

CORRESPONDENCE

Reduced Rate of Hospital Admissions for ACS during Covid-19 Outbreak in Northern Italy

TO THE EDITOR: To address the coronavirus (Covid-19) pandemic,¹ strict social containment measures have been adopted worldwide, and health care systems have been reorganized to cope with the enormous increase in the numbers of acutely ill patients.^{2,3} During this same period, some changes in the pattern of hospital admissions for other conditions have been noted. The aim of the present analysis is to investigate the rate of hospital admissions for acute coronary syndrome (ACS) during the early days of the Covid-19 outbreak.

In this study, we performed a retrospective analysis of clinical and angiographic characteristics of consecutive patients who were admitted

for ACS at 15 hospitals in northern Italy. All the hospitals were hubs of local networks for treatment involving primary percutaneous coronary intervention. The study period was defined as the time between the first confirmed case of Covid-19 in Italy (February 20, 2020) and March 31, 2020. We compared hospitalization rates between the study period and two control periods: a corresponding period during the previous year (February 20 to March 31, 2019) and an earlier period during the same year (January 1 to February 19, 2020). The primary outcome was the overall rate of hospital admissions for ACS. We calculated incidence rates for the primary outcome by dividing the number of cumulative admissions

Table 1. Comparison of Hospital Admissions for Acute Coronary Syndrome (ACS) in Northern Italy between the Onset of the Covid-19 Outbreak and Two Control Periods.*

ACS Subtype	No. of Patients	Study Period (N=547)	Control Periods	
			Same Year (N=899)	Previous Year (N=756)
All ACS	2202			
No. of daily admissions		13.3	18.0	18.9
Incidence rate ratio (95% CI)			0.74 (0.66–0.82)	0.70 (0.63–0.78)
P value			<0.001	<0.001
STEMI	957			
No. of daily admissions		6.1	7.8	8.0
Incidence rate ratio (95% CI)			0.77 (0.66–0.91)	0.75 (0.64–0.89)
NSTEMI	832			
No. of daily admissions		4.2	7.1	7.5
Incidence rate ratio (95% CI)			0.59 (0.49–0.71)	0.56 (0.46–0.67)
Unstable angina	413			
No. of daily admissions		3.1	3.1	3.4
Incidence rate ratio (95% CI)			1.00 (0.79–1.26)	0.91 (0.72–1.16)

* The study period was defined as the time between the first confirmed case of Covid-19 in Italy (February 20, 2020) and March 31, 2020. The two control periods were from January 1 to February 19, 2020 (same year) and from February 20 to March 31, 2019 (previous year). The 95% confidence intervals are not adjusted for multiple testing and therefore should not be used to infer definitive effects. CI denotes confidence interval, NSTEMI non-ST-segment elevation myocardial infarction, and STEMI ST-segment elevation myocardial infarction.

by the number of days for each time period. Incidence rate ratios comparing the study period with each of the control periods were calculated with the use of Poisson regression. (Details regarding the study methods are provided in the Supplementary Appendix, available with the full text of this letter at NEJM.org.)

Of the 547 patients who were hospitalized for ACS during the study period, 420 (76.8%) were males; the mean (\pm SD) age was 68 ± 12 years. Of these patients, 248 (45.3%) presented with ST-segment elevation myocardial infarction (STEMI). The mean admission rate for ACS during the study period was 13.3 admissions per day. This rate was significantly lower than either the rate during the earlier period in the same year (total number of admissions, 899; 18.0 admissions per day; incidence rate ratio, 0.74; 95% confidence interval [CI], 0.66 to 0.82; $P<0.001$) or the rate during the previous year (total number of admissions, 756; 18.9 admissions per day; incidence rate ratio, 0.70; 95% CI, 0.63 to 0.78; $P<0.001$). The incidence rate ratios for individual ACS subtypes are presented in Table 1. After the national lockdown was implemented on March 8, 2020,⁴ a further reduction in ACS admissions was reported. (Details regarding the full secondary analyses are provided in the Supplementary Appendix.)

This report shows a significant decrease in ACS-related hospitalization rates across several cardiovascular centers in northern Italy during the early days of the Covid-19 outbreak. Recent data suggest a significant increase in mortality during this period that was not fully explained by Covid-19 cases alone.⁵ This observation and data from our study raise the question of whether some patients have died from ACS without seeking medical attention during the Covid-19 pandemic.

Ovidio De Filippo, M.D.

Fabrizio D'Ascenzo, M.D., Ph.D.

Filippo Angelini, M.D.

Pier Paolo Bocchino, M.D.

Federico Conrotto, M.D.

Andrea Saglietto, M.D.

Azienda Ospedaliera Universitaria Città della Salute e della Scienza di Torino
Turin, Italy
fabrizio.dascenzo@unito.it

Gioel Gabrio Secco, M.D.

Azienda Ospedaliera SS Antonio e Biagio e Cesare Arrigo
Alessandria, Italy

Gianluca Campo, M.D.

Azienda Ospedaliera Universitaria di Ferrara
Ferrara, Italy

Guglielmo Gallone, M.D.

