Appendix

Hospital resource use and in-hospital mortality before and during the COVID-19 pandemic: a nationwide cohort study
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Table S1 - ICD-10 codes for COVID-19.

Name	**ICD-10 diagnosis code**	**Code position**
COVID-19, virus confirmed	U071	Any
COVID-19, virus not confirmed	U072	Any

Table S2 - ICD-10 codes for baseline characteristics and outcomes.

Name of group	**ICD-10 diagnosis code**	**Code position: Comorbidities**
Hypertension	I10-I13, I15, I674	Any
Obesity (BMI ≥ 30.0 kg/m2)	E65-E66	Any
Coronary artery disease	I20-I25	Any
Congestive heart failure	I50, I110, I130, I132	Any
Cerebrovascular disease	I60-I67, I69	Any
Chronic obstructive pulmonary disease	J44	Any
Chronic kidney disease	N18	Any
Solid tumor	C0-C7	Any
Liver disease including cirrhosis	K7, K703, K717, K744, K746 K7470-K7472	Any
Diabetes mellitus type 1 and 2	E10, E11	Any

Table S3 - Multivariable random slope mixed-effects model of changes in in-hospital mortality, hospital length of stay, 30-day hospital readmission, and facility discharge for exposure and control group in patients with cardiovascular disease between January 2018 and December 2021.

Outcome and study phase[a]	Coefficient (95% CI)[b]	Slope (95% CI)[c]	P-value		
			Slope differs from zero	Change in slope from prior slope	Difference in slopes (Control vs Exposure group)
In-hospital mortality					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0261 (-0.0264 to -0.0258)	-0.0261 (-0.0264 to -0.0258)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	0.0015 (0.0009 to 0.0020)	-0.0246 (-0.0250 to -0.0242)	< 0.001	< 0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0456 (0.0451 to 0.0461)	0.0195 (0.0192 to 0.0198)	< 0.001	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.3617 (0.3605 to 0.3629)	0.3827 (0.3817 to 0.3836)	< 0.001	< 0.001	< 0.001
Hospital length of stay[d]					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0372 (-0.0409 to -0.0334)	-0.0372 (-0.0409 to -0.0334)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	0.0049 (0.0001 to 0.0096)	-0.0323 (-0.0351 to -0.0295)	< 0.001	0.0439	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0358 (0.0307 to 0.0409)	-0.0014 (-0.0051 to 0.0023)	0.4655	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.1791 (0.1685 to 0.1896)	0.1826 (0.1754 to 0.1898)	< 0.001	< 0.001	< 0.001
30-day hospital readmission					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0079 (-0.0084 to -0.0075)	-0.0079 (-0.0084 to -0.0075)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	-0.0084 (-0.0091 to -0.0076)	-0.0163 (-0.0169 to -0.0157)	< 0.001	< 0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	-0.0255 (-0.0261 to -0.0249)	-0.0334 (-0.0339 to -0.0330)	< 0.001	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	-0.3749 (-0.3764 to -0.3733)	-0.4167 (-0.4179 to -0.4154)	< 0.001	< 0.001	< 0.001

Facility discharge					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0124 (-0.0128 to -0.0120)	-0.0124 (-0.0128 to -0.0120)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	0.0179 (0.0172 to 0.0186)	0.0055 (0.0049 to 0.0061)	< 0.001	< 0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0260 (0.0254 to 0.0265)	0.0135 (0.0131 to 0.0139)	< 0.001	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.2624 (0.2610 to 0.2639)	0.2939 (0.2927 to 0.2951)	< 0.001	< 0.001	< 0.001

CI, confidence interval; NA, not applicable.

[a] Time is treated continuously; coefficients and slopes are reported in monthly estimates (e.g., change per one month).

[b] Model includes patient`s age, sex, housing condition, Elixhauser comorbidity index, and the Hospital Frailty Risk Score.

[c] Slope during the pandemic can be derived by summing coefficient from the pre-pandemic and pandemic phase.

[d] Regression coefficients and slopes for hospital length of stay are provided in days.

The exposure group included patients diagnosed with COVID-19 or a randomly split pre-pandemic subset, while the control group included those without COVID-19 or a randomly split pre-pandemic subset.

Table S4 - Multivariable random slope mixed-effects model of changes in in-hospital mortality, hospital length of stay, 30-day hospital readmission, and facility discharge for exposure and control group in patients with COPD between January 2018 and December 2021.

Outcome and study phase[a]	Coefficient (95% CI)[b]	Slope (95% CI)[c]	P-value		
			Slope differs from zero	Change in slope from prior slope	Difference in slopes (Control vs Exposure group)
In-hospital mortality					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0240 (-0.0249 to -0.0232)	-0.0240 (-0.0249 to -0.0232)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	0.0023 (0.0009 to 0.0037)	-0.0217 (-0.0229 to -0.0206)	< 0.001	0.0015	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0413 (0.0402 to 0.0425)	0.0173 (0.0164 to 0.0181)	< 0.001	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.3736 (0.3706 to 0.3765)	0.3931 (0.3907 to 0.3956)	< 0.001	< 0.001	< 0.001
Hospital length of stay[d]					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0389 (-0.0496 to -0.0282)	-0.0389 (-0.0496 to -0.0282)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	0.0020 (-0.0119 to 0.0159)	-0.0369 (-0.0453 to -0.0285)	< 0.001	0.7768	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0350 (0.0202 to 0.0497)	-0.0040 (-0.0147 to 0.0068)	0.4715	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.1604 (0.1287 to 0.1921)	0.1585 (0.1361 to 0.1809)	< 0.001	< 0.001	< 0.001
30-day hospital readmission					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0097 (-0.0108 to -0.0085)	-0.0097 (-0.0108 to -0.0085)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	-0.0112 (-0.0132 to -0.0092)	-0.0209 (-0.0224 to -0.0193)	< 0.001	< 0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	-0.0206 (-0.0223 to -0.0190)	-0.0303 (-0.0315 to -0.0292)	< 0.001	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	-0.3793 (-0.3835 to -0.3751)	-0.4208 (-0.4242 to -0.4174)	< 0.001	< 0.001	< 0.001

