benefits (prevention of outcome)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptomatic laboratory-confirmed COVID-19</td>
<td>Critical</td>
<td>RCT (0) OBS (2)</td>
<td>Moderna COVID-19 booster dose (50 µg) induced immune response (GMR) noninferior to that following dose 2 of the 100 µg primary series</td>
<td>4</td>
</tr>
<tr>
<td>Hospitalization due to COVID-19</td>
<td>Critical</td>
<td>RCT (0) OBS (0)</td>
<td>No data available</td>
<td>ND</td>
</tr>
<tr>
<td>Death due to COVID-19</td>
<td>Important</td>
<td>RCT (0) OBS (0)</td>
<td>No data available</td>
<td>ND</td>
</tr>
<tr>
<td>Transmission of SARS-CoV-2 infection</td>
<td>Important</td>
<td>RCT (0) OBS (0)</td>
<td>No data available</td>
<td>ND</td>
</tr>
<tr>
<td><strong>Harms</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serious adverse events</td>
<td>Critical</td>
<td>RCT (0) OBS (2)</td>
<td>No SAEs were attributed to Moderna COVID-19 booster dose (50 µg) during follow-up. No imbalance between booster and comparison group</td>
<td>4</td>
</tr>
<tr>
<td>Reactogenicity</td>
<td>Important</td>
<td>RCT (0) OBS (2)</td>
<td>Grade ≥3 reactogenicity occurred in 10.8% of Moderna COVID-19 booster dose (50 µg) recipients vs 19.7% primary series (100µg)</td>
<td>4</td>
</tr>
</tbody>
</table>

Evidence type: 1=high; 2=moderate; 3=low; 4=very low; ND= no data
# Janssen booster ≥2 months after primary dose

## Summary of GRADE

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Importance</th>
<th>Design (# of studies)</th>
<th>Findings</th>
<th>Evidence type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benefits (prevention of outcome)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Symptomatic laboratory-confirmed COVID-19</td>
<td>Critical</td>
<td>RCT (0) OBS (2)</td>
<td>Janssen COVID-19 booster dose is more effective at preventing symptomatic laboratory-confirmed COVID-19 than the primary dose</td>
<td>4</td>
</tr>
<tr>
<td>Hospitalization due to COVID-19</td>
<td>Critical</td>
<td>RCT (0) OBS (2)</td>
<td>Janssen COVID-19 booster dose may be more effective at preventing hospitalization due to COVID-19 (severe COVID-19) than the primary dose</td>
<td>4</td>
</tr>
<tr>
<td>Death due to COVID-19</td>
<td>Important</td>
<td>RCT (0) OBS (2)</td>
<td>Janssen COVID-19 booster dose may be more effective at preventing death due to COVID-19 than the primary dose</td>
<td>4</td>
</tr>
<tr>
<td>Transmission of SARS-CoV-2 infection</td>
<td>Important</td>
<td>RCT (0) OBS (0)</td>
<td>No data available</td>
<td>ND</td>
</tr>
<tr>
<td><strong>Harms</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serious adverse events</td>
<td>Critical</td>
<td>RCT (1) OBS (0)</td>
<td>3 SAEs were attributed to Janssen COVID-19 booster dose (facial paresis, pulmonary embolism, and cerebrovascular accident). SAE were balanced between booster and placebo arms</td>
<td>4</td>
</tr>
<tr>
<td>Reactogenicity</td>
<td>Important</td>
<td>RCT (1) OBS (0)</td>
<td>Grade ≥3 systemic adverse events occurred in 2.1% of Janssen COVID-19 booster dose recipients- similar or less than after the primary dose</td>
<td>4</td>
</tr>
</tbody>
</table>

Evidence type: 1=high; 2=moderate; 3=low; 4=very low; ND=no data
Myocarditis/pericarditis following Moderna
- Highest reporting rate in 18-24yo males (0-7 days post dose 2)= 39 cases/1M doses administered\(^2\)

Thrombosis with thrombocytopenia syndrome (TTS) following Janssen
- Highest reporting rate in 30-39 year old females (0-21 days post dose)= 10 cases/1M doses administered\(^2\)

Guillain Barré syndrome (GBS) following Janssen
- Highest reporting rate in 50-64 year old males (1-42d post dose)= 16 cases/1M doses administered\(^3\)
Heterologous Boosting (Mix and Match)

- Use of Moderna, Janssen, and Pfizer-BioNTech COVID-19 vaccines as boosters led to strong serologic responses in groups primed by all three vaccines.
- For a given primary COVID-19 vaccine, heterologous boosts elicited similar or higher serologic responses as compared to their respective homologous booster responses.
- mRNA vaccines resulted in higher antibody titers in the first 28 days after the boost.
- The study arms were small (n=49-53), but no safety concerns were identified.

