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State-Specific Prevalence and Characteristics of Frequent Mental Distress and History of Depression Diagnosis Among Adults with Arthritis — United States, 2017

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An estimated 54.4 million (22.7%) U.S. adults have provider-diagnosed arthritis (arthritis), a number that is projected to rise to 78.4 million by 2040 (*1*,*2*). Chronic pain conditions like arthritis are associated with poorer mental health (*3*), especially anxiety and depression, which can impede self-care and self-management behaviors (*1*). Although the national prevalence of mental health conditions among adults with arthritis has been reported (*3*,*4*), little is known about state-specific prevalences, particularly of frequent mental distress, a useful public health measure that reflects perceived mental health status. An estimated 11.3% and 19% of U.S. adults overall have frequent mental distress and a history of depression, respectively (*5*). This analysis used 2017 Behavioral Risk Factor Surveillance System (BRFSS) data to estimate state-specific prevalence of frequent mental distress and history of depression among adults with arthritis. The median state age-adjusted prevalences of frequent mental distress and history of depression among adults with arthritis in the 50 states and the District of Columbia (DC) were 16.8% (range = 12.9% [Hawaii] to 22.4% [Kentucky]) and 32.1% (range = 17.7% [Hawaii] to 36.6% [Oklahoma]), respectively. Health care providers have an opportunity to improve the quality of life of arthritis patients by screening for mental health problems, encouraging physical activity, and making referrals to evidence-based programs such as physical activity programs,* self-management education programs† (e.g., Chronic Disease Self-Management Program), psychotherapy,§ and cognitive behavioral therapy, that can help improve management of arthritis and mental health outcomes.

BRFSS¶ is a landline and cellular telephone survey conducted annually in all 50 states, DC, and U.S. territories that collects information on health-related behavioral risk factors, health care access, and chronic conditions among noninstitutionalized U.S. adults aged ≥18 years. The median survey response rate for all states and DC in 2017 was 45.8% and ranged from 30.6% (Illinois) to 64.1% (Wyoming).** For this analysis, 2017 BRFSS data were restricted to those for 147,288 adults with arthritis, defined as a "yes" response to the question "Have you ever been told by a doctor or other health care

* https://www.cdc.gov/arthritis/interventions/physical-activity.html.
† https://www.cdc.gov/arthritis/interventions/self_manage.htm.
§ https://www.nami.org/Learn-More/Treatment/Psychotherapy.
¶ https://www.cdc.gov/brfss/index.html.
** https://www.cdc.gov/brfss/annual_data/2017/pdf/2017-sdqr-508.pdf.

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professional that you have arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?" Frequent mental distress, a commonly used indicator of mental health, was defined as a response of ≥14 days to the question "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" The rationale for selecting the 14-day minimum period was based on evidence showing that clinicians and clinical researchers use a similar period as a marker for clinical depression and anxiety disorders, and a longer duration of reported symptoms is associated with a higher level of activity limitation.[††] History of depression was defined as an affirmative response to the question "Have you ever been told you have a depressive disorder (including depression, major depression, dysthymia, or minor depression)?"

For adults with arthritis, the unadjusted, age-specific, and age-adjusted prevalences of frequent mental distress and history of depression were estimated overall, by state, and by sociodemographic characteristics. Estimates were age-adjusted using logistic regression modeling to produce predicted marginal probabilities. Differences in mental health outcomes across subgroups among adults with arthritis were tested using chi-squared tests; all differences reported were significant at $\alpha<0.05$. All analyses were conducted using SAS software (version 9.4; SAS Institute) and SAS-callable SUDAAN (version 11.0.1; Research Triangle Institute) to account for the complex survey sampling design.

Overall, the nationwide unadjusted prevalence estimates of frequent mental distress and history of depression among adults with arthritis were 19.0% (95% confidence interval [CI] = 18.6–19.5) and 32.1% (95% CI = 31.5–32.6), respectively. Among adults with arthritis, the age-adjusted prevalence of frequent mental distress was significantly higher among women than among men (19.9% versus 14.6%) and persons who were lesbian/gay/bisexual compared with those who were heterosexual (28.0% versus 16.8%); it also varied by education level (Table 1). The age-adjusted prevalence of a history of depression was significantly higher among women (36.3%) than among men (24.0%), differed by race/ethnicity and education level, and was higher among lesbian/gay/bisexual adults (46.7%) than among heterosexual adults (30.5%).

Age-adjusted prevalence of both mental health measures among adults with arthritis varied widely by state (Table 2). The median state age-adjusted prevalence of frequent mental distress and history of depression among adults with arthritis in all 50 states and DC was 16.8% (range = 12.9% [Hawaii] to 22.4% [Kentucky]) and 32.1% (range = 17.7% [Hawaii] to 36.6% [Oklahoma]), respectively. States with high prevalences of frequent mental distress clustered in the Appalachian and southern states, whereas a similar geographic clustering was not observed for prevalence of a history of depression (Figure).

[††] https://www.cdc.gov/hrqol/faqs.htm#10.

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TABLE 1. Age-specific and age-adjusted prevalence* of frequent mental distress and history of depression among U.S. adults aged ≥18 years with arthritis, by selected characteristics — Behavioral Risk Factor Surveillance System, 50 states and District of Columbia, 2017

Characteristic	No. of respondents	Weighted population (x1,000)	Unadjusted prevalence, % (95% CI)	Age-adjusted prevalence, % (95% CI)
Arthritis and frequent mental distress				
Overall	**23,059**	**11,483**	**19.0 (18.6–19.5)**	**17.8 (17.3–18.3)**
Age group (yrs)				
18–44	3,663	2,844	30.9 (29.3–32.5)	—
45–64	11,939	5,951	23.1 (22.3–23.8)	—
≥65	7,457	2,687	10.6 (10.1–11.2)	—
Sex				
Men	7,174	3,913	16.1 (15.4–16.8)	14.6 (13.9–15.3)
Women	15,874	7,566	21.0 (20.4–21.7)	19.9 (19.3–20.6)
Race/Ethnicity				
White, non-Hispanic	17,264	7,785	18.0 (17.5–18.5)	17.1 (16.7–17.6)
Black, non-Hispanic	2,043	1,487	21.2 (19.5–22.9)	18.9 (17.3–20.5)
Hispanic	1,506	1,235	21.8 (19.8–23.9)	19.0 (17.1–21.1)
Other/Multiracial, non-Hispanic	1,748	711	22.0 (19.1–25.1)	19.5 (16.8–22.4)
Education level				
Less than high school diploma	3,099	2,612	27.4 (25.8–29.1)	26.3 (24.6–28.0)
High school or equivalent	7,786	3,579	20.1 (19.3–20.9)	19.0 (18.2–19.8)
Some college	7,378	3,820	19.2 (18.3–20.0)	17.4 (16.6–18.3)
College graduate	4,737	1,431	11.1 (10.5–11.7)	10.3 (9.7–10.9)
Sexual orientation				
Heterosexual	9,736	6,083	17.6 (16.9–18.3)	16.8 (16.1–17.5)
Lesbian/Gay/Bisexual	581	438	33.6 (29.7–37.8)	28.0 (24.5–31.8)
Arthritis and history of depression				
Overall	**43,433**	**19,658**	**32.1 (31.5–32.6)**	**31.3 (30.8–31.9)**
Age group (yrs)				
18–44	5,684	4,322	46.4 (44.7–48.1)	—
45–64	20,727	9,666	37.0 (36.1–37.8)	—
≥65	17,022	5,670	21.9 (21.2–22.7)	—
Sex				
Men	12,391	6,244	25.3 (24.5–26.1)	24.0 (23.2–24.8)
Women	31,023	13,394	36.6 (35.9–37.4)	36.3 (35.5–37.0)
Race/Ethnicity				
White, non-Hispanic	34,356	13,965	31.8 (31.2–32.4)	31.5 (31.0–32.1)
Black, non-Hispanic	3,092	2,171	30.3 (28.3–32.3)	28.4 (26.4–30.4)
Hispanic	2,536	2,032	34.8 (32.5–37.1)	32.4 (30.0–34.8)
Other/Multiracial, non-Hispanic	2,693	1,158	35.5 (32.3–38.9)	33.5 (30.3–36.9)
Education level				
Less than high school diploma	4,712	3,797	38.5 (36.7–40.2)	38.1 (36.3–39.9)
High school or equivalent	12,998	5,633	31.1 (30.1–32.0)	30.6 (29.7–31.6)
Some college	13,885	6,789	33.7 (32.6–34.7)	32.4 (31.4–33.5)
College graduate	11,740	3,384	26.0 (25.2–26.9)	25.5 (24.6–26.4)
Sexual orientation				
Heterosexual	18,551	10,755	30.8 (29.9–31.6)	30.5 (29.6–31.3)
Lesbian/Gay/Bisexual	1,038	678	51.5 (47.3–55.6)	46.7 (42.5–51.0)

Abbreviation: CI = confidence interval.
* Estimates for all characteristics except age group were age-adjusted using logistic regression modeling to produce predicted marginal probabilities.

Discussion

Frequent mental distress and history of depression are common features among adults with arthritis in all states, with considerable variability across states. These findings are supported by previous studies that estimated anxiety and current depression among adults with and without arthritis (*3*,*4*). Similar to findings in an earlier report (*6*), states with high prevalences of frequent mental distress were geographically clustered, with eight of the 10 states in the highest quintile in the Appalachian and southern states. This report also provides further evidence of poorer mental health status among lesbian/gay/bisexual adults with arthritis compared with their heterosexual peers with arthritis (*4*).