Facility discharge					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0134 (-0.0145 to -0.0124)	-0.0134 (-0.0145 to -0.0124)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	0.0192 (0.0174 to 0.0210)	0.0057 (0.0043 to 0.0072)	< 0.001	< 0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0249 (0.0235 to 0.0264)	0.0115 (0.0105 to 0.0125)	< 0.001	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.2613 (0.2576 to 0.2651)	0.2920 (0.2889 to 0.2951)	< 0.001	< 0.001	< 0.001

CI, confidence interval; NA, not applicable.

[a] Time is treated continuously; coefficients and slopes are reported in monthly estimates (e.g., change per one month).

[b] Model includes patient`s age, sex, housing condition, Elixhauser comorbidity index, and the Hospital Frailty Risk Score.

[c] Slope during the pandemic can be derived by summing coefficient from the pre-pandemic and pandemic phase.

[d] Regression coefficients and slopes for hospital length of stay are provided in days.

The exposure group included patients diagnosed with COVID-19 or a randomly split pre-pandemic subset, while the control group included those without COVID-19 or a randomly split pre-pandemic subset.

Table S5 - Multivariable random slope mixed-effects model of changes in in-hospital mortality, hospital length of stay, 30-day hospital readmission, and facility discharge for exposure and control group in patients with diabetes mellitus between January 2018 and December 2021.

Outcome and study phase[a]	Coefficient (95% CI)[b]	Slope (95% CI)[c]	P-value		
			Slope differs from zero	Change in slope from prior slope	Difference in slopes (Control vs Exposure group)
In-hospital mortality					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0308 (-0.0315 to -0.0301)	-0.0308 (-0.0315 to -0.0301)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	0.0020 (0.0008 to 0.0031)	-0.0288 (-0.0297 to -0.0279)	< 0.001	0.0007	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0554 (0.0545 to 0.0563)	0.0246 (0.0240 to 0.0253)	< 0.001	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.3410 (0.3389 to 0.3432)	0.3676 (0.3659 to 0.3693)	< 0.001	< 0.001	< 0.001
Hospital length of stay[d]					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0426 (-0.0499 to -0.0353)	-0.0426 (-0.0499 to -0.0353)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	0.0023 (-0.0070 to 0.0117)	-0.0403 (-0.0458 to -0.0348)	< 0.001	0.6273	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0509 (0.0410 to 0.0608)	0.0083 (0.0010 to 0.0156)	0.0254	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.1826 (0.1628 to 0.2024)	0.1932 (0.1804 to 0.2061)	< 0.001	< 0.001	< 0.001
30-day hospital readmission					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0032 (-0.0040 to -0.0023)	-0.0032 (-0.0040 to -0.0023)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	-0.0132 (-0.0146 to -0.0118)	-0.0164 (-0.0174 to -0.0153)	< 0.001	< 0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	-0.0354 (-0.0365 to -0.0342)	-0.0385 (-0.0394 to -0.0377)	< 0.001	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	-0.3511 (-0.3538 to -0.3483)	-0.4028 (-0.4049 to -0.4008)	< 0.001	< 0.001	< 0.001

Facility discharge					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0155 (-0.0163 to -0.0148)	-0.0155 (-0.0163 to -0.0148)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	0.0172 (0.0158 to 0.0185)	0.0016 (0.0005 to 0.0028)	0.0040	< 0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0325 (0.0315 to 0.0335)	0.0170 (0.0162 to 0.0177)	< 0.001	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.2446 (0.2421 to 0.2472)	0.2787 (0.2767 to 0.2808)	< 0.001	< 0.001	< 0.001

CI, confidence interval; NA, not applicable.

[a] Time is treated continuously; coefficients and slopes are reported in monthly estimates (e.g., change per one month).

[b] Model includes patient`s age, sex, housing condition, Elixhauser comorbidity index, and the Hospital Frailty Risk Score.

[c] Slope during the pandemic can be derived by summing coefficient from the pre-pandemic and pandemic phase.

[d] Regression coefficients and slopes for hospital length of stay are provided in days.

The exposure group included patients diagnosed with COVID-19 or a randomly split pre-pandemic subset, while the control group included those without COVID-19 or a randomly split pre-pandemic subset.

Table S6 - Multivariable random slope mixed-effects model of changes in in-hospital mortality, hospital length of stay, 30-day hospital readmission, and facility discharge for exposure and control group in patients with chronic kidney disease between January 2018 and December 2021.

Outcome and study phase[a]	Coefficient (95% CI)[b]	Slope (95% CI)[c]	P-value		
			Slope differs from zero	Change in slope from prior slope	Difference in slopes (Control vs Exposure group)
In-hospital mortality					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0268 (-0.0274 to -0.0262)	-0.0268 (-0.0274 to -0.0262)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	0.0041 (0.0032 to 0.0051)	-0.0226 (-0.0234 to -0.0219)	< 0.001	< 0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0464 (0.0456 to 0.0473)	0.0197 (0.0191 to 0.0203)	< 0.001	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.3751 (0.3731 to 0.3771)	0.3989 (0.3974 to 0.4005)	< 0.001	< 0.001	< 0.001
Hospital length of stay[d]					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0379 (-0.0451 to -0.0307)	-0.0379 (-0.0451 to -0.0307)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	-0.0064 (-0.0155 to 0.0028)	-0.0442 (-0.0496 to -0.0388)	< 0.001	0.1718	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0334 (0.0236 to 0.0433)	-0.0044 (-0.0116 to 0.0028)	0.2271	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.1489 (0.1282 to 0.1696)	0.1381 (0.1238 to 0.1524)	< 0.001	< 0.001	< 0.001
30-day hospital readmission					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0098 (-0.0105 to -0.0090)	-0.0098 (-0.0105 to -0.0090)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	-0.0101 (-0.0114 to -0.0089)	-0.0199 (-0.0208 to -0.0189)	< 0.001	< 0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	-0.0216 (-0.0227 to -0.0205)	-0.0313 (-0.0321 to -0.0306)	< 0.001	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	-0.3790 (-0.3816 to -0.3763)	-0.4204 (-0.4225 to -0.4183)	< 0.001	< 0.001	< 0.001

