

CORRESPONDENCE

The Covid-19 Pandemic and the Incidence of Acute Myocardial Infarction

TO THE EDITOR: During the Covid-19 pandemic, reports have suggested a decrease in the number of patients presenting to hospitals because of emergency conditions such as acute myocardial infarction.^{1,2} We examined this issue using data from Kaiser Permanente Northern California, a large integrated health care delivery system with 21 medical centers and 255 clinics that provides comprehensive care for more than 4.4 million persons throughout Northern California.³

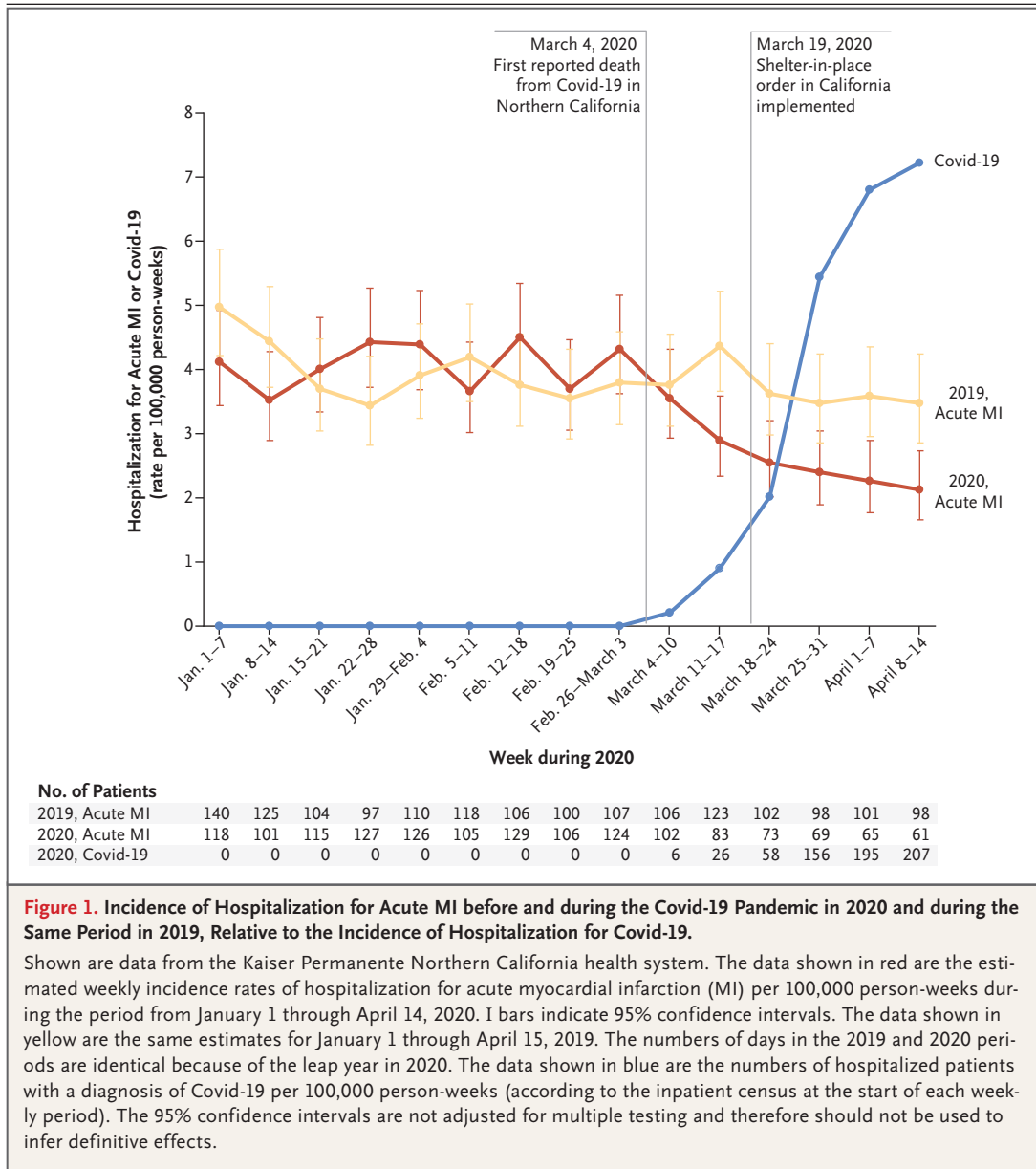
We examined patient characteristics and weekly incidence rates of hospitalization for acute myocardial infarction (ST-segment elevation myocardial infarction [STEMI] or non-ST-segment elevation myocardial infarction [NSTEMI]) among adults in the Kaiser Permanente system before and after the first reported death from Covid-19 in Northern California on March 4, 2020.⁴ We compared these data with data from the same period in 2019. Incidence rates (events per 100,000 person-weeks) for the Covid-19 period (March 4 through April 14, 2020) were calculated and compared with those from the pre-Covid-19 period (January 1 through March 3, 2020), and incidence rates from January 1 through April 14, 2020, were compared with those from the corresponding period in 2019 (January 1 through April 15, 2019). In addition, incidence rates for each week from March 5 through April 15, 2019, were compared with those in the period from January 1 through March 4, 2019. Incidence rate ratios were used to compare the relative change in event rates between the periods and were calculated for key patient subgroups. Details are provided in the Supplemental Methods section in the Supplementary Appendix, available with the full text of this letter at NEJM.org.