https://www.medrxiv.org/content/10.1101/2021.10.10.21264827v1.full.pdf
Evidence to Recommendations Framework
Booster doses of COVID-19 vaccines

Feasibility and Implementation
Cumulative Number of COVID-19 Vaccine Booster/Additional Doses

Total booster/additional doses administered: 10.9M

Potential underreporting due to reporting lag

Booster dose recommendation

- All adults, 18+
- 65+ years
- 50-64 years
- 18-49 years

Completed primary vaccination regime, by week

![Graph showing completed primary vaccination regime by week. Data as of September 9, 2021.](image-url)
Completed primary vaccination regime, by week

Completed primary series **6 months prior**

CDC Immunization Data Lake. Data as of September 9, 2021
### Number of U.S. persons potentially eligible (in millions) for a booster dose on October 22, 2021

<table>
<thead>
<tr>
<th>Age group</th>
<th>Pfizer-BioNTech ≥6m</th>
<th>Moderna ≥6m</th>
<th>Janssen ≥2m</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-29 years old</td>
<td>4.7</td>
<td>3.0</td>
<td>2.4</td>
<td>10.1</td>
</tr>
<tr>
<td>30-49 years old</td>
<td>11.9</td>
<td>8.3</td>
<td>4.5</td>
<td>24.7</td>
</tr>
<tr>
<td>50-64 years old</td>
<td>13.2</td>
<td>10.1</td>
<td>4.0</td>
<td>27.3</td>
</tr>
<tr>
<td>65+ years old</td>
<td>17.3</td>
<td>17.7</td>
<td>1.9</td>
<td>36.9</td>
</tr>
<tr>
<td>Total</td>
<td>47.1</td>
<td>39.1</td>
<td>12.9</td>
<td>99.1</td>
</tr>
</tbody>
</table>

Data as of September 9, 2021.
Summary
Work Group interpretation

- **Top priority** should be continued vaccination of unvaccinated individuals

- Goals of booster program:
  - Prevention of **severe disease**, including hospitalization and death
  - Other considerations are important, such as maintaining workforce and healthcare capacity, prevention of transmission, individual benefit/risk balance

- Balance of benefits and risks varies by age
  - Adults ≥65 years have the clearest benefit>risk
  - Moderna: Benefits are incrementally smaller with decreasing age, given high effectiveness maintained from primary series. Myocarditis risk higher in young adults.
  - Janssen: Benefits may be smaller across age groups compared with mRNA vaccines. TTS risk higher in young females.
Work Group interpretation

- For people who received Moderna COVID-19 vaccine as a primary series, the Work Group supports using a single booster dose ≥ 6 months following the primary series in certain populations (consistent with CDC recommended populations for Pfizer-BioNTech COVID-19 booster).

- For people who received Janssen COVID-19 vaccine as primary vaccination, the Work Group supports using a single booster ≥ 2 months following the initial dose in all people aged ≥ 18 years and older.

- A single dose of Janssen COVID-19 vaccine results in lower VE and antibody levels compared to mRNA vaccine primary series- data demonstrate that a single dose of Janssen or mRNA COVID-19 vaccines boost immune response in these individuals.
Acknowledgments

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- Stephen Hadler

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- Heather Scobie
- Ian Plumb
- Amy Blain
- Neela Goswami
- Mary Chamberland
- CDC/University of Iowa
- VTF ACIP WG Team
- ACIP COVID-19 Vaccines Work Group
- Vaccine Task Force
- Epi Task Force
- Respiratory Viruses Branch
Clinical Considerations for COVID-19 Vaccine Booster Doses

Sujan Reddy, MD, MSc

October 26, 2021
Key clinical considerations regarding booster doses

- Indication for and timing of booster dose depends on which primary series was administered
- Booster product can be the same as or different than the primary series product
  - Any FDA-approved or authorized COVID-19 vaccine can be used for booster dose, regardless of vaccine received for primary series
- Moderna booster dose is half (50 µg in 0.25ml) of the primary series dose (100 µg in 0.5ml)
- Special considerations for moderately and severely immunocompromised people

COVID-19 vaccine booster dose in persons who completed an mRNA primary series

Persons who should receive a COVID-19 booster dose

- Aged ≥65 years
- Aged ≥18 years and reside in long-term care settings
- Aged 50-64 years with certain underlying medical conditions

Persons who may receive a COVID-19 booster dose, based on individual benefits and risks

- Aged 18-49 years with certain underlying medical conditions*
- Aged 18-64 years at increased risk for SARS-CoV-2 exposure and transmission because of occupational or institutional setting