Facility discharge					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0131 (-0.0138 to -0.0124)	-0.0131 (-0.0138 to -0.0124)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	0.0215 (0.0204 to 0.0227)	0.0084 (0.0075 to 0.0094)	< 0.001	< 0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0275 (0.0265 to 0.0285)	0.0144 (0.0137 to 0.0151)	< 0.001	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.2681 (0.2656 to 0.2705)	0.3040 (0.3021 to 0.3060)	< 0.001	< 0.001	< 0.001

CI, confidence interval; NA, not applicable.

[a] Time is treated continuously; coefficients and slopes are reported in monthly estimates (e.g., change per one month).

[b] Model includes patient`s age, sex, housing condition, Elixhauser comorbidity index, and the Hospital Frailty Risk Score.

[c] Slope during the pandemic can be derived by summing coefficient from the pre-pandemic and pandemic phase.

[d] Regression coefficients and slopes for hospital length of stay are provided in days.

The exposure group included patients diagnosed with COVID-19 or a randomly split pre-pandemic subset, while the control group included those without COVID-19 or a randomly split pre-pandemic subset.

Table S7 - Multivariable random slope mixed-effects model of changes in in-hospital mortality, hospital length of stay, 30-day hospital readmission, and facility discharge for exposure and control group in patients with solid cancer between January 2018 and December 2021.

Outcome and study phase[a]	Coefficient (95% CI)[b]	Slope (95% CI)[c]	P-value		
			Slope differs from zero	Change in slope from prior slope	Difference in slopes (Control vs Exposure group)
In-hospital mortality					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0167 (-0.0173 to -0.0161)	-0.0167 (-0.0173 to -0.0161)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	0.0029 (0.0019 to 0.0038)	-0.0138 (-0.0145 to -0.0131)	< 0.001	< 0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0268 (0.0259 to 0.0276)	0.0101 (0.0095 to 0.0107)	< 0.001	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.3865 (0.3841 to 0.3888)	0.3995 (0.3975 to 0.4014)	< 0.001	< 0.001	< 0.001
Hospital length of stay[d]					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0190 (-0.0303 to -0.0077)	-0.0190 (-0.0303 to -0.0077)	0.0010	NA	NA
Phase 2 (01/2020 to 12/2021)	-0.0153 (-0.0297 to -0.0009)	-0.0343 (-0.0429 to -0.0257)	< 0.001	0.0369	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0282 (0.0129 to 0.0434)	0.0092 (-0.0021 to 0.0205)	0.1118	NA	0.0001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.1338 (0.0967 to 0.1709)	0.1277 (0.0987 to 0.1566)	< 0.001	< 0.001	< 0.001
30-day hospital readmission					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0190 (-0.0200 to -0.0181)	-0.0190 (-0.0200 to -0.0181)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	-0.0039 (-0.0055 to -0.0024)	-0.0230 (-0.0242 to -0.0217)	< 0.001	< 0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	-0.0049 (-0.0061 to -0.0036)	-0.0239 (-0.0248 to -0.0230)	< 0.001	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	-0.4148 (-0.4186 to -0.4109)	-0.4426 (-0.4460 to -0.4392)	< 0.001	< 0.001	< 0.001

Facility discharge					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0050 (-0.0058 to -0.0042)	-0.0050 (-0.0058 to -0.0042)	< 0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	0.0196 (0.0183 to 0.0209)	0.0146 (0.0136 to 0.0157)	< 0.001	< 0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0140 (0.0129 to 0.0151)	0.0090 (0.0082 to 0.0098)	< 0.001	NA	< 0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.2825 (0.2792 to 0.2858)	0.3111 (0.3083 to 0.3139)	< 0.001	< 0.001	< 0.001

CI, confidence interval; NA, not applicable.

[a] Time is treated continuously; coefficients and slopes are reported in monthly estimates (e.g., change per one month).

[b] Model includes patient`s age, sex, housing condition, Elixhauser comorbidity index, and the Hospital Frailty Risk Score.

[c] Slope during the pandemic can be derived by summing coefficient from the pre-pandemic and pandemic phase.

[d] Regression coefficients and slopes for hospital length of stay are provided in days.

The exposure group included patients diagnosed with COVID-19 or a randomly split pre-pandemic subset, while the control group included those without COVID-19 or a randomly split pre-pandemic subset.

Table S8 - Multivariable random slope mixed-effects model of changes in in-hospital mortality, hospital length of stay, 30-day hospital readmission, and facility discharge for exposure and control group in patients admitted to big hospitals between January 2018 and December 2021.