A meta-analysis of 12 studies reported that persons with chronic conditions (e.g., cancer, end stage renal disease, rheumatoid arthritis, and angina) who reported current depression were three times more likely to have a reduced adherence to

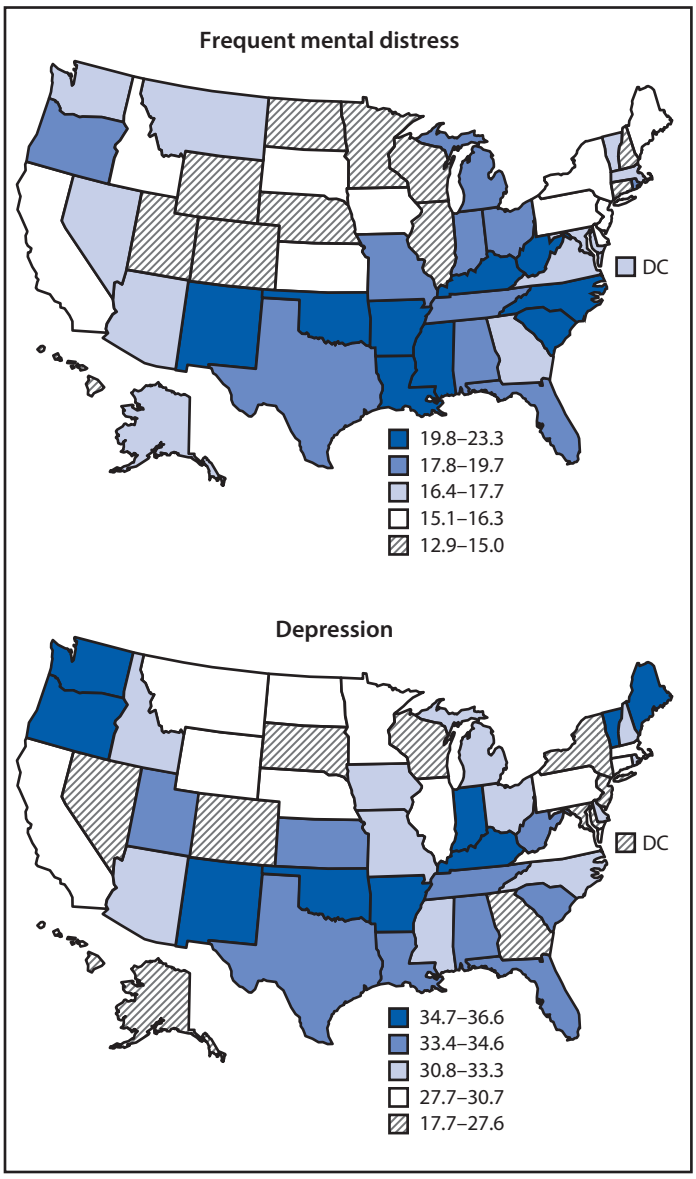
TABLE 2. Age-specific and age-adjusted prevalence* of frequent mental distress and history of depression among U.S. adults aged ≥18 years with arthritis, by state — Behavioral Risk Factor Surveillance System, 50 states and District of Columbia (DC), 2017

State	Arthritis and frequent mental distress				Arthritis and history of depression			
	No. of respondents	Weighted population (x1,000)	Unadjusted prevalence, % (95% CI)	Age-adjusted prevalence, % (95% CI)	No. of respondents	Weighted population (x1,000)	Unadjusted prevalence, % (95% CI)	Age-adjusted prevalence, % (95% CI)
Alabama	526	263	22.0 (19.8–24.3)	19.7 (17.7–22.0)	892	433	35.2 (32.7–37.7)	33.5 (31.1–36.0)
Alaska	131	22	18.2 (13.9–23.5)	15.4 (11.7–20.1)	238	37	30.3 (25.4–35.8)	27.6 (23.0–32.7)
Arizona	757	237	18.7 (17.3–20.3)	17.7 (16.2–19.2)	1,430	407	31.9 (30.2–33.6)	31.4 (29.7–33.2)
Arkansas	369	159	23.2 (19.9–26.8)	20.9 (17.8–24.4)	695	262	37.6 (33.9–41.5)	35.8 (32.1–39.5)
California	333	948	16.4 (14.2–18.9)	15.6 (13.4–18.1)	692	1,789	30.6 (27.8–33.5)	30.4 (27.4–33.5)
Colorado	351	135	15.0 (13.4–16.8)	13.8 (12.2–15.5)	673	243	26.7 (24.6–28.8)	25.7 (23.7–27.8)
Connecticut	427	97	15.5 (13.8–17.4)	14.9 (13.2–16.8)	858	177	27.8 (25.7–30.1)	27.8 (25.7–30.0)
Delaware	216	34	18.2 (15.3–21.5)	16.9 (14.2–20.1)	385	62	32.8 (29.2–36.6)	32.1 (28.6–35.9)
DC	131	13	16.7 (13.8–20.0)	15.9 (13.1–19.2)	189	19	23.4 (19.9–27.3)	22.9 (19.5–26.7)
Florida	1,337	779	19.5 (17.4–21.7)	19.6 (17.4–21.9)	2,325	1,329	32.5 (30.0–35.0)	33.5 (30.9–36.2)
Georgia	269	298	17.5 (15.2–20.1)	16.0 (13.8–18.5)	480	482	27.9 (25.3–30.7)	26.6 (24.0–29.4)
Hawaii	269	32	13.7 (11.6–16.0)	12.9 (10.9–15.1)	411	42	18.3 (16.1–20.7)	17.7 (15.6–20.2)
Idaho	224	51	17.2 (14.6–20.3)	16.1 (13.6–19.0)	506	103	33.9 (30.7–37.3)	33.3 (30.0–36.6)
Illinois	233	383	16.0 (13.7–18.7)	14.7 (12.5–17.2)	436	689	28.8 (25.8–31.9)	27.8 (25.0–30.9)
Indiana	873	298	21.3 (19.8–22.9)	19.2 (17.7–20.7)	1,644	522	36.8 (35.0–38.6)	35.2 (33.4–37.0)
Iowa	307	96	16.7 (14.8–18.7)	15.7 (13.9–17.7)	678	189	32.2 (30.0–34.6)	31.9 (29.7–34.2)
Kansas	968	92	18.1 (16.8–19.4)	16.7 (15.5–18.0)	2,019	178	34.4 (32.9–35.9)	33.6 (32.1–35.1)
Kentucky	671	268	25.0 (22.5–27.7)	22.4 (20.0–25.0)	1,145	420	38.6 (35.8–41.4)	36.4 (33.7–39.2)
Louisiana	318	217	23.2 (20.5–26.1)	21.1 (18.5–23.8)	549	344	35.9 (32.9–39.0)	34.3 (31.3–37.5)
Maine	593	62	18.8 (16.8–20.9)	17.3 (15.4–19.3)	1,228	120	36.2 (33.8–38.6)	35.3 (32.8–37.8)
Maryland	689	198	17.5 (15.7–19.5)	16.2 (14.5–18.1)	1,293	324	28.4 (26.4–30.5)	27.5 (25.5–29.6)
Massachusetts	310	200	16.3 (13.7–19.4)	15.3 (12.7–18.3)	575	364	28.9 (25.6–32.4)	28.4 (25.1–31.9)
Michigan	650	466	20.3 (18.6–22.1)	18.8 (17.2–20.6)	1,262	797	34.3 (32.4–36.3)	33.3 (31.4–35.3)
Minnesota	550	115	14.1 (12.7–15.5)	13.2 (11.9–14.6)	1,234	244	29.5 (27.7–31.3)	29.1 (27.4–31.0)
Mississippi	338	152	23.9 (21.0–27.1)	21.5 (18.8–24.5)	588	227	34.7 (31.6–37.9)	32.9 (29.9–36.1)
Missouri	494	251	19.7 (17.6–22.0)	18.4 (16.4–20.6)	867	436	33.7 (31.3–36.3)	33.0 (30.5–35.6)
Montana	293	36	17.8 (15.3–20.5)	16.4 (14.0–19.0)	557	66	31.8 (28.9–34.9)	30.7 (27.8–33.8)
Nebraska	609	51	15.0 (13.4–16.8)	14.0 (12.4–15.7)	1,266	105	30.6 (28.5–32.8)	30.0 (27.9–32.2)
Nevada	189	82	18.0 (14.5–22.1)	17.1 (13.6–21.3)	298	129	28.1 (24.0–32.5)	27.6 (23.4–32.2)
New Hampshire	286	44	16.0 (13.7–18.7)	14.8 (12.6–17.3)	638	95	33.9 (31.0–36.9)	33.1 (30.2–36.1)
New Jersey	571	284	18.5 (16.3–20.9)	17.3 (15.2–19.7)	957	413	26.2 (23.8–28.8)	25.5 (23.1–28.1)
New Mexico	406	92	23.4 (20.7–26.3)	21.6 (19.1–24.4)	679	143	36.0 (33.0–39.1)	34.9 (31.9–38.0)
New York	524	587	17.6 (15.6–19.7)	16.7 (14.8–18.8)	914	907	26.4 (24.3–28.6)	26.0 (23.9–28.3)
North Carolina	297	441	23.4 (20.4–26.6)	22.0 (19.1–25.3)	476	644	33.7 (30.4–37.1)	32.9 (29.7–36.4)
North Dakota	255	21	15.2 (13.1–17.6)	13.3 (11.4–15.5)	580	44	31.7 (28.9–34.6)	29.8 (27.2–32.6)
Ohio	790	501	19.7 (17.9–21.7)	18.3 (16.6–20.1)	1,406	838	32.4 (30.3–34.5)	31.4 (29.4–33.5)
Oklahoma	437	179	22.5 (20.3–24.9)	20.3 (18.2–22.6)	805	309	38.2 (35.7–40.8)	36.6 (34.1–39.3)
Oregon	284	167	20.3 (17.9–22.9)	18.8 (16.5–21.4)	557	305	36.4 (33.6–39.2)	35.5 (32.7–38.4)
Pennsylvania	357	525	18.2 (16.0–20.7)	17.3 (15.1–19.8)	639	875	30.1 (27.5–32.9)	29.6 (27.0–32.4)
Rhode Island	319	46	20.1 (17.5–23.0)	18.5 (16.0–21.2)	652	79	34.5 (31.5–37.7)	33.3 (30.4–36.4)
South Carolina	709	223	21.4 (19.6–23.3)	20.3 (18.5–22.2)	1,257	366	34.1 (32.0–36.2)	33.7 (31.6–35.8)
South Dakota	272	23	16.5 (13.4–20.1)	15.2 (12.3–18.7)	484	41	28.6 (24.9–32.6)	27.6 (24.1–31.5)
Tennessee	429	315	21.2 (18.8–23.8)	19.2 (17.0–21.7)	772	551	36.0 (33.2–38.9)	34.6 (31.8–37.5)
Texas	618	923	21.3 (18.0–24.9)	19.7 (16.6–23.3)	1,091	1,560	35.4 (31.6–39.5)	34.6 (30.7–38.8)
Utah	359	63	15.5 (13.7–17.5)	13.7 (12.1–15.6)	835	146	35.4 (33.0–37.9)	33.9 (31.4–36.3)
Vermont	327	24	17.3 (15.2–19.6)	16.3 (14.2–18.5)	726	48	35.1 (32.5–37.8)	34.7 (32.1–37.5)
Virginia	471	272	17.2 (15.3–19.2)	15.7 (14.0–17.6)	935	497	30.8 (28.6–33.1)	29.7 (27.5–32.0)
Washington	631	246	18.5 (16.8–20.3)	16.8 (15.2–18.5)	1,381	499	36.9 (34.9–39.0)	35.7 (33.7–37.8)
West Virginia	526	130	23.6 (21.5–25.8)	21.5 (19.6–23.6)	869	200	35.8 (33.5–38.1)	34.2 (32.0–36.5)
Wisconsin	256	184	16.3 (13.9–19.1)	15.0 (12.8–17.7)	487	320	28.5 (25.6–31.5)	27.6 (24.8–30.5)
Wyoming	179	17	15.3 (12.9–18.0)	13.5 (11.4–16.1)	403	36	31.9 (28.8–35.1)	30.2 (27.2–33.4)
State median	N/A	N/A	18.2	16.8	N/A	N/A	32.5	32.1
Range	N/A	N/A	13.7–25.0	12.9–22.4	N/A	N/A	18.3–38.6	17.7–36.6

Abbreviations: CI = confidence interval; N/A = not applicable.
* Estimates were age-adjusted using logistic regression modeling to produce predicted marginal probabilities.

medical treatment recommendations (i.e., medication adherence, diet, exercise, and follow-up appointments) than were those who did not report depression (*7*). In addition, among persons with rheumatoid arthritis, symptoms of anxiety and current depression are associated with reduced response to treatment and poorer quality of life (*8*). Therefore, actively

FIGURE. Age-adjusted prevalence* of frequent mental distress and history of depression among adults aged ≥18 years with arthritis — Behavioral Risk Factor Surveillance System, 2017



Abbreviation: DC = District of Columbia.
* The percentage intervals for the quintile cutoffs vary because of variations in the distribution of frequent mental distress and history of depression.

engaging adults with arthritis in evidence-based programs such as the Arthritis Self-Management Program[§§] or the more widely available Chronic Disease Self-Management Program[¶¶] can help address the physical and psychological needs in tandem; these programs have shown to reduce depression and improve self-efficacy in adults with arthritis (*9*). The higher prevalences of poor mental health outcomes among specific subgroups in this study, including those who are lesbian/gay/bisexual, suggests that organizations serving these persons can be important partners for promoting and increasing access to these evidence-based interventions.