- Booster dose administered at least 6 months after completion of mRNA primary series
- Any FDA-approved or authorized COVID-19 vaccine (Pfizer-BioNTech, Moderna, or Janssen) can be used for booster dose, regardless of vaccine received for primary series

* Includes pregnant people
Individual risk-benefit assessment for people who “may receive” mRNA booster dose

- Individual risk factors for SARS-CoV-2 infection
  - Risk of exposure (occupational and institutional settings)
  - Risk for infection (time since completion of primary series)
- Potential impact of SARS-CoV-2 infection
  - Risk for severe infection (underlying conditions)
  - Risk associated with a person’s circumstances (living with/caring for at-risk individuals or consequences of inability to meet obligations due to infection)
- Potential benefits of booster
  - Reduced risk of infection, including severe infection
- Potential risks of booster
  - Common risks of transient local and systemic symptoms
  - Rare risks of serious adverse events
COVID-19 vaccine booster dose in persons who received a dose of Janssen vaccine

- Persons aged ≥18 years who received primary vaccination with Janssen COVID-19 vaccine should receive a single COVID-19 vaccine booster dose at least 2 months later.

- Any FDA-approved or authorized COVID-19 vaccine (Pfizer-BioNTech, Moderna, or Janssen) can be used as the booster dose, at an interval of at least 2 months since the primary Janssen vaccine dose.
## FDA-authorized or approved COVID-19 vaccines for primary or booster vaccination

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Primary series/dose</th>
<th>Booster dose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dose (volume)</td>
<td>No. doses (interval)</td>
</tr>
<tr>
<td>Pfizer-BioNTech</td>
<td>30 µg (0.3 ml)</td>
<td>2 (21 days)</td>
</tr>
<tr>
<td>Moderna</td>
<td>100 µg (0.5 ml)</td>
<td>2 (28 days)</td>
</tr>
<tr>
<td>Janssen</td>
<td>$5 \times 10^{10}$ VP (0.5 ml)</td>
<td>1 (N/A)</td>
</tr>
</tbody>
</table>

- Any of the COVID-19 vaccines (Pfizer-BioNTech, Moderna, Janssen) can be used for booster vaccination, regardless of the vaccine product used for primary vaccination
  - When a heterologous (mix-and-match) booster dose is administered, the booster dose eligibility criteria and interval for receiving a booster dose are those of the vaccine used for primary vaccination
Heterologous (mix-and-match) booster dose

- Heterologous dosing may be considered for the **booster dose** only
  - Primary series doses and additional dose should utilize the same vaccine product with limited exceptions
    - Additional dose only indicated for moderately to severely immunocompromised people who received 2 doses of mRNA vaccine
- Interval from the primary series should follow the interval recommended by the primary series
  - People who received a single dose Janssen primary series can receive a mRNA COVID-19 booster dose at least 2 months after completing primary series
- Individual risk-benefit assessment may inform which booster product to use
  - Availability of booster product
  - Risk profile of vaccine boosters, including rare events
Potential risks of COVID-19 vaccine booster doses, based on rare events observed after primary vaccination

- **Janssen:**
  - Thrombosis with thrombocytopenia syndrome (TTS): highest risk in women aged 18-49 years
  - Guillain-Barré Syndrome (GBS): highest risk in men aged 50-64 years

- **mRNA:**
  - Myocarditis and pericarditis: highest risk in males aged 12-30 years
Moderately and severely immunocompromised people
Definitions

- **Additional dose:** a subsequent vaccine dose to people who likely did not mount a protective immune response after primary vaccination in order to optimize vaccine-induced protection

- **Booster dose:** a subsequent dose of vaccine administered when the initial sufficient immune response to a primary vaccine series is likely to have waned over time

Additional dose of mRNA COVID-19 vaccine in immunocompromised persons

- Moderately-to-severely immunocompromised persons aged ≥12 years (Pfizer-BioNTech) or ≥18 years (Moderna) who completed an mRNA COVID-19 vaccine primary series **should** receive an additional mRNA vaccine dose at least 28 days after their second dose.