Roberto Verardi, M.D.

Azienda Ospedaliera Universitaria Città della Salute e della Scienza di Torino
Turin, Italy

Luca Gaido, M.D.

Ospedale Maria Vittoria
Turin, Italy

Mario Iannaccone, M.D.

Ospedale San Giovanni Bosco
Turin, Italy

Marcello Galvani, M.D.

Ospedale Morgagni
Forlì, Italy

Fabrizio Ugo, M.D.

Presidio Ospedaliero Sant'Andrea di Vercelli
Vercelli, Italy

Umberto Barbero, M.D.

Ospedale Civile SS Annunziata
Savigliano, Italy

Vincenzo Infantino, M.D.

Ospedale di Ciriè
Ciriè, Italy

Luca Olivotti, M.D.

Ospedale Santa Corona
Pietra Ligure, Italy

Marco Mennuni, M.D.

Azienda Ospedaliera Universitaria Maggiore della Carità
Novara, Italy

Sebastiano Gili, M.D.

IRCCS Centro Cardiologico Monzino
Milan, Italy

Fabio Infusino, M.D.

Sapienza University of Rome
Rome, Italy

Matteo Vercellino, M.D.

Azienda Ospedaliera SS Antonio e Biagio e Cesare Arrigo
Alessandria, Italy

Ottavio Zucchetti, M.D.

Azienda Ospedaliera Universitaria di Ferrara
Ferrara, Italy

Gianni Casella, M.D.

Ospedale Maggiore Carlo Alberto Pizzardi
Bologna, Italy

Massimo Giammaria, M.D.

Ospedale Maria Vittoria
Turin, Italy

Giacomo Boccuzzi, M.D.

Ospedale San Giovanni Bosco
Turin, Italy

Paolo Tolomeo, M.D.

Azienda Ospedaliera Universitaria di Ferrara
Ferrara, Italy

Baldassarre Doronzo, M.D.

Ospedale Civile SS Annunziata
Savigliano, Italy

Gaetano Senatore, M.D.

Ospedale di Ciriè
Ciriè, Italy

Walter Grosso Marra, M.D.

Ospedale di Ivrea
Ivrea, Italy

Andrea Rognoni, M.D.

Azienda Ospedaliera Universitaria Maggiore della Carità
Novara, Italy

Daniela Trabattoni, M.D.

IRCCS Centro Cardiologico Monzino
Milan, Italy

Luca Franchin, M.D.

Andrea Borin, M.D.

Francesco Bruno, M.D.

Azienda Ospedaliera Universitaria Città della Salute e della
Scienza di Torino
Turin, Italy

Alessandro Galluzzo, M.D.

Presidio Ospedaliero Sant'Andrea di Vercelli
Vercelli, Italy

Alfonso Gambino, M.D.

Ospedale Santa Croce
Moncalieri, Italy

Annamaria Nicolino, M.D.

Ospedale Santa Corona
Pietra Ligure, Italy

Alessandra Truffa Giachet, M.D.

Ospedale Cardinal Massaia
Asti, Italy

Gennaro Sardella, M.D.

Francesco Fedele, M.D.

Sapienza University of Rome
Rome, Italy

Silvia Monticone, M.D., Ph.D.

University of Torino
Turin, Italy

Antonio Montefusco, M.D.

Pierluigi Omedè, M.D.

Mauro Pennone, M.D.

Azienda Ospedaliera Universitaria Città della Salute e della
Scienza di Torino
Turin, Italy

Giuseppe Patti, M.D.

University of Eastern Piedmont
Novara, Italy

Massimo Mancone, M.D.

Sapienza University of Rome
Rome, Italy

Gaetano M. De Ferrari, M.D.

University of Torino
Turin, Italy

Drs. De Filippo and D'Ascenzo contributed equally to this letter.

Disclosure forms provided by the authors are available with the full text of this letter at [NEJM.org](https://www.nejm.org).

This letter was published on April 28, 2020, at [NEJM.org](https://www.nejm.org).

1. Zhou P, Yang XL, Wang XG, et al. A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature* 2020;579:270-3.

2. Saglietto A, D'Ascenzo F, Zoccai GB, De Ferrari GM. COVID-19 in Europe: the Italian lesson. *Lancet* 2020;395:1110-1.

3. Grasselli G, Pesenti A, Cecconi M. Critical care utilization for the COVID-19 outbreak in Lombardy, Italy: early experience and forecast during an emergency response. *JAMA* 2020 March 13 (Epub ahead of print).

4. Government of Italy decree of the president of the Council of Ministers 9 March 2020 (<https://www.gazzettaufficiale.it/eli/id/2020/03/09/20A01558/sg>). (In Italian.)

5. L'andamento dei decessi del 2020. Dati anticipatori sulla base del sistema ANPR. Istat, March 31, 2020 (https://www.istat.it/it/files/2020/03/Decessi_2020_Nota.pdf). (In Italian.)

DOI: 10.1056/NEJMc2009166

Correspondence Copyright © 2020 Massachusetts Medical Society.