The Community Preventive Services Task Force (Community Guide) recommends active screening for depression for all adults, use of trained depression care managers, and educating both patients and providers.[***] Home-based supports, such as the use of community health workers, can support culturally appropriate care and further patient engagement in treatment goal-setting and self-management. Using community health workers can result in greater improvements in participant behavior and health outcomes (e.g., improvement in diabetes control) when compared with usual care.[†††]

Because of shortages in mental health care providers,[§§§] multidisciplinary and population-based strategies that include both clinical and community approaches to addressing mental health service needs are needed for adults with arthritis. For example, allied professionals could use technology such as telemedicine in collaboration with mental health professionals, especially in rural areas (*10*) and in the delivery of care in community-based settings. The Program to Encourage Active, Rewarding Lives (PEARLS), for example, is a national evidence-based program for late-life depression that brings high quality mental health care into community-based settings that reach vulnerable older adults including those with arthritis.[¶¶¶]

Summary

What is already known about this topic?

Persons with arthritis have unique challenges because the interplay between anxiety, depression, and chronic pain is cyclical, with each having the potential to exacerbate the others.

What is added by this report?

In 2017, frequent mental distress and history of depression were commonly reported by adults with arthritis in all states, with clustering of high prevalence of frequent mental distress in Appalachian and southern states.

What are the implications for public health practice?

All adults with arthritis might benefit from systematic mental health screening by their health care team (if needed, referral to mental health services) and participation in evidence-based interventions such as physical activity and self-management education programs whose proven benefits include reduced pain and improved mental health.

§§ https://www.cdc.gov/arthritis/docs/ASMP-executive-summary.pdf.
¶¶ https://www.selfmanagementresource.com/programs/.

*** https://www.thecommunityguide.org/topic/mental-health.
††† https://www.ahrq.gov/downloads/pub/evidence/pdf/comhealthwork/comhwork.pdf.
§§§ https://www.thenationalcouncil.org/wp-content/uploads/2017/03/Psychiatric-Shortage_National-Council-.pdf.
¶¶¶ https://depts.washington.edu/hprc/evidence-based-programs/pearls-program/.

The findings in this report are subject to at least five limitations. First, BRFSS data are self-reported and susceptible to recall and social desirability biases. Second, low response rates for individual states might bias findings, but sampling weights can help adjust for nonresponse bias. Third, a history of depression overestimates current depression or depressive symptoms. Fourth, the depression question does not capture adults with undiagnosed depression, and thus, might underrepresent the true proportion of respondents who are currently depressed. Finally, the arthritis question includes many types of arthritis, and prevalences of frequent mental distress and history of depression might vary among those with arthritis, rheumatoid arthritis, gout, lupus, and fibromyalgia; however, the same strategies can be used to address mental health issues for all of these conditions.

The findings from this report can be used to monitor state-specific trends in mental health among adults with arthritis. Although variation by sociodemographic and geographic characteristics exist, the prevalences of both frequent mental distress and history of depression among adults with arthritis suggests that all adults with arthritis might benefit from systematic mental health screening by their provider and, if indicated, referral to mental health services and self-management education programs and engagement with mental health and allied professionals in a variety of clinical and community settings. In addition, the use of innovative delivery models, such as employment of community health workers and telemedicine, might prove beneficial and could augment current shortages in mental health services. To further understand geographic and sociodemographic variation in characteristics among adults with arthritis, it might be beneficial to examine at the local or community level other psychosocial and access characteristics, such as employment, physical and social environmental factors, and access to social or health care services.

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Description of Eschar-Associated Rickettsial Diseases Using Passive Surveillance Data — United States, 2010–2016

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Rickettsial eschars are necrotic lesions that occur at the site of tick or mite bites and represent locations of primary inoculation of spotted fever group *Rickettsia* and *Orientia* species. In the United States, eschars are hallmarks of less severe spotted fever diseases, including those caused by endemic agents such as *Rickettsia parkeri* (*1*) and *Rickettsia* species 364D (*2*), as well as several imported agents, including *Rickettsia africae, Rickettsia conorii,* and *Orientia tsutsugamushi*. Eschars generally do not occur with Rocky Mountain spotted fever (RMSF), a potentially deadly disease caused by *Rickettsia rickettsii* and have not been associated with *Ehrlichia* or *Anaplasma* species. The presence of eschars can help differentiate less severe spotted fever rickettsioses from RMSF and clarify the potential contributions of each within surveillance data. The lone star tick (*Amblyomma americanum),* the Gulf Coast tick (*Amblyomma maculatum*), and the Pacific Coast tick *(Dermacentor occidentalis)* are the three most common species of tick vectors that spread eschar-associated pathogens in the United States (*1–4*). Lone star and Gulf Coast ticks are vectors of *R. parkeri*, and Pacific Coast ticks are vectors of *Rickettsia* species 364D. In commonly available serologic assays, spotted fever group *Rickettsia* antigens cross-react, which presents a challenge when differentiating RMSF from other spotted fever rickettsioses. Incidence of spotted fever rickettsiosis continues to rise, with few cases providing species-specific laboratory evidence; therefore, the proportion of spotted fever rickettsioses caused by *R. rickettsii* remains unclear (*5*). This analysis serves as the first summary of eschar-associated rickettsial disease surveillance data in the United States. During 2010–2016, the presence or absence of eschars was reported in <20% of tickborne rickettsial disease (TBRD) cases. Eschar-associated illnesses represented a small percentage (1.1%) of TBRD cases. Among the 484 reported eschar-associated cases, 97 (20%) were classified as ehrlichiosis or anaplasmosis. Further research is needed to determine whether eschars associated with ehrlichiosis or anaplasmosis reflect a reporting error, a new finding, or the result of coinfection with another eschar-associated rickettsial pathogen.

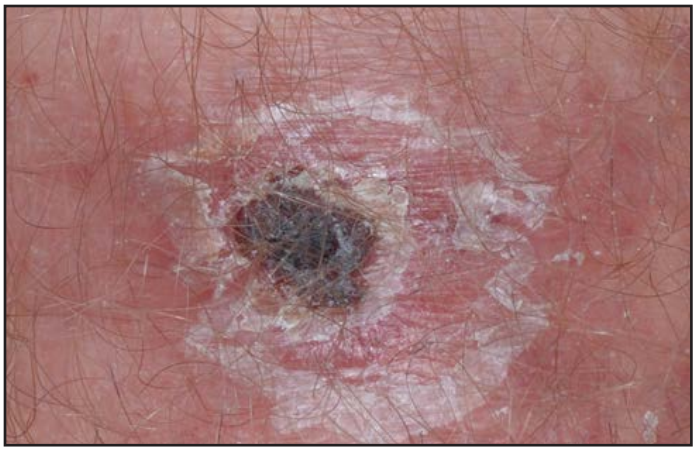
Notifiable rickettsial diseases are reported to CDC through the National Notifiable Diseases Surveillance System, which also collects basic demographic information. Supplementary information is recorded through submission of TBRD supplemental case report forms, or extractions from state surveillance systems, and includes clinical details, diagnostic criteria, and patient outcomes. Since 2010, the CDC supplemental case report form* has requested information on eschars.

For this report, supplementary surveillance data collected by state and local health departments for illness with onset during 2010–2016 that were received and entered by CDC as of November 13, 2018, were summarized. TBRDs are not reportable conditions in Alaska and Hawaii, so no data from these states were included in this report. Case classifications were made according to the Council of State and Territorial Epidemiologists definitions (*6*,*7*). Confirmed cases were clinically compatible and had confirmatory diagnostic evidence obtained by seroconversion (fourfold change) in anti-*Ehrlichia, -Anaplasma,* or *-Rickettsia* immunoglobulin (Ig)G antibody titers by indirect immunofluorescence antibody assay or tested positive by polymerase chain reaction (PCR), immunohistochemistry, or culture. Probable cases were clinically compatible and included supportive laboratory evidence from serologic assays (including IgG- or IgM-positive antibodies reactive to *Ehrlichia, Anaplasma*, or *Rickettsia* species using immunofluorescence antibody assay or other serologic methods) or reported the presence of morulae (intracellular inclusion bodies in leukocytes) (*7*). Data were analyzed using SAS software (version 9.4; SAS Institute).

A rickettsial eschar begins as a small, painless papule that appears within a few days after the bite of an infected vector. The papule grows, becomes vesicular or pustular, and ulcerates forming a brown-to-black crust surrounded by a red annular halo (Figure 1). During 2010–2016, a total of 44,099 cases of TBRD with supplemental case report forms were reported to CDC, including 484 (1.1%) reported as eschar-associated TBRD; however, most case reports (35,749, 81.1%) were missing information on eschars altogether. Among reported eschar-associated cases, 387 (80.0%) were classified as spotted fever rickettsioses, 64 (13.2%) as *Ehrlichia chaffeensis* ehrlichiosis, 30 (6.2%) as *Anaplasma phagocytophilum* anaplasmosis, one (0.2%) as *Ehrlichia ewingii* ehrlichiosis, and two (0.4%) as undetermined ehrlichiosis/anaplasmosis. Notation of suspected spotted fever species is not required but was listed for 16 (4.1%) cases,

* The TBRD case report form used for this review can be found at https://www.cdc.gov/ticks/pdf/2010_TBRD_case_report.pdf; however, a case definition change for spotted fever rickettsiosis will go into effect January 1, 2020, and a new case report form is forthcoming.

FIGURE 1. Rickettsial disease eschar from a patient with *Rickettsia parkeri* rickettsiosis



Photo/CDC

including *R. africae* (11 cases), *R. parkeri* (two) and *R. conorii* (one), *Rickettsia* species 364D (one), and *Rickettsia akari* (one). No eschar-associated cases were associated with *R. rickettsii*.