Outcome and study phase[a]	Coefficient (95% CI)[b]	Slope (95% CI)[c]	P-value		
			Slope differs from zero	Change in slope from prior slope	Difference in slopes (Control vs Exposure group)
In-hospital mortality					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0254 (-0.0257 to -0.0251)	-0.0254 (-0.0257 to -0.0251)	<0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	-0.0020 (-0.0025 to -0.0015)	-0.0275 (-0.0279 to -0.0271)	<0.001	<0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0447 (0.0443 to 0.0451)	0.0193 (0.0190 to 0.0196)	<0.001	NA	<0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.3432 (0.3422 to 0.3442)	0.3605 (0.3597 to 0.3613)	<0.001	<0.001	<0.001
Hospital length of stay[d]					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0359 (-0.0391 to -0.0327)	-0.0359 (-0.0391 to -0.0327)	<0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	0.0049 (0.0007 to 0.0090)	-0.0311 (-0.0335 to -0.0287)	<0.001	0.0207	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0403 (0.0359 to 0.0446)	0.0043 (0.0011 to 0.0075)	0.0085	NA	<0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.1327 (0.1240 to 0.1415)	0.1419 (0.1361 to 0.1476)	<0.001	<0.001	<0.001
30-day hospital readmission					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0071 (-0.0075 to -0.0067)	-0.0071 (-0.0075 to -0.0067)	<0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	-0.0071 (-0.0077 to -0.0064)	-0.0142 (-0.0147 to -0.0136)	<0.001	<0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	-0.0281 (-0.0286 to -0.0275)	-0.0351 (-0.0355 to -0.0348)	<0.001	NA	<0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	-0.3693 (-0.3706 to -0.3680)	-0.4115 (-0.4126 to -0.4104)	<0.001	<0.001	<0.001

Facility discharge					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0113 (-0.0116 to -0.0110)	-0.0113 (-0.0116 to -0.0110)	<0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	0.0135 (0.0128 to 0.0141)	0.0022 (0.0017 to 0.0027)	<0.001	<0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0246 (0.0242 to 0.0251)	0.0133 (0.0130 to 0.0137)	<0.001	NA	<0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.2411 (0.2399 to 0.2423)	0.2679 (0.2669 to 0.2689)	<0.001	<0.001	<0.001

CI, confidence interval; NA, not applicable.

[a] Time is treated continuously; coefficients and slopes are reported in monthly estimates (e.g., change per one month).

[b] Model includes patient`s age, sex, housing condition, Elixhauser comorbidity index, and the Hospital Frailty Risk Score.

[c] Slope during the pandemic can be derived by summing coefficient from the pre-pandemic and pandemic phase.

[d] Regression coefficients and slopes for hospital length of stay are provided in days.

The exposure group included patients diagnosed with COVID-19 or a randomly split pre-pandemic subset, while the control group included those without COVID-19 or a randomly split pre-pandemic subset.

Table S9 - Multivariable random slope mixed-effects model of changes in in-hospital mortality, hospital length of stay, 30-day hospital readmission, and facility discharge for exposure and control group in patients admitted to small hospitals between January 2018 and December 2021.

Outcome and study phase[a]	Coefficient (95% CI)[b]	Slope (95% CI)[c]	P-value		
			Slope differs from zero	Change in slope from prior slope	Difference in slopes (Control vs Exposure group)
In-hospital mortality					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0273 (-0.0279 to -0.0267)	-0.0273 (-0.0279 to -0.0267)	<0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	-0.0036 (-0.0046 to -0.0025)	-0.0309 (-0.0317 to -0.0301)	<0.001	<0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0482 (0.0475 to 0.0490)	0.0209 (0.0203 to 0.0215)	<0.001	NA	<0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.3354 (0.3334 to 0.3374)	0.3527 (0.3511 to 0.3544)	<0.001	<0.001	<0.001
Hospital length of stay[d]					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0504 (-0.0564 to -0.0444)	-0.0504 (-0.0564 to -0.0444)	<0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	0.0214 (0.0136 to 0.0292)	-0.0290 (-0.0336 to -0.0244)	<0.001	<0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0382 (0.0300 to 0.0463)	-0.0123 (-0.0183 to -0.0062)	<0.001	NA	<0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.1060 (0.0898 to 0.1221)	0.1151 (0.1047 to 0.1255)	<0.001	<0.001	<0.001
30-day hospital readmission					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0059 (-0.0066 to -0.0052)	-0.0059 (-0.0066 to -0.0052)	<0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	-0.0038 (-0.0050 to -0.0025)	-0.0097 (-0.0107 to -0.0087)	<0.001	<0.001	NA

Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	-0.0307 (-0.0317 to -0.0297)	-0.0366 (-0.0374 to -0.0359)	<0.001	NA	<0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	-0.3615 (-0.3641 to -0.3590)	-0.4019 (-0.4039 to -0.3999)	<0.001	<0.001	<0.001
Facility discharge					
Control group (reference)					
Phase 1 (01/2018 to 12/2019)	-0.0137 (-0.0143 to -0.0131)	-0.0137 (-0.0143 to -0.0131)	<0.001	NA	NA
Phase 2 (01/2020 to 12/2021)	0.0132 (0.0119 to 0.0144)	-0.0005 (-0.0016 to 0.0005)	0.3404	<0.001	NA
Exposure group					
Exposure group by time interaction during phase 1 (01/2018 to 12/2019)	0.0273 (0.0264 to 0.0282)	0.0137 (0.0130 to 0.0143)	<0.001	NA	<0.001
Exposure group by time interaction during phase 2 (01/2020 to 12/2021)	0.2467 (0.2443 to 0.2491)	0.2736 (0.2716 to 0.2756)	<0.001	<0.001	<0.001

CI, confidence interval; NA, not applicable.

[a] Time is treated continuously; coefficients and slopes are reported in monthly estimates (e.g., change per one month).

[b] Model includes patient`s age, sex, housing condition, Elixhauser comorbidity index, and the Hospital Frailty Risk Score.

[c] Slope during the pandemic can be derived by summing coefficient from the pre-pandemic and pandemic phase.