- Recommendation does not apply to immunocompromised recipients of Janssen COVID-19 vaccine; these persons should follow the booster dose recommendations.
Moderately and severely immunocompromised people

- Active treatment for solid tumor and hematologic malignancies
- Receipt of solid-organ transplant and taking immunosuppressive therapy
- Receipt of CAR-T-cell or hematopoietic stem cell transplant (within 2 years of transplantation or taking immunosuppression therapy)
- Moderate or severe primary immunodeficiency (e.g., DiGeorge, Wiskott-Aldrich syndromes)
- Advanced or untreated HIV infection
- Active treatment with high-dose corticosteroids (i.e., ≥20mg prednisone or equivalent per day), alkylating agents, antimetabolites, transplant-related immunosuppressive drugs, cancer chemotherapeutic agents classified as severely immunosuppressive, TNF blockers, and other biologic agents that are immunosuppressive or immunomodulatory

ACIP General Best Practice Guidelines for Immunization; CDC Yellow Book; 2013 IDSA Clinical Practice Guideline for Vaccination of the Immunocompromised Host
Recommendation for moderately and severely immunocompromised people

- If received mRNA primary series
  - Administer mRNA additional dose ≥28 days after second dose
    - If received Moderna primary, Moderna additional dose is 100 µg (0.5ml)
  - Administer any COVID-19 vaccine booster dose ≥6 months after the additional dose (after third mRNA vaccine dose)
    - If Moderna booster dose is used, dose is 50µg (0.25ml)
    - Pfizer-BioNTech dose is the same for primary series, additional and booster dose

- If received Janssen primary dose
  - Administer any COVID-19 vaccine booster dose ≥2 months after the initial Janssen dose
    - If Moderna booster dose is used, dose is 50µg (0.25ml)
Additional considerations
Definition of ‘fully vaccinated’

- People who have completed a primary vaccine series (i.e., 2-dose mRNA vaccine series or a single dose of the Janssen vaccine) are considered fully vaccinated ≥2 weeks after completion of the primary series.

- Receipt of an additional or booster dose is not required to be considered fully vaccinated.

- People who have received a booster dose should continue to follow guidance for fully vaccinated persons to minimize spread of SARS-CoV-2.

Coadministration with other vaccines

- COVID-19 vaccines (Pfizer-BioNTech, Moderna, or Janssen) may be given with other vaccines, without regard to timing.

- This includes simultaneous administration of COVID-19 vaccines and other vaccines on the same day.

- If multiple vaccines are administered at a single visit, administer each injection in a different injection site.

https://www.cdc.gov/vaccines/covid-19/clinical-considerations/covid-19-vaccines-us.html#Coadministration
Additional updates to clinical considerations of COVID-19 vaccines

- Recipients of hematopoietic cell transplant or CAR-T-cell therapy should be revaccinated with a primary vaccine series at least 3 months after transplant or therapy.

- Further considerations for risks and benefits of vaccination in people with history of multisystem inflammatory syndrome in children/adolescents (MIS-C) or adults (MIS-A).

- Updated recommendations for administration errors and deviations.
Updates to additional clinical resources

Interim Clinical Considerations for Use of COVID-19 Vaccines Currently Approved or Authorized in the United States

Summary of recent changes (last updated September 27, 2021):

- New section on Considerations for use of a Pfizer-BioNTech COVID-19 vaccine booster dose after completion of a Pfizer-BioNTech primary vaccine series.

Key points:

- COVID-19 vaccination is recommended for everyone aged 12 years and older in the United States for the prevention of severe disease, 2019 (COVID-19).
- COVID-19 vaccines are currently authorized or approved for use in preventing severe illness, hospitalization, and death.
- Available evidence suggests vaccines offer protection against known variants, including the Delta variant (B.1.617.2), particularly against hospitalization and death. The Delta variant, currently the predominant SARS-CoV-2 variant in the United States, is associated with increased transmissibility.
- Efforts to maximize the proportion of people in the United States who are fully vaccinated against COVID-19 remain critical to ending the COVID-19 pandemic.
- ACP has recommended that all eligible patients receive COVID-19 Vaccination for use in persons aged 16-17 years.
- ACP has revised interim immunization recommendations. See Advisory Committee on Immunization Practices (ACIP) for the latest.
- Pfizer-BioNTech COVID-19 vaccine in persons aged 12-15 years
- Moderna COVID-19 vaccine in persons aged 12-15 years
- Janssen COVID-19 vaccine in persons aged 18-25 years

Updates will be posted at: [https://www.cdc.gov/vaccines/covid-19/info-by-product/index.html](https://www.cdc.gov/vaccines/covid-19/info-by-product/index.html)
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.
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- Using the Zoom Webinar System
  - Click on the “Q&A” button
  - Type your question in the “Q&A” box
  - Submit your question

- If you are a patient, please refer your question to your healthcare provider.

- If you are a member of the media, please direct your questions to CDC Media Relations at 404-639-3286 or email media@cdc.gov.
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- **When:** A few hours after the live call ends
- **What:** Video recording
- **Where:** On the COCA Call webpage [https://emergency.cdc.gov/coca/calls/2021/callinfo_102621.asp](https://emergency.cdc.gov/coca/calls/2021/callinfo_102621.asp)
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