Patients reporting eschar-associated illnesses were predominantly male (290, 59.9%), white (331, 68.4%), and non-Hispanic (402, 83.1%) (Table). Hospitalization (90, 18.6%) and death (1, 0.2%) occurred among a smaller proportion of patients with eschar-associated illness than among those with illness not associated with eschar (2,120, 27.0% and 21, 0.3%), respectively. Race and sex distributions were similar among patients with and without eschars. All but seven jurisdictions in which TBRD are reportable submitted information on the presence and absence of eschars during this period. Most eschar-associated cases (74.6%, 361) were reported from the South, compared with 60.3% (4,738) of cases not associated with eschar (Table). Most eschar-associated cases (462, 95.5%) were reported from states where ticks that transmit eschar-associated pathogens were present (Figure 2). A large proportion of all TBRD cases were missing travel history (30,455, 69.1%).

Only 42 (8.7%) of 484 eschar-associated cases were confirmed, compared with 1,093 (13.9%) TBRD cases not associated with eschar (Table). Thirty-four (7.0%) reported eschar-associated cases were tested by PCR, one report described visualization of morulae, and 447 (92.0%) cases met confirmed or supportive laboratory criteria using serologic evidence; techniques were not mutually exclusive.

Discussion

The presence of an eschar can aid in the clinical and epidemiologic differentiation of less severe spotted fever rickettsioses (e.g., Pacific Coast tick fever [*Rickettsia* species 364D] and *R. parkeri* rickettsiosis) from the more severe RMSF (*8*). Complete reporting of eschars might help to explain the proportions of spotted fever rickettsioses that are caused by less pathogenic spotted fever group *Rickettsia* and those caused by *R. rickettsii*. In addition, rickettsial eschars serve as an important clinical specimen; rickettsial DNA can be extracted from eschar lesions obtained by punch biopsies, by removing a portion of the eschar scab, or by swabbing the ulcerated area (*9*). PCR testing of eschar swabs and scabs provides confirmatory testing without a more invasive biopsy, although the pathogen cannot be cultured and immunohistochemistry cannot be performed on eschar swabs or scabs. To assist agencies that request rickettsial disease testing, CDC provides instructions for collection and submission of eschar swab and skin biopsy specimens.[†]

Demographic characteristics of patients with eschar-associated TBRD were similar to those of patients for whom eschars were not reported. Eschar-associated cases reported during this period were less likely to be confirmed, and less severe (as indicated by lower hospitalization and case-fatality

TABLE. Demographic characteristics and outcome indicators for tickborne rickettsial disease cases by eschar status— United States case report forms, 2010–2016

Characteristic	No. (%) Eschar reported (n = 484)	No eschar reported (n = 7,866)	Missing information about eschars (n = 35,749)	Chi-squared p-value*
Case classification				p<0.001
Confirmed	42 (8.7)	1,093 (13.9)	11,145 (31.2)	
Probable	442 (91.3)	6,773 (86.1)	24,604 (68.8)	
Sex				p<0.001
Male	290 (59.9)	5,037 (64.0)	21,887 (61.2)	
Female	189 (39.0)	2,780 (35.3)	13,166 (36.8)	
Unknown	5 (1.0)	49 (0.6)	696 (2.0)	
Race				p<0.001
White	331 (68.4)	5,896 (75.0)	23,923 (66.9)	
Black	10 (2.1)	143 (1.8)	670 (1.9)	
American Indian/ Alaska Native	8 (1.7)	40 (0.5)	776 (2.2)	
Asian/Pacific Islander	2 (0.4)	37 (0.5)	186 (0.5)	
Not specified/ Unknown	133 (27.5)	1,750 (22.3)	10,194 (28.5)	
Ethnicity				p<0.001
Hispanic	10 (2.1)	203 (2.6)	677 (1.9)	
Non-Hispanic	402 (83.1)	6,267 (79.7)	21,668 (60.6)	
Unknown	72 (14.9)	1,396 (17.8)	13,404 (37.5)	
Age group (yrs)				p<0.001
<10	11 (2.3)	183 (2.5)	789 (3.1)	
10–19	14 (2.9)	387 (5.3)	1,350 (5.3)	
20–29	37 (7.6)	546 (7.4)	1,705 (6.7)	
30–39	45 (9.3)	827 (11.2)	2,408 (9.5)	
40–49	71 (14.7)	1,128 (15.3)	3,448 (13.5)	
50–59	99 (20.5)	1,547 (21.0)	5,269 (20.6)	
60–69	91 (18.8)	1,526 (20.7)	5,569 (21.9)	
≥70	79 (16.3)	1,220 (16.6)	4,960 (19.5)	
Unknown	37 (7.6)	502 (6.4)	10,261 (28.7)	

See table footnotes on the next page.

[†] https://www.cdc.gov/ncezid/dvbd/specimensub/rickettsial-shipping.html.

TABLE. (*Continued*) Demographic characteristics and outcome indicators for tickborne rickettsial disease cases by eschar status—United States case report forms, 2010–2016

Characteristic	No. (%) Eschar reported (n = 484)	No eschar reported (n = 7,866)	Missing information about eschars (n = 35,749)	Chi-squared p-value*
U.S. Census region of residence†				p<0.001
Northeast	24 (5.0)	608 (7.7)	10,576 (29.7)	
Midwest	71 (14.7)	2,385 (30.4)	11,881 (33.3)	
South	361 (74.6)	4,738 (60.3)	12,888 (36.1)	
West	28 (5.8)	125 (1.6)	329 (0.9)	
Travel				p<0.001
Yes	110 (22.7)	1,403 (17.8)	3,730 (10.4)	
No	162 (33.5)	1,678 (21.3)	6,562 (18.4)	
Unknown	212 (43.8)	4,785 (60.8)	25,457 (71.2)	
Immunosuppressive condition				p<0.001
Yes	62 (12.8)	765 (9.7)	2,109 (5.9)	
No	318 (65.7)	5,349 (68.0)	14,474 (40.5)	
Unknown	104 (21.5)	1,752 (22.3)	19,166 (53.6)	
Hospitalization status				p<0.001
Hospitalized	90 (18.6)	2,120 (27.0)	9,104 (25.5)	
Not hospitalized	368 (76.0)	5,559 (70.7)	17,529 (49.0)	
Unknown	26 (5.4)	187 (2.4)	9,116 (25.5)	
Outcome				p<0.001
Died	1 (0.2)	21 (0.3)	124 (0.4)	
Survived	434 (89.7)	7,351 (93.5)	26,895 (75.2)	
Unknown	49 (10.1)	494 (6.3)	8,730 (24.4)	

* Statistically significant difference (p<0.05) between eschar reporting categories using Chi-squared analysis.

† *Northeast:* Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. *Midwest:* Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. *South:* Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. *West:* Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

rates), than were cases for which eschars were not reported, consistent with previously published studies (*1*–*3*,*8*). Gulf Coast and lone star ticks transmit several eschar-causing pathogens (including *R. parkeri*) and are prevalent in the southern United States, where most eschar-associated cases were reported (*1*,*3*,*10*). Although incomplete data on travel history limits the ability to draw conclusions regarding the geographic distribution of eschar-associated illnesses, the predominance of reported cases in areas with compatible vectors is consistent with expected distributions of eschar-associated illnesses, including *R. parkeri* rickettsiosis. Among the 22 cases reported from areas without these tick vectors, six were imported cases of either African tick bite fever (*R. africae*) or Mediterranean spotted fever (*R. conorii*) from Africa, but seven patients reported no travel and were primarily reported as having cases of anaplasmosis. Further investigation is needed to understand the occurrence of locally acquired eschar-associated illnesses in areas without known competent vectors.

Summary

What is already known about this topic?

Eschars are a clinical sign used to differentiate less severe rickettsioses from potentially deadly Rocky Mountain spotted fever.

What is added by this report?

Eschars are infrequently reported in tickborne rickettsial disease (TBRD) surveillance data and represent an underutilized resource to aid in distinguishing the various spotted fever group *Rickettsia*. Although 1% of total TBRD case reports during 2010–2016 documented the presence of an eschar, 81% of cases lacked information on eschars altogether.

What are the implications for public health practice?

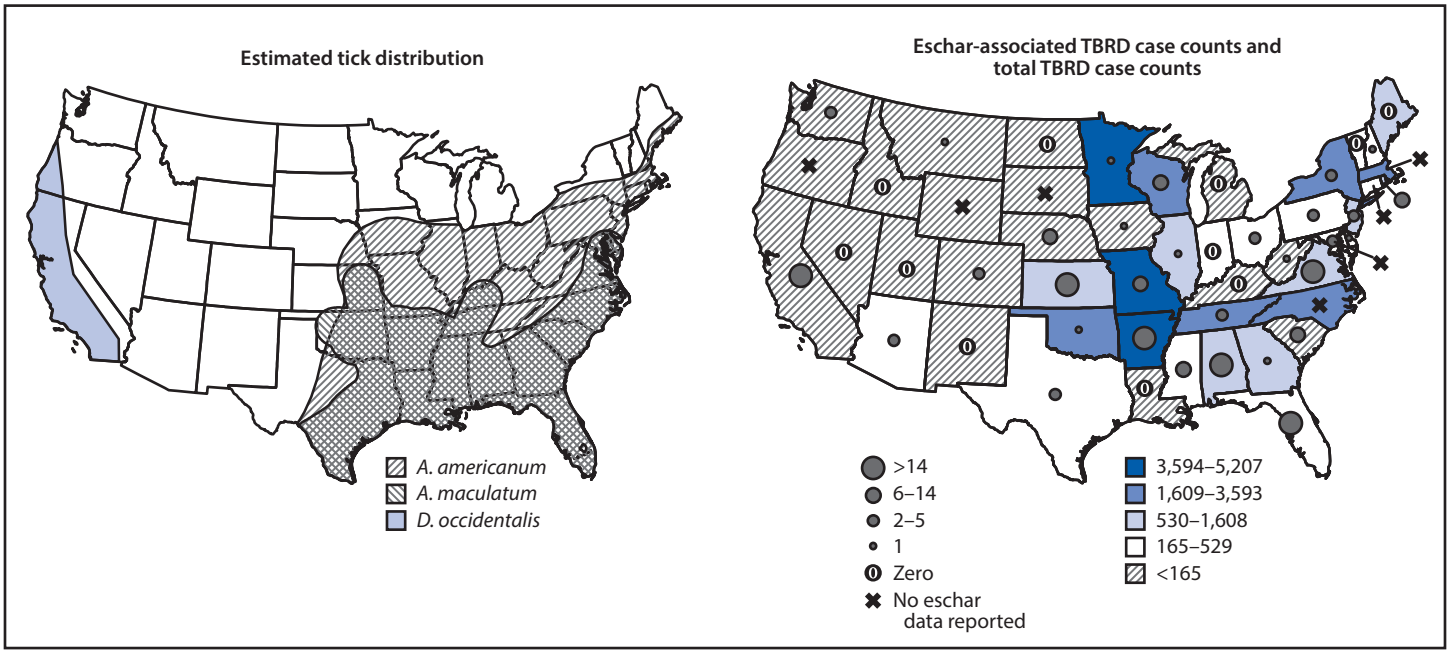
Systematic reporting of the presence or absence of eschars on the TBRD case report form can improve the quality of surveillance data and enhance understanding of the impact of spotted fever rickettsioses in the United States.