[d] Regression coefficients and slopes for hospital length of stay are provided in days.

The exposure group included patients diagnosed with COVID-19 or a randomly split pre-pandemic subset, while the control group included those without COVID-19 or a randomly split pre-pandemic subset.

Table S10 - In-hospital mortality in Europe, USA, and China between February 2020 and December 2021.

Country	Time	
	02/2020 to 06/2020	**07/2020 to 12/2021**
Switzerland [31, 33-36]	9.5%, 19%	10.2% (2nd wave), 5.4% (3rd wave), 19% (2nd wave), 14.5% (2nd wave), 12.8% (2nd wave)
Italy [32, 39]	20%	23.7% (2nd wave), 15.8% (3rd wave)
Spain [46-47]	17%, 14.1%	13% (2nd and 3rd wave), 11.4% (2nd wave)
UK [43-44, 48]	26%, 32.3%, 26.1%	13.1% (2nd wave)
Germany [40, 70]	22%	15.1% (2nd wave)
USA [41-42, 49]	21%, 22.8%, 23.2%	12.3% (2nd wave)
China [45]	14%	

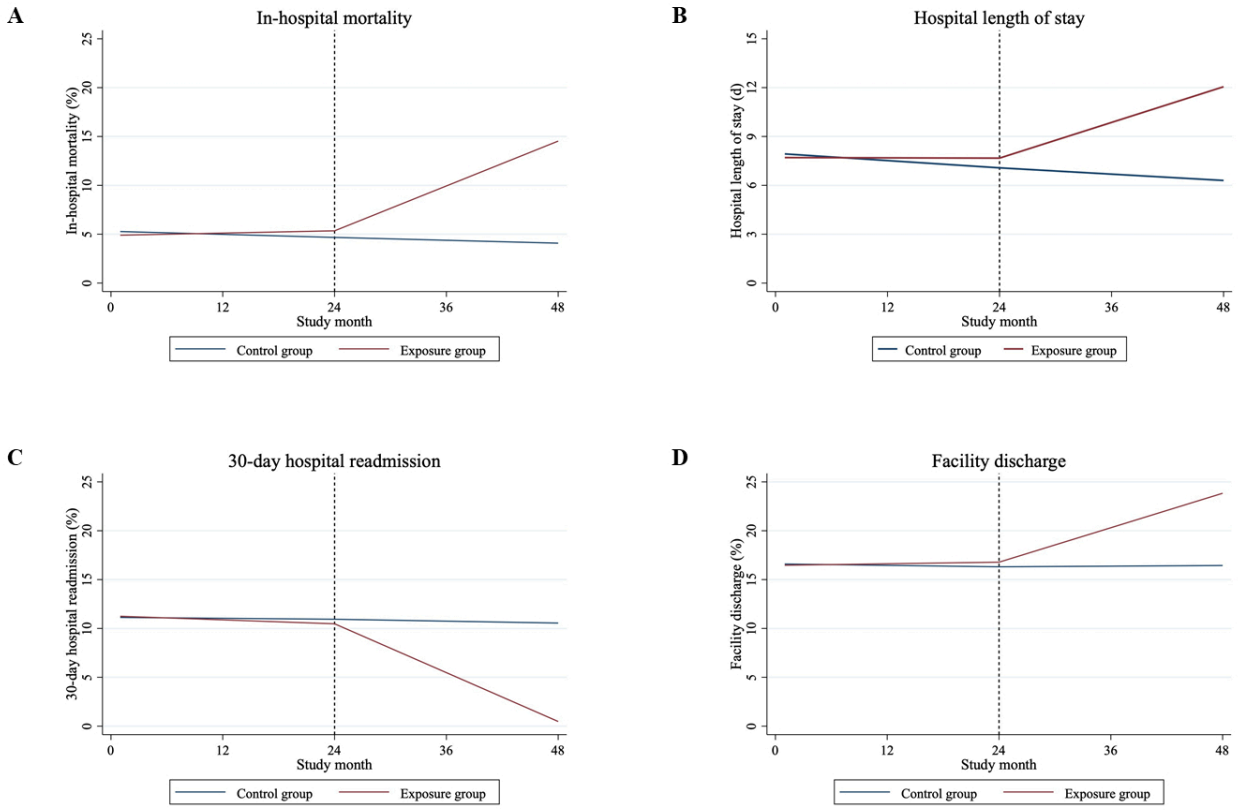

Figure S1 Trends in in-hospital mortality, hospital length of stay, 30-day hospital readmission, and facility discharge for exposure and control group in patients with cardiovascular disease before and during COVID-19 pandemic.
The exposure group included patients diagnosed with COVID-19 or a randomly split pre-pandemic subset, while the control group included those without COVID-19 or a randomly split pre-pandemic subset.