Data from 43,017,810 person-weeks from January 1 through April 14, 2020, were evaluated. The weekly rates of hospitalization for acute myocardial infarction decreased by up to 48% during the Covid-19 period. From January 1 through

March 3, 2020, a total of 1051 hospitalization events occurred (incidence rate, 4.1 per 100,000 person-weeks), and from April 8 through April 14, 2020, a total of 61 hospitalization events occurred (incidence rate, 2.1 per 100,000 person-weeks) (incidence rate ratio, 0.52; 95% confidence interval [CI], 0.40 to 0.68; $P < 0.001$) (Fig. 1, and Table S2 in the Supplementary Appendix). Decreases were similar among patients with NSTEMI (incidence rate ratio, 0.51; 95% CI, 0.38 to 0.68) and those with STEMI (incidence rate ratio, 0.60; 95% CI, 0.33 to 1.08) (Fig. S1 and Table S2). The decrease seen in the comparison of the Covid-19 period with the pre-Covid-19 period in 2020 was similar to the decrease seen in the comparison of the Covid-19 period in 2020 with the same weekly periods in 2019 (Fig. 1, Fig. S1, and Table S3).

Among patients who presented during the Covid-19 period from March 4 through April 14, 2020, the prevalences of preexisting coronary artery disease, previous acute myocardial infarction, and percutaneous coronary intervention were lower than among those who presented during the pre-Covid-19 period (from January 1 through March 3, 2020) and among those who presented from January 1 through April 15, 2019. However, demographic characteristics, hemodynamic measures (vital signs) on admission, initial and peak troponin I values, and the burden of other examined coexisting conditions were similar in patients who presented during the Covid-19 period and in those who presented from January 1 through March 3, 2020, and in those who presented from January 1 through April 15, 2019 (Table S4). Decreases in hospitalizations for acute myocardial infarction according to patient age (<65 years or ≥ 65 years), sex, and the presence or absence of diabetes are shown in Table S5.

In a large diverse community setting in California, the incidence of hospitalization for acute myocardial infarction declined after March 4, 2020, during the Covid-19 pandemic, more than



would be expected on the basis of typical seasonal variation alone. Similar findings have been noted in northern Italy.⁵

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1. Krumholz HM. Where have all the heart attacks gone? *New York Times*. April 6, 2020.

2. Garcia S, Albaghdadi MS, Meraj PM, et al. Reduction in ST-segment elevation cardiac catheterization laboratory activations in the United States during COVID-19 pandemic. *J Am Coll Cardiol* 2020 April 9 (Epub ahead of print).

3. Gordon NP. Characteristics of adult health plan members in Kaiser Permanente's Northern California region, as estimated from the 2011 member health survey. Oakland, CA: Division of Research, Kaiser Permanente Medical Care Program, April 2013.

4. Graff A. California reports its first coronavirus death. *San Francisco Chronicle*. March 4, 2020.

5. De Filippo O, D'Ascenzo F, Angelini F, et al. Reduced rate of hospital admissions for ACS during Covid-19 outbreak in northern Italy. *N Engl J Med*. DOI:10.1056/NEJMc2009166.

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