Although the presence and frequency of spotted fever rickettsiosis associated with eschars was not surprising, the number of reported ehrlichiosis and anaplasmosis cases associated with eschars was unexpected. Approximately 20% of TBRD cases reporting the presence of an eschar during 2010–2016 were associated with cases of ehrlichiosis and anaplasmosis. Eschars had not previously been reported with *Anaplasma* or *Ehrlichia* species infections. Eschar-associated ehrlichiosis or anaplasmosis might represent a newly described clinical finding; signal coinfection with a spotted fever group *Rickettsia* and *Anaplasma* or *Ehrlichia* species; or indicate a reporting error. Coinfections could result from concomitant transmission of two pathogens carried by the same tick or from the bite of two separate tick species. Several pathogens are known to cocirculate: lone star ticks are known to transmit *E. chaffeensis, E. ewingii, R. parkeri,* and *Rickettsia amblyommatis*; however, coinfection has not been documented in humans (*3*,*10*). Further clinical research is needed to understand the importance of these findings.

The findings in this report are subject to at least three limitations. First, reported data regarding eschars come from passive surveillance systems and might not be representative of the overall disease incidence. Second, eschar reporting as part of TBRD surveillance is a relatively new element, introduced in 2010; as such, eschars might not be well understood or reported. Finally, conclusions about the demographic and geographic profiles of eschar-associated illnesses might be limited by missing data.

More complete reporting of eschars in surveillance data will help track this clinical feature as a hallmark of rickettsial disease and help differentiate less severe rickettsial diseases from deadly RMSF. Correct identification and complete documentation of eschar-associated TBRD surveillance data can enhance understanding of the impact of spotted fever rickettsioses in the United States.

FIGURE 2. Estimated geographic range of *Amblyomma americanum*, *Amblyomma maculatum*,* and *Dermacentor occidentalis*† and number of eschar-associated illnesses, compared with total reported tickborne rickettsial diseases (TBRDs)§ — United States, 2010–2016



* https://www.cdc.gov/ticks/geographic_distribution.html.
† Bishopp FC, Trembley HL. Distribution and hosts of certain North American ticks. J Parasitol 1945;31:1–54.
§ TBRDs are not reportable conditions in Alaska and Hawaii; therefore, these states were not included in this figure.

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Characteristics of Patients Experiencing Rehospitalization or Death After Hospital Discharge in a Nationwide Outbreak of E-cigarette, or Vaping, Product Use–Associated Lung Injury — United States, 2019

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CDC, the Food and Drug Administration (FDA), state and local health departments, and public health and clinical stakeholders continue to investigate a nationwide outbreak of e-cigarette, or vaping, product use–associated lung injury (EVALI) (*1–4*). Characterizing EVALI patients who experience rehospitalization or death after hospital discharge might identify risk factors for higher morbidity and mortality. CDC analyzed national data on EVALI patients to determine the prevalence of rehospitalization and death after discharge and to identify characteristics associated with EVALI patients who require rehospitalization and those who die after discharge, compared with other EVALI patients. As of December 10, 2019, a total of 2,409 EVALI cases requiring hospitalization have been reported to CDC, as have 52 deaths. Among the 1,139 EVALI patients discharged on or before October 31, 2019, 31 (2.7%) were rehospitalized after discharge, with a median of 4 days (interquartile range [IQR] = 2–20 days) between discharge and rehospitalization; seven deaths (13.5% of EVALI deaths) occurred after discharge, with a median of 3 days (IQR = 2–13 days) between discharge and death. Characteristics of EVALI patients who were rehospitalized or died after hospital discharge suggest that chronic medical conditions, including cardiac disease, chronic pulmonary disease (e.g., chronic obstructive pulmonary disease [COPD] and obstructive sleep apnea), and diabetes, are risk factors leading to higher morbidity and mortality among some EVALI patients. For example, 70.6% of patients who were rehospitalized and 83.3% of those who died had one or more chronic conditions, compared with 25.6% of those who were neither rehospitalized nor died. In addition, EVALI patients who were rehospitalized or died after discharge were older: the median ages of patients who died, were rehospitalized, and who neither died nor were rehospitalized were 54, 27, and 23 years, respectively. EVALI patient follow-up optimally within 48 hours after hospital discharge might minimize risk for rehospitalization and death, especially among patients with chronic conditions. In addition, interventions for EVALI patients, including intensive hospital discharge planning and optimized case management, might minimize risks for morbidity and mortality after a hospital discharge (*5*).

CDC partnered with state health departments and the Council of State and Territorial Epidemiologists Vaping Associated Pulmonary Illness Task Force to develop and disseminate EVALI surveillance case definitions* and data collection tools† beginning in August 2019. States and jurisdictions voluntarily report data on confirmed and probable hospitalized or deceased EVALI patients to CDC weekly. States might also include available data from medical record abstractions and interviews of patients, or proxies (e.g., spouses or parents) if patients were too ill or had died.

This report compares clinical characteristics of EVALI patients who were rehospitalized or died after hospital discharge with those of patients who were neither rehospitalized nor died after hospital discharge, among cases reported to CDC by December 10, 2019. Rehospitalized patients were defined as those who had a second hospitalization, regardless of reason for admission, that occurred one or more days after the date of discharge from the first hospitalization. A death after hospital discharge was defined as death, regardless of reason for death, that occurred one or more days after the date of last hospital discharge. Rehospitalized patients and those who died after discharge were compared separately with hospitalized EVALI patients who met the following criteria: 1) an initial hospital discharge date on or before October 31, 2019, to allow time for the two outcomes of interest to potentially occur; 2) no reports of rehospitalization nor death as of December 10, 2019; and 3) available data for at least one variable in all of the following categories: medical history, EVALI symptoms reported, and clinical course of EVALI illness. Percentages and distributions of categorical and continuous indicators were compared using Fisher's exact tests and Kruskal-Wallis tests, respectively; p-values <0.05 were considered statistically significant for pair-wise comparisons between 1) the comparison group and patients who were rehospitalized or 2) the comparison group and those who died after discharge. To assess the impact of

* https://www.cdc.gov/tobacco/basic_information/e-cigarettes/assets/2019-Lung-Injury-Surveillance-Case-Definition-508.pdf.

† https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease/healthcare-providers/pdfs/National-Case-Report-Form-v01.pdf.

multiple comorbidities on rehospitalization or death after discharge among EVALI patients, the additive effect of several specific chronic conditions was studied; chronic conditions included for this comorbidity analysis were cardiac disease; asthma; obstructive sleep apnea; COPD; other respiratory conditions not including asthma, obstructive sleep apnea, or COPD (e.g., interstitial lung disease); and diabetes. The IQR was included where median values were reported. All analyses were conducted using SAS software (version 9.4; SAS Institute).

As of December 10, 2019, a total of 2,409 EVALI cases requiring hospitalization have been reported to CDC, as have 52 deaths. Among the 1,139 EVALI patients discharged on or before October 31, 2019, 31 (2.7%) were rehospitalized after discharge without subsequent report of death. An additional seven deaths (13.5% of EVALI deaths) occurred after hospital discharge. The comparison group included 768 EVALI patients who met the inclusion criteria. The age distributions differed among EVALI patients who were rehospitalized, who died after discharge, and who were neither rehospitalized nor died (Table 1). The median ages of patients who died, were rehospitalized, and who neither died nor were rehospitalized were 54, 27, and 23 years, respectively. Among deaths after discharge, five (71.4%) occurred among females, although females accounted for 33.6% of comparison cases.

EVALI patients who were rehospitalized or died after hospital discharge had more chronic medical conditions. For example, 70.6% and 17.6% of patients who were rehospitalized had at least one or at least two chronic conditions, respectively, and 83.3% and 50.0% of those who died had at least one or at least two chronic conditions, respectively, compared with 25.6% and 3.8%, respectively, of those who were neither rehospitalized nor died ($p<0.05$) (Table 1).

Neither symptoms reported when initially seeking medical care nor the location of this initial care were associated with rehospitalization or death after discharge (Table 2). All patients who died after hospital discharge had been admitted to an intensive care unit during their previous hospitalization ($p = 0.006$), compared with 41.9% of the comparison group and 47.4% of the surviving rehospitalized patients (Table 3). Respiratory failure necessitating intubation and mechanical ventilation during initial hospitalization was more common among patients who died (100%) than among patients who were neither rehospitalized nor died (15.6%) ($p = 0.03$). No significant difference among the three groups with respect to receipt of corticosteroid therapy or antibiotic therapy during initial hospitalization was observed. Duration of initial hospitalization did not differ among the three groups. Among rehospitalized patients, a median of 4 days (IQR = 2–20) elapsed between discharge from the first hospitalization and rehospitalization. Among patients who died after discharge, a median of 3 days (IQR = 2–13) elapsed between hospital discharge and death.

Discussion

As of December 10, 2019, 2.7% of EVALI patients reported to CDC have required rehospitalization, and approximately one in seven deaths among EVALI patients has occurred after discharge. Compared with other hospitalized EVALI patients, the prevalence of one or more chronic conditions was higher among those who required rehospitalization and those who died after discharge. EVALI patients who died also were more likely to have been admitted to an intensive care unit, experienced respiratory failure necessitating intubation and mechanical ventilation, and were significantly older. EVALI patients with chronic comorbidities and these initial hospitalization characteristics might require a higher threshold for hospital discharge and focused efforts during discharge planning and transition to the outpatient setting, such as intensive case management and rapid follow-up (*5*).

At least one quarter of rehospitalizations occurred within 2 days of initial discharge, which suggests that ensuring clinical stability before discharge as well as postdischarge follow-up optimally within 48 hours might minimize risk for rehospitalization and death, especially among patients with chronic conditions (*5*). A higher frequency of rehospitalizations among EVALI patients after a longer interval has been reported elsewhere (*6*); differences observed in the current study might reflect its larger study population and wider geographic distribution of EVALI cases. Concurrent with this report, CDC is publishing additional clinical guidance for discharge planning for EVALI patients (*5*).