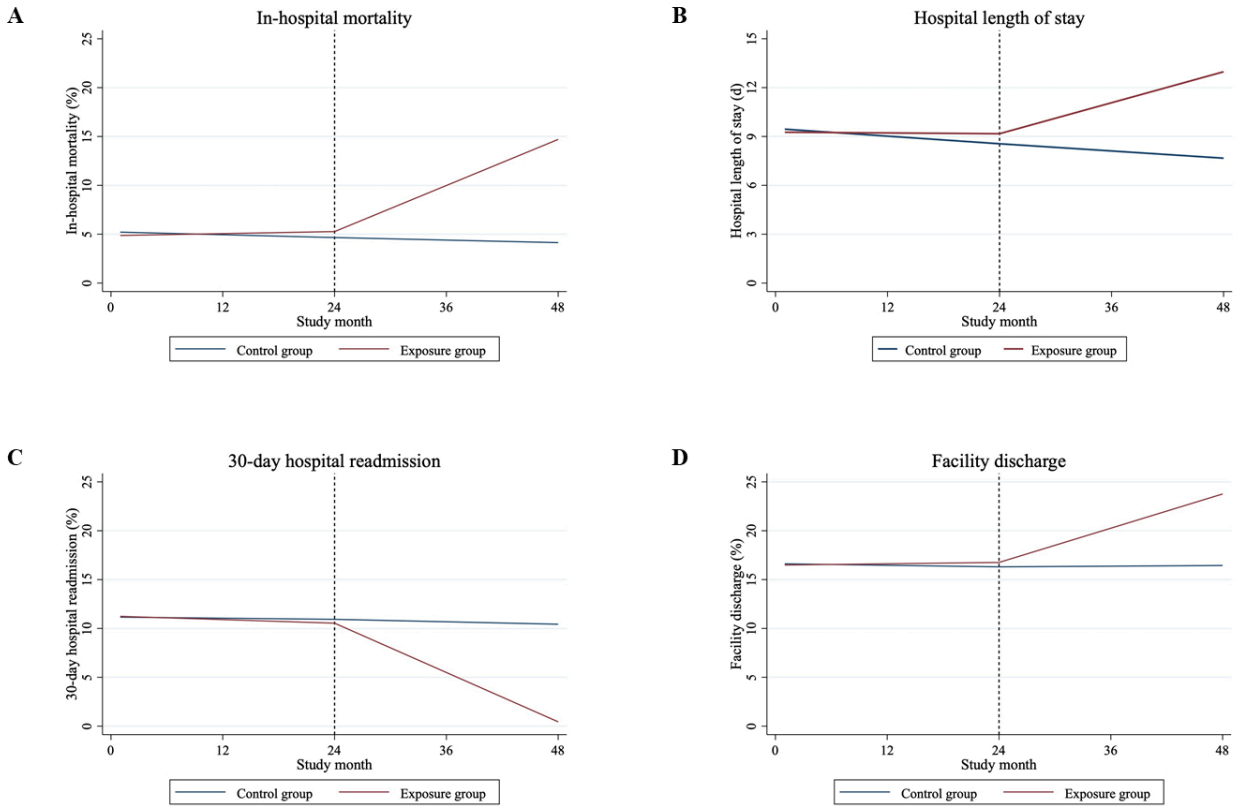

Figure S2 Trends in in-hospital mortality, hospital length of stay, 30-day hospital readmission, and facility discharge for exposure and control group in patients with COPD before and during COVID-19 pandemic.
The exposure group included patients diagnosed with COVID-19 or a randomly split pre-pandemic subset, while the control group included those without COVID-19 or a randomly split pre-pandemic subset.

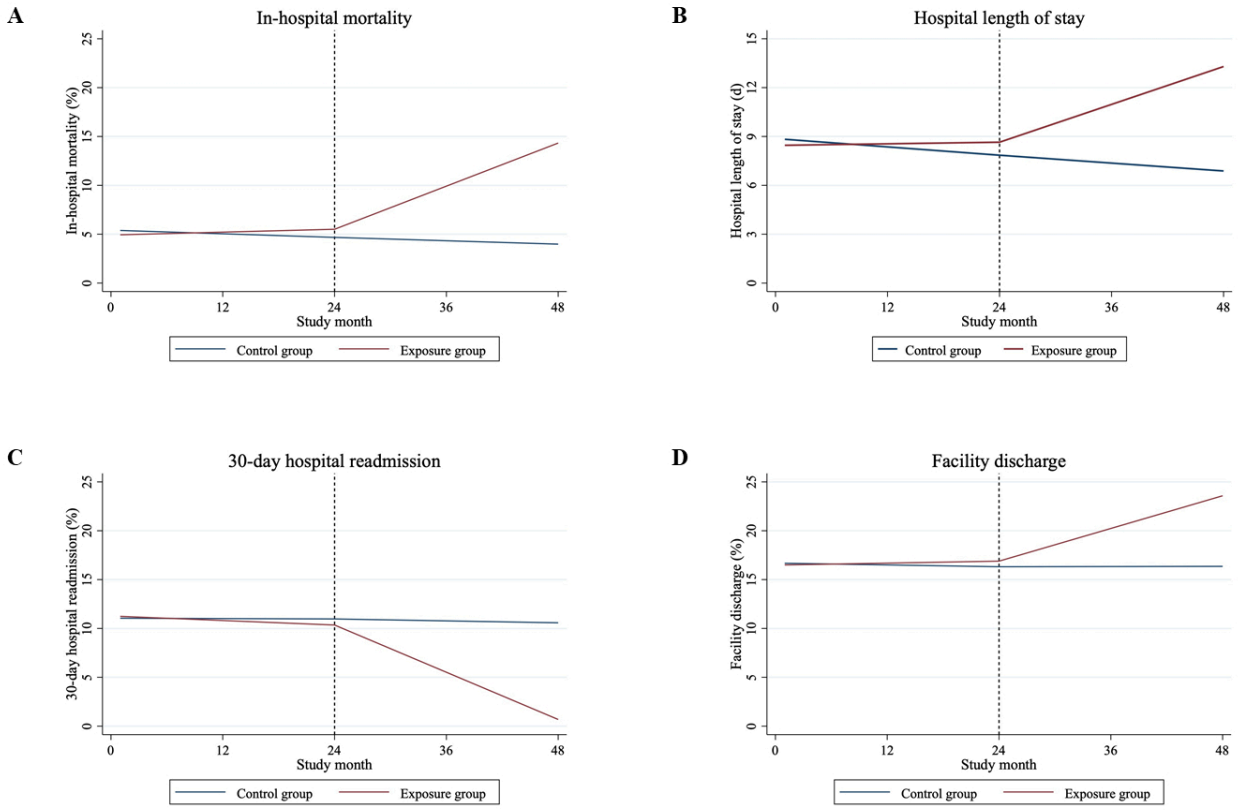

Figure S3 Trends in in-hospital mortality, hospital length of stay, 30-day hospital readmission, and facility discharge for exposure and control group in patients with diabetes mellitus before and during COVID-19 pandemic.
The exposure group included patients diagnosed with COVID-19 or a randomly split pre-pandemic subset, while the control group included those without COVID-19 or a randomly split pre-pandemic subset.