The findings in this report are subject to at least seven limitations. First, the limited proportion of reported cases with detailed clinical data might limit generalizability. Second, the small number of rehospitalizations and deaths after discharge limit the ability to identify significant differences and assess confounding factors. Third, EVALI patients in the comparison group might not fully represent a cohort at lower risk; some patients might still be rehospitalized or die. However, limiting comparison cases to those patients discharged on or before October 31, 2019, was intended to mitigate this effect. Fourth, reported data do not include the reason for rehospitalization or death after hospital discharge of EVALI patients; rehospitalization or death was possibly not related to EVALI, especially among patients with multiple comorbidities. Fifth, use of e-cigarette, or vaping, products, as well as compliance with recommended postdischarge treatment, was not assessed. Sixth, available data might represent an underestimation of rehospitalized EVALI patients. These data might not be as rigorously reported as those concerning patients initially

TABLE 1. Demographic and medical history characteristics of e-cigarette, or vaping, product use–associated lung injury (EVALI) patients, by rehospitalization, death after discharge, and no rehospitalization nor death after discharge — United States, 2019*

	Rehospitalization (N = 31)			Death after discharge (N = 7)			No rehospitalization nor death† (N = 768)	
Characteristic	**No.**	**No. (%) or median (IQR)**	**P-value§**	**No.**	**No. (%) or median (IQR)**	**P-value¶**	**No.**	**No. (%) or median (IQR)**
Age, median (IQR)	31	27 (17–39)	0.35	7	54 (34–75)	<0.001	766	23 (18–32)
Age group (yrs)								
13–17	31	8 (25.8%)	0.01	7	0 (0.0%)	<0.001	766	128 (16.7%)
18–24		4 (12.9%)			0 (0.0%)			305 (39.8%)
25–50		17 (54.8%)			2 (28.6%)			290 (37.9%)
≥51		2 (6.5%)			5 (71.4%)			43 (5.6%)
Gender								
Male	31	18 (58.1%)	0.36	7	2 (28.6%)	0.06	766	508 (66.3%)
Female		13 (41.9%)			5 (71.4%)			257 (33.6%)
Other		0 (0.0%)			0 (0.0%)			1 (0.1%)
Medical history								
Any cardiac disease	16	4 (25.0%)	0.07	6	5 (83.3%)	<0.001	591	59 (10.0%)
Any chronic respiratory disease	22	10 (45.5%)	0.09	5	2 (40.0%)	0.62	681	187 (27.5%)
Asthma	16	3 (18.8%)	0.74	5	0 (0.0%)	>0.99	599	99 (16.5%)
Obstructive sleep apnea	16	3 (18.8%)	0.002	5	2 (40.0%)	0.002	599	8 (1.3%)
COPD	16	2 (12.5%)	0.12	5	2 (40.0%)	0.01	599	21 (3.5%)
Diabetes mellitus	16	3 (18.8%)	0.009	5	1 (20.0%)	0.13	599	15 (2.5%)
Any mental, emotional, or behavioral disorder	19	13 (68.4%)	0.10	5	4 (80.0%)	0.20	645	310 (48.1%)
Anxiety	17	10 (58.8%)	0.13	5	3 (60.0%)	0.38	558	214 (38.4%)
Depression	16	5 (31.3%)	0.80	5	3 (60.0%)	0.37	553	204 (36.9%)
ADHD	16	2 (12.5%)	0.19	5	0 (0.0%)	>0.99	599	29 (4.8%)
Chronic conditions**								
Presence of ≥1 chronic condition	17	12 (70.6%)	<0.001	6	5 (83.3%)	0.006	665	170 (25.6%)
Presence of ≥2 chronic conditions		3 (17.6%)	0.03		3 (50.0%)	0.001		25 (3.8%)
No. of chronic conditions† (median [IQR])		1 (0–1)	<0.001		1.5 (1–3)	<0.001		0 (0–1)

Abbreviations: ADHD = attention deficit hyperactivity disorder; COPD = chronic obstructive pulmonary disease; IQR = interquartile range.

* For cases reported by December 10, 2019.

† Includes hospitalized EVALI patients who met the following criteria: 1) an initial hospital discharge date on or before October 31, 2019; 2) no reports of rehospitalization nor death as of December 10, 2019; and 3) available data for at least one variable in all of the following categories: medical history, EVALI symptoms reported, and clinical course of EVALI illness.

§ Comparing EVALI patients who were rehospitalized to those who were not rehospitalized nor died. Fisher's exact tests were used to compare categorical variables, and Kruskal-Wallis tests were used to compare continuous variables.

¶ Comparing EVALI patients who died after discharge to those who were not rehospitalized nor died. Fisher's exact tests were used to compare categorical variables, and Kruskal-Wallis tests were used to compare continuous variables.

** Chronic conditions included here are cardiac disease; asthma; obstructive sleep apnea (OSA); COPD; other respiratory conditions not including asthma, OSA, or COPD; and diabetes mellitus. Examples of "other respiratory conditions" observed among EVALI patients included interstitial lung disease, pulmonary hypertension, and hypersensitivity pneumonitis.

seeking care, there might have been variability in how states defined rehospitalization, or both. Finally, data on insurance status were not collected, so the relationship between EVALI outcomes and insurance status, prescription medication coverage, and access to care in the inpatient and outpatient settings could not be assessed.

Among EVALI patients, careful and comprehensive discharge planning ensuring clinical stability before discharge, follow-up optimally within 48 hours after hospital discharge, and enhanced efforts to coordinate care and address comorbidities might minimize risk for rehospitalizations or death after discharge (*5*). The latest national and state data from patient reports and product sample testing suggest tetrahydrocannabinol-containing e-cigarette, or vaping, products, particularly from informal sources such as friends, family members, or in-person or online dealers, are linked to most of the cases and play a major role in the outbreak (*1*,*7*,*8*). Thus, CDC and FDA recommend that persons not use tetrahydrocannabinol -containing e-cigarette, or vaping, products, particularly from informal sources. Vitamin E acetate, found in product samples tested by the FDA and state laboratories, has also been found in patient lung fluid specimens from a number of geographically diverse states tested by CDC (*9*). However, evidence is not yet sufficient to rule out the contribution of other chemicals of concern. While it appears that vitamin E acetate is associated with EVALI, there are many different substances and product sources that are being investigated, and there may be more than one cause. Therefore, the best way for persons to ensure that they are not at risk while the investigation continues is to consider

TABLE 2. Clinical characteristics upon first reported clinical encounter of e-cigarette, or vaping, product use–associated lung injury (EVALI) patients, by rehospitalization, death after discharge, and no rehospitalization nor death after discharge — United States, 2019*

	Rehospitalization (N = 31)			Death after discharge (N = 7)			No rehospitalization nor death† (N = 768)	
Characteristic	**No.**	**No. (%) or median (IQR)**	**P-value§**	**No.**	**No. (%) or median (IQR)**	**P-value¶**	**No.**	**No. (%) or median (IQR)**
Symptoms at first reported clinical encounter								
Any respiratory**	25	25 (100%)	0.62	7	7 (100%)	>0.99	760	726 (95.5%)
Any gastrointestinal††	24	19 (79.2%)	0.79	6	4 (66.7%)	0.31	732	598 (81.7%)
Any constitutional§§	25	21 (84.0%)	0.14	7	5 (71.4%)	0.10	743	684 (92.1%)
Days between date of symptom onset and first clinical encounter	23	6 (1–15)	0.35	7	3 (1–5)	0.09	679	5 (3–8)
Location of first reported clinical encounter								
Hospital¶¶	31	25 (80.6%)	0.76	7	5 (71.4%)	0.84	762	554 (72.7%)
Emergency department only***		3 (9.7%)			1 (14.3%)			117 (15.4%)
Outpatient/Urgent care		3 (9.7%)			1 (14.3%)			91 (11.9%)

Abbreviation: IQR = interquartile range.

* For cases reported by December 10, 2019.

† Includes hospitalized EVALI patients who met the following criteria: 1) an initial hospital discharge date on or before October 31, 2019; 2) no reports of rehospitalization nor death as of December 10, 2019; and 3) available data for at least one variable in all of the following categories: medical history, EVALI symptoms reported, and clinical course of EVALI illness.

§ Comparing EVALI patients who were rehospitalized to those who were not rehospitalized nor died. Fisher's exact tests were used to compare categorical variables, and Kruskal-Wallis tests were used to compare continuous variables.

¶ Comparing EVALI patients who died after discharge to those who were not rehospitalized nor died. Fisher's exact tests were used to compare categorical variables, and Kruskal-Wallis tests were used to compare continuous variables.

** Common examples include: cough, shortness of breath, chest pain, and difficulty breathing.

†† Common examples include: diarrhea, nausea, vomiting, and abdominal pain.

§§ Common examples include: fever, chills, malaise, fatigue, headache, and body aches.

¶¶ Includes hospitalizations that occurred directly from the emergency department.

*** Does not include emergency department encounters resulting in hospitalization.

refraining from the use of all e-cigarette, or vaping, products. Adults who continue to use e-cigarette, or vaping, products should carefully monitor themselves for symptoms and see a health care provider immediately if they develop symptoms similar to those reported in this outbreak (*5*,*10*). Irrespective of the ongoing investigation, e-cigarette, or vaping, products should never be used by youths, young adults, or pregnant women. Adults using e-cigarette, or vaping, products as an alternative to cigarettes should not go back to smoking; they should weigh all available information and consider using FDA-approved cessation medications.§

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§ https://www.cdc.gov/tobacco/campaign/tips/quit-smoking/index.html?s_cid.

TABLE 3. Clinical course during initial hospitalization of e-cigarette, or vaping, product use–associated lung injury (EVALI) patients, by rehospitalization, death after discharge, and no rehospitalization nor death after discharge — United States, 2019*

	Rehospitalization (N = 31)			Death after discharge (N = 7)			No rehospitalization nor death† (N = 768)	
Characteristic	**No.**	**No. (%) or median (IQR)**	**P-value§**	**No.**	**No. (%) or median (IQR)**	**P-value¶**	**No.**	**No. (%) or median (IQR)**
Admission to intensive care unit	19	9 (47.4%)	0.65	6	6 (100%)	0.006	677	284 (41.9%)
Respiratory failure necessitating intubation and mechanical ventilation	11	4 (36.4%)	0.08	2	2 (100%)	0.03	347	54 (15.6%)
Extracorporeal membrane oxygenation	15	0 (0.0%)	>0.99	5	1 (20.0%)	0.05	459	4 (0.9%)
Corticosteroids	19	17 (89.5%)	>0.99	5	5 (100%)	>0.99	629	555 (88.2%)
Days after initial hospital admission that steroid treatment was initiated	6	1.5 (0–3)	0.40	1	9	N/A	200	1 (0–3)
Duration of steroid treatment (days)	3	20 (5–30)	0.38	1	18	N/A	97	10 (5–17)
Antibiotics received	15	15 (100%)	>0.99	4	4 (100%)	>0.99	518	507 (97.9%)
Imaging								
CT performed	16	16 (100%)	0.38	6	6 (100%)	>0.99	547	498 (91.0%)
Any infiltrates or opacities on CT	11	11 (100%)	>0.99	2	2 (100%)	>0.99	254	253 (99.6%)
Bilateral findings on CT	10	10 (100%)	>0.99	2	2 (100%)	>0.99	254	244 (96.1%)
X-ray performed	16	16 (100%)	>0.99	6	6 (100%)	>0.99	538	522 (97.0%)
Any infiltrates or opacities on x-ray	7	5 (71.4%)	0.13	2	2 (100%)	>0.99	249	227 (91.2%)
Bilateral findings on x-ray	10	6 (60.0%)	0.23	2	2 (100%)	>0.99	262	206 (78.6%)
CT, x-ray, or both performed	17	17 (100%)	>0.99	6	6 (100%)	>0.99	578	578 (100%)
Any infiltrates or opacities	11	11 (100%)	>0.99	2	2 (100%)	>0.99	307	307 (100%)
Bilateral findings on CT, x-ray, or both	11	10 (90.9%)	0.51	2	2 (100%)	>0.99	308	289 (93.8%)
Duration of hospitalization (days)								
First admission	31	4 (2–8)	0.11	7	9 (2–23)	0.33	762	5 (3–8)
Second admission	27	4 (2–8)	N/A	N/A	N/A	N/A	N/A	N/A
Days between discharge from first hospitalization and admission for second hospitalization	31	4 (2–20)	N/A	1	1	N/A	N/A	N/A
Days between discharge from first hospitalization and death	N/A	N/A	N/A	7	3 (2–13)	N/A	N/A	N/A

Abbreviations: CT = computed tomography; IQR = interquartile range; N/A = not applicable.

* For cases reported by December 10, 2019.

† Includes hospitalized EVALI patients who met the following criteria: 1) an initial hospital discharge date on or before October 31, 2019; 2) no reports of rehospitalization nor death as of December 10, 2019; and 3) available data for at least one variable in all of the following categories: medical history, EVALI symptoms reported, and clinical course of EVALI illness.

§ Comparing EVALI patients who were rehospitalized to those who were not rehospitalized nor died. Fisher's exact tests were used to compare categorical variables, and Kruskal-Wallis tests were used to compare continuous variables.

¶ Comparing EVALI patients who died after discharge to those who were not rehospitalized nor died. Fisher's exact tests were used to compare categorical variables, and Kruskal-Wallis tests were used to compare continuous variables.

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Summary

What is already known about this topic?

Some patients hospitalized for e-cigarette, or vaping, product use–associated lung injury (EVALI) have been rehospitalized or have died after hospital discharge.

What is added by this report?

Compared with other EVALI patients, rehospitalized patients and patients who died after hospital discharge were more likely to have one or more chronic conditions, including cardiac disease, chronic pulmonary disease, and diabetes, and to be older. At least one quarter of rehospitalizations and deaths occurred within 2 days after discharge.

What are the implications for public health practice?

Intensive discharge planning, ensuring clinical stability before discharge, optimized case management, and follow-up optimally within 48 hours after hospital discharge might minimize EVALI patients' risk for rehospitalization and death, especially among patients with chronic conditions.

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Lung Injury Response Epidemiology/Surveillance Task Force

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Update: Interim Guidance for Health Care Professionals Evaluating and Caring for Patients with Suspected E-cigarette, or Vaping, Product Use–Associated Lung Injury and for Reducing the Risk for Rehospitalization and Death Following Hospital Discharge — United States, December 2019

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CDC, the Food and Drug Administration, state and local health departments, and public health and clinical stakeholders continue to investigate a nationwide outbreak of e-cigarette, or vaping, product use–associated lung injury (EVALI) (*1*–*4*). Clinical guidance from CDC and state partners for EVALI continues to evolve as more information about EVALI becomes available (*5*–*8*). Among EVALI patients who were rehospitalized or who died after discharge for an EVALI-related hospitalization, a recent study found a high rate of comorbidities and a median interval from discharge to readmission of 4 days and a median interval from discharge to death of 3 days; at least one quarter of rehospitalizations and deaths occurred within 2 days of discharge (*9*). The study findings prompted CDC, in consultation with the Lung Injury Response Clinical Working Group, to update guidance regarding timing of the initial postdischarge follow-up of hospitalized EVALI patients and other EVALI patient management. Updates to current clinical guidance include recommendations for discharge planning and optimized follow-up and case management after discharge that might reduce risk of rehospitalization and avert postdischarge mortality among patients hospitalized for EVALI. Specifically, guidance updates include 1) confirming no clinically significant fluctuations in vital signs for at least 24–48 hours before discharge; 2) ensuring outpatient primary care or pulmonary specialist follow-up, optimally within 48 hours of discharge (previously recommended within 2 weeks of discharge); 3) planning for discharge care, early follow-up, and management of any comorbidities; 4) arranging posthospitalization specialty care; 5) following best practices for medication adherence; and 6) ensuring social support and access to mental and behavioral health and substance use disorder services.

As of December 10, 2019, a total of 2,409 hospitalized EVALI cases have been reported to CDC, including 52 (2%) deaths among EVALI patients. Among 1,139 reported cases with patient hospital discharge by October 31, 2019, 31 (2.7%) patients were rehospitalized after initial discharge (median time to readmission: 4 days [interquartile range: 2–20 days]), and seven patients died following discharge after an EVALI hospitalization (median time to death: 3 days [interquartile range 2–13 days]) (*9*). Characteristics of EVALI patients who were rehospitalized or died following hospital discharge indicate that some chronic medical conditions, including cardiac disease, chronic pulmonary disease (e.g., chronic obstructive pulmonary disease and obstructive sleep apnea), and diabetes, and increasing age are risk factors leading to higher morbidity and mortality among some EVALI patients. For example, 70.6% of patients who were rehospitalized and 83.3 (five of six) of patients who died had one or more chronic conditions, compared with 25.6% of patients who were neither rehospitalized nor died (*9*). EVALI patients who were rehospitalized or died after discharge were older: the median ages of patients who died, were rehospitalized, and who neither died nor were rehospitalized were 54, 27, and 23 years, respectively (*9*).

Confirming stability of certain clinical parameters without clinically significant fluctuations in vital signs (Box) (Supplementary Figure, https://stacks.cdc.gov/view/cdc/83554) before discharge and careful hospital discharge and transition planning might help prevent rehospitalization or death, particularly among those patients with cardiac or chronic respiratory comorbidities who are at higher risk for rehospitalization or death (*9*). In addition, anxiety, depression, attention-deficit/hyperactivity disorder, and other mental or behavioral health conditions were common among all EVALI patients (*9*). Based on the high prevalence of these conditions, appropriate engagement with social and behavioral health services during care transition from hospital to the outpatient setting is also important.

Clinical Guidance Development

To develop this updated clinical guidance, CDC reviewed new data on rehospitalization and death after hospital discharge (*9*), and consulted with the Lung Injury Response Clinical Working Group regarding approaches to clinical management of suspected EVALI patients. Previous EVALI guidance has focused on 1) diagnosis (including obtaining an accurate history and conducting a physical examination that includes vital

BOX. Criteria for determining readiness for hospital discharge of patients with e-cigarette, or vaping, product use–associated lung injury (EVALI)

- Patient is clinically stable for 24–48 hours before discharge
- Initial outpatient follow-up, optimally within 48 hours of discharge is scheduled
- Pulmonology follow-up within 2–4 weeks and at 1–2 months is scheduled
- Additional specialty outpatient follow-up is scheduled according to specific patient characteristics (e.g., endocrinology, cardiology, psychiatry, addiction medicine, physical therapy, pain medicine, and others as indicated)
- Discharge medication reconciliation and counseling of patient by inpatient pharmacist is completed
- Screening for mental health and substance use disorders and social needs and connection to appropriate social care (e.g., social work, behavioral health, community health) is established before discharge
- Health care providers have discussed e-cigarette, or vaping, cessation, documented patient quit plan, and offered evidence-based tobacco use cessation interventions, including behavioral counseling and medications

signs, pulmonary auscultation, and pulse oximetry; laboratory testing to rule out infectious etiologies; radiographic imaging; and consulting a specialist); 2) inpatient and outpatient management (including consideration of empiric administration of corticosteroids and antimicrobials, if indicated); 3) follow-up after hospital admission; and 4) considerations during the influenza season (Figure) (*5*,*7*). This updated guidance highlights health care system best practices for EVALI patients that might improve care quality and reduce the risk for adverse outcomes, including rehospitalization and death. Best practices include carefully assessing clinical readiness for discharge, comprehensive discharge planning (e.g., follow-up with specialty care providers), and ensuring follow-up by primary care or pulmonary specialist, optimally within 48 hours of hospital discharge.

Updated Guidance: Discharge Planning

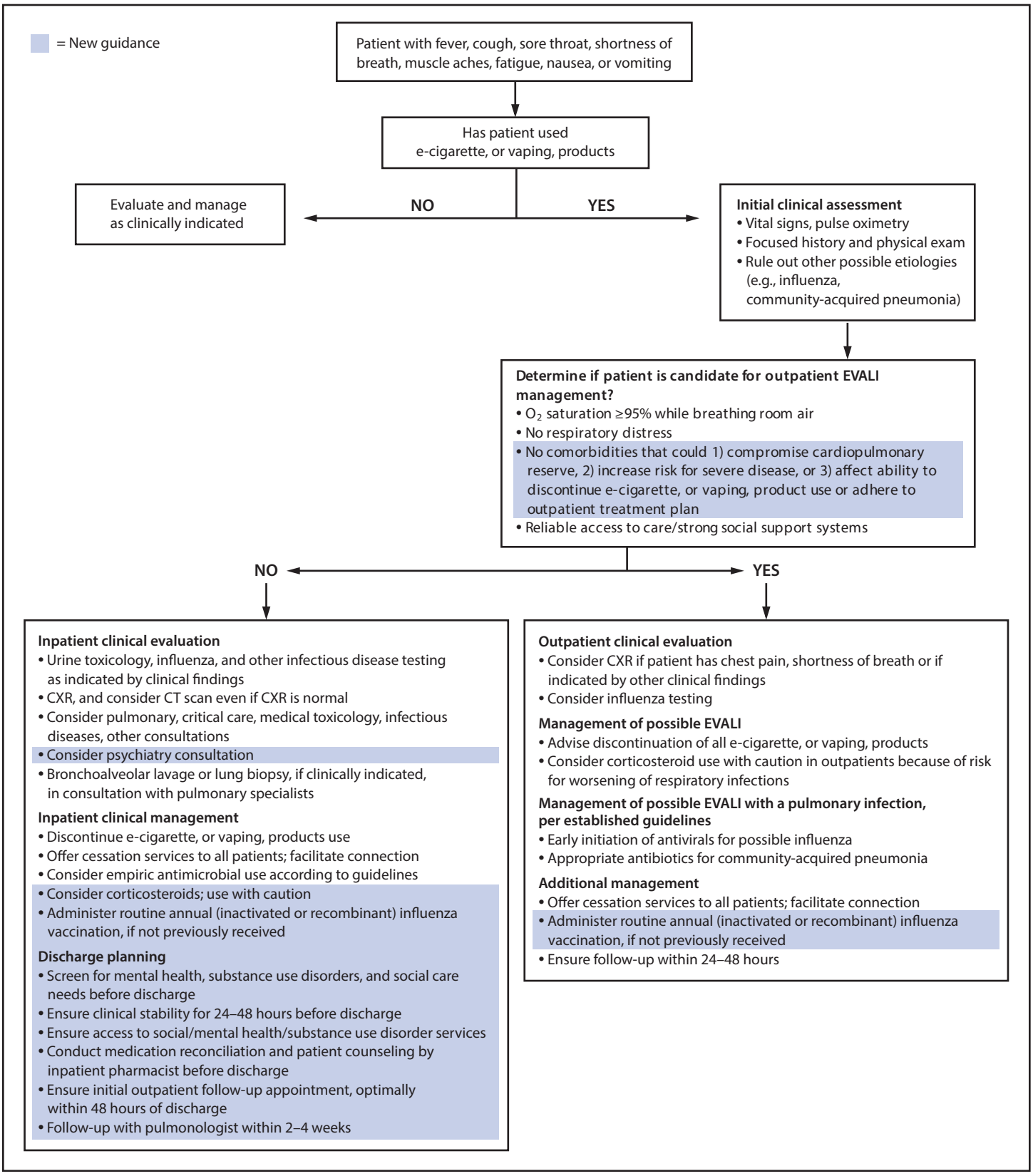
The occurrence of adverse clinical outcomes among EVALI patients shortly after hospital discharge (*9*) underscores the importance of ensuring that patients are clinically stable and have quality posthospital care transitions, which can improve patient outcomes (*10*).