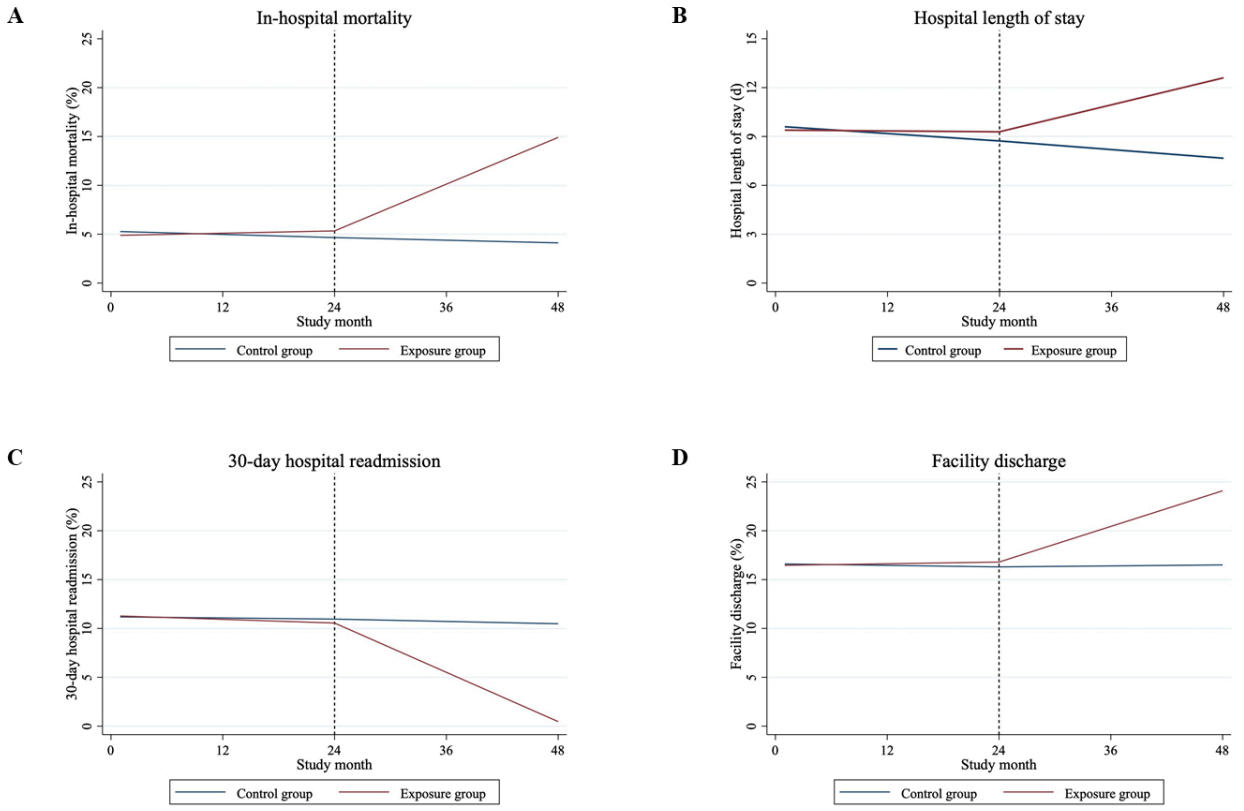

Figure S4 Trends in in-hospital mortality, hospital length of stay, 30-day hospital readmission, and facility discharge for exposure and control group in patients with chronic kidney disease before and during COVID-19 pandemic.
The exposure group included patients diagnosed with COVID-19 or a randomly split pre-pandemic subset, while the control group included those without COVID-19 or a randomly split pre-pandemic subset.