Assess clinical readiness for discharge. Patients should be ready for discharge and meet discharge criteria for at least 24–48 hours before discharge, without clinically significant fluctuations in vital signs (Box) (Supplementary Figure, https://stacks.cdc.gov/view/cdc/83554).

Assure social support and access to mental health and substance use disorder services. Rehospitalized EVALI patients often continue to use e-cigarette, or vaping, products after initial hospitalization (Lung Injury Response Clinical Working Group, personal communication, December 2019). Therefore, during an inpatient admission and during outpatient follow-up, patients should be supported in their efforts to discontinue e-cigarette, or vaping, product use and should be educated that resuming use of e-cigarette, or vaping, products might result in recurrence of lung injury symptoms. EVALI patients might also benefit from evaluation for mental and behavioral health conditions by a social worker, behavioral health professional, psychologist or psychiatrist, or other member of the social care workforce to determine postdischarge support needs (*11*). The U.S. Department of Health and Human Services' Substance Abuse and Mental Health Services Administration offers several helpful mental and behavioral health condition screening tools (*12*). In addition, tools such as the World Health Organization's Alcohol, Smoking, and Substance Involvement Screening Test for adults (*12*) or the CRAFFT-N screening tools for adolescents (*13*) are available to help identify patient need for substance use treatment services (*14*). Approaches to changing behavior, including cognitive-behavioral therapy, contingency management, and motivational enhancement therapy, as well as multidimensional family therapy (a comprehensive family-centered treatment program) have been shown to be effective in reducing drug use in patients with cannabis use disorder, and addiction medicine services should be included in the care plan as appropriate (*15*,*16*). Evidence-based strategies are recommended for the treatment of tobacco product use and dependence (*17*). For patients aged <18 years who use e-cigarette, or vaping, products, health care professionals can consider the use of interventions that have been shown to increase cigarette smoking cessation among adults, including behavioral interventions (*18*). No medications are currently approved by the Food and Drug Administration for cessation of tobacco products, including e-cigarettes, in children and adolescents (*18*).

Follow best practices for medication adherence. A recent analysis found no significant difference in the percentage of discharged EVALI patients who received corticosteroid treatment while hospitalized among those who were rehospitalized, who later died, and who neither required rehospitalization nor died after discharge (*9*). However, clinicians working closely with CDC have reported that rehospitalized EVALI patients

FIGURE. Updated algorithm for management of patients* with suspected e-cigarette, or vaping, product use–associated lung injury (EVALI), December 2019



Abbreviations: CT = computed tomography; CXR = chest x-ray.
* Influenza vaccination recommendations: https://www.cdc.gov/mmwr/volumes/68/rr/rr6803a1.htm?s_cid=rr6803a1_w.

have at times not adhered to prescribed corticosteroid tapers (Lung Injury Response Clinical Working Group, personal communication, December 2019). Patient adherence to prescribed medications has been determined to be enhanced by inpatient pharmacist counseling before patient discharge (*19*,*20*) and that such counseling decreases rehospitalization. Thus, part of EVALI patient discharge planning should include inpatient pharmacist counseling, particularly for patients on a corticosteroid taper. Before hospital discharge, clinicians should evaluate EVALI patients for risk of secondary adrenal insufficiency (*21*) and other consequences of corticosteroid use (*22*) in the context of corticosteroid doses received and patient medical history; for patients who have had a prolonged corticosteroid course, clinicians should consider a corticosteroid taper and follow-up with an endocrinologist (*21*,*22*). Clinicians should also counsel patients about the signs and symptoms of adrenal insufficiency, such as fatigue, decreased appetite, gastrointestinal distress, myalgia, joint pain, salt craving, dizziness, and postural hypotension (*21*) and advise them to seek medical attention should these occur.

Postdischarge medical follow-up. Care transition and follow-up best practices include 1) scheduling follow-up appointments before hospital discharge and assigning patient navigators or community health workers to patients with significant barriers to care; 2) directly connecting patients to community services such as those addressing social determinants of health; 3) checking in by telephone or text; and 4) facilitating home visits by community health workers, home nursing services, or equivalent support staff for the most vulnerable patients (*23*,*24*).

Initial outpatient follow-up. Outpatient follow-up with primary care providers or pulmonology specialists within 48 hours after hospital discharge for EVALI might provide an opportunity to prevent adverse outcomes, including rehospitalization or death. Previous guidance recommended outpatient follow-up within 1–2 weeks (*5*–*8*); however, recent data support ensuring earlier follow-up, optimally within 48 hours (*9*). Early outpatient follow-up has been shown to be effective in improving management of other pulmonary conditions, including asthma (*19*). Outpatient follow-up with primary care providers or pulmonary specialists should include 1) clinically assessing for stable vital signs, physical exam, resolution or symptoms, and normalized laboratory tests; 2) continuing education about EVALI; 3) ensuring adherence with medication regimens such as tapering of corticosteroids (if prescribed at the time of hospital discharge); 4) reinforcing the importance of abstinence from e-cigarette, or vaping, product use; 5) facilitating connection to outpatient care by all providers or services indicated by patients' medical history or conditions; 6) connecting patients to needed social, mental health, and substance use disorder resources; and 7) establishing connection to necessary services.

Pulmonary specialist follow-up. Longer-term pulmonary follow-up should generally occur within 2–4 weeks after discharge (often at completion of the corticosteroid taper) to assess pulmonary function and resolution of radiographic findings (Lung Injury Clinical Working Group, personal communication, December 2019). In addition to this new guidance, CDC continues to recommend follow-up testing 1–2 months after discharge, which might include spirometry, diffusing capacity of the lung for carbon monoxide, and chest x-ray (*7*,*8*).

Other follow-up. Patients who have experienced prolonged immobilization during hospitalization (particularly those with intensive care unit–related deconditioning and muscle atrophy) might benefit from physical therapy. Ongoing engagement with addiction medicine and mental health services should be considered.

New data have provided insight into characteristics of EVALI patients who have been rehospitalized or have died after an EVALI-related hospitalization. In consultation with the Lung Injury Response Clinical Working Group, CDC is using these data to update clinical guidance to include recommendations for outpatient follow-up, optimally within 48 hours after hospital discharge and for specific considerations concerning discharge planning and care transitions. Incorporating these updated recommendations into the management of patients with EVALI might reduce their risk for rehospitalization and avert further mortality among patients hospitalized for EVALI.

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Summary

What is already known on this topic?

In a recent examination of rehospitalization and death among previously hospitalized patients with e-cigarette or vaping, product use–associated lung injury (EVALI), at least one quarter of rehospitalizations and deaths occurred within 2 days of discharge; comorbidities were common among patients who were rehospitalized or who died after discharge.

What is added by this report?

Updated guidance recommends posthospitalization outpatient follow-up, optimally within 48 hours of discharge, and emphasizes the importance of preparation for hospital discharge and postdischarge care coordination to reduce risk of rehospitalization and death among hospitalized EVALI patients.

What are the implications for public health practice?

Incorporating this updated guidance into the management of hospitalized EVALI patients might reduce EVALI-associated morbidity and mortality.

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Erratum

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In the report "Use of 13-Valent Pneumococcal Conjugate Vaccine and 23-Valent Pneumococcal Polysaccharide Vaccine Among Adults Aged ≥65 Years: Updated Recommendations of the Advisory Committee on Immunization Practices," on page 1074, the ACIP Pneumococcal Vaccines Work Group should have included **Nancy Bennett, University of Rochester Medical Center**, and **Monica Farley, Veterans Affairs Medical Center and Emory University Department of Medicine**.

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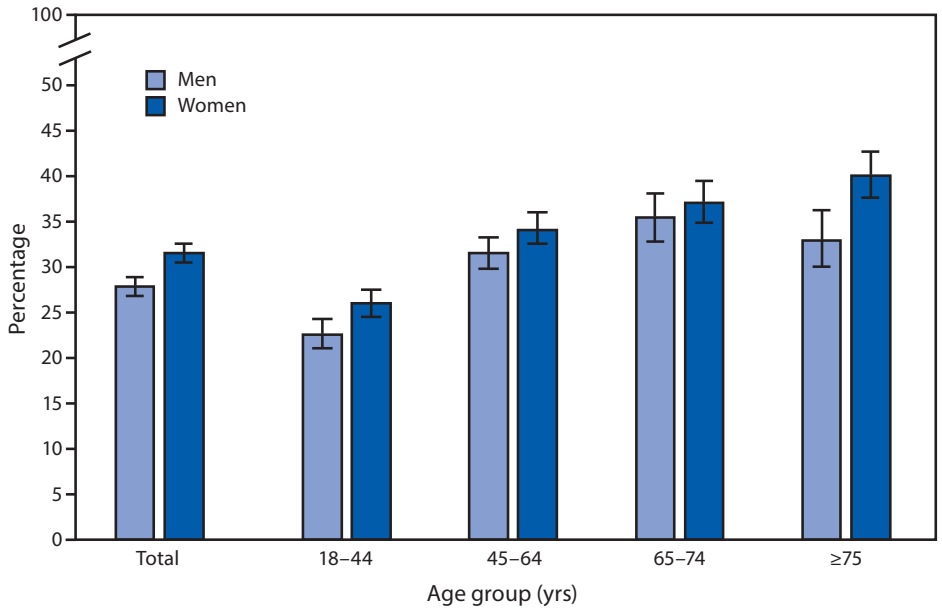
In the report "World AIDS Day — December 1," on page 1089, the fourth reference should have read as follows:

4. **Holmes JR**, Dinh T-H, Farach N, et al. Status of HIV case-based surveillance implementation in 39 U.S. PEPFAR-supported countries, May–July 2019. MMWR Morb Mortal Wkly Rep 2019;68:1089–95.

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Adults Aged ≥18 Years Who Had Lower Back Pain in the Past 3 Months,† by Sex and Age Group — National Health Interview Survey,§ United States, 2018



* With 95% confidence intervals indicated by error bars.
† Based on a response to the question "During the past 3 months, did you have lower back pain?"
§ Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population and are derived from the National Health Interview Survey Sample Adult component.

In 2018, 28.0% of men and 31.6% of women aged ≥18 years had lower back pain in the past 3 months. The percentage of women who had lower back pain increased as age increased. Among men, the percentage increased with age through age 74 years and then decreased. Women in the age groups 18–44, 45–64, and ≥75 years were more likely to have lower back pain in the past 3 months than were men in the same age groups, but percentages were similar between men and women in the age group 65–74 years.

Source: National Health Interview Survey, 2018. https://www.cdc.gov/nchs/nhis/index.htm.

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