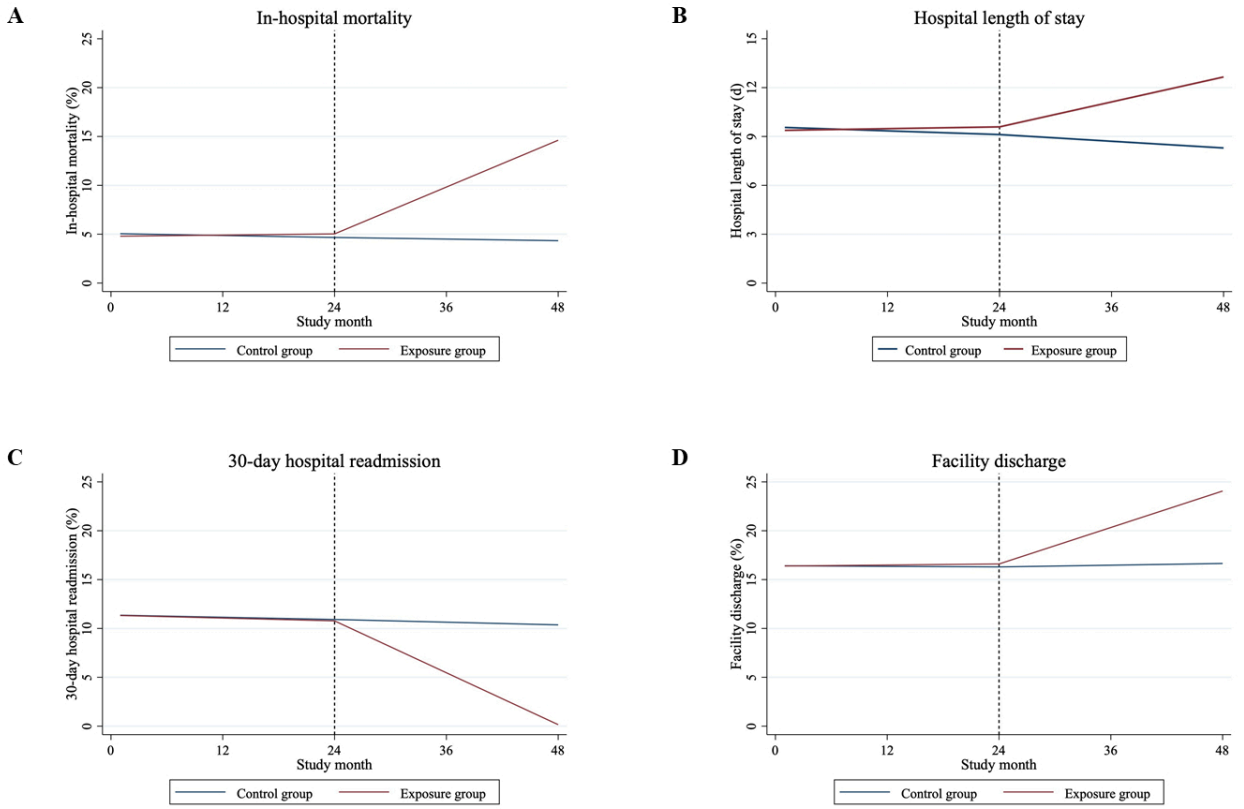

Figure S5 Trends in in-hospital mortality, hospital length of stay, 30-day hospital readmission, and facility discharge for exposure and control group in patients with solid cancer before and during COVID-19 pandemic.
The exposure group included patients diagnosed with COVID-19 or a randomly split pre-pandemic subset, while the control group included those without COVID-19 or a randomly split pre-pandemic subset.

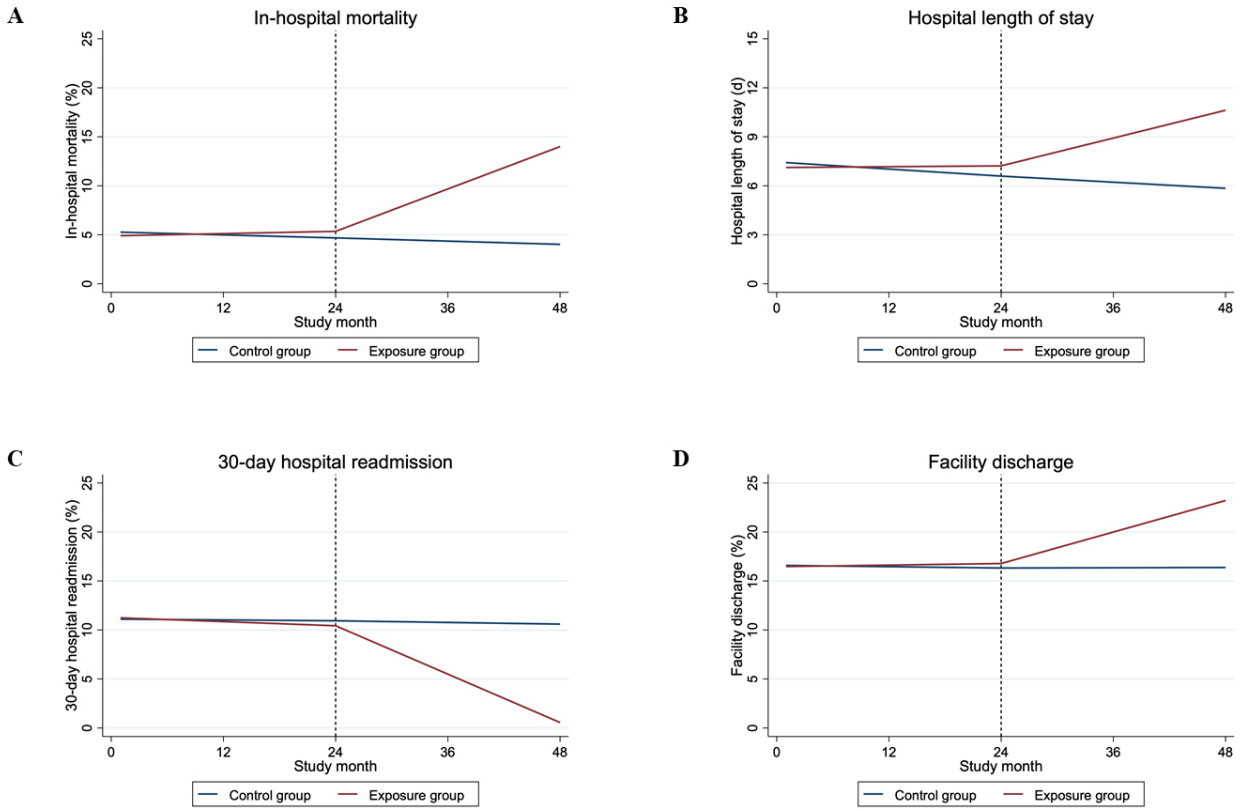

Figure S6 Trends in in-hospital mortality, hospital length of stay, 30-day hospital readmission, and facility discharge for exposure and control group in patients admitted to big hospitals before and during COVID-19 pandemic.
The exposure group included patients diagnosed with COVID-19 or a randomly split pre-pandemic subset, while the control group included those without COVID-19 or a randomly split pre-pandemic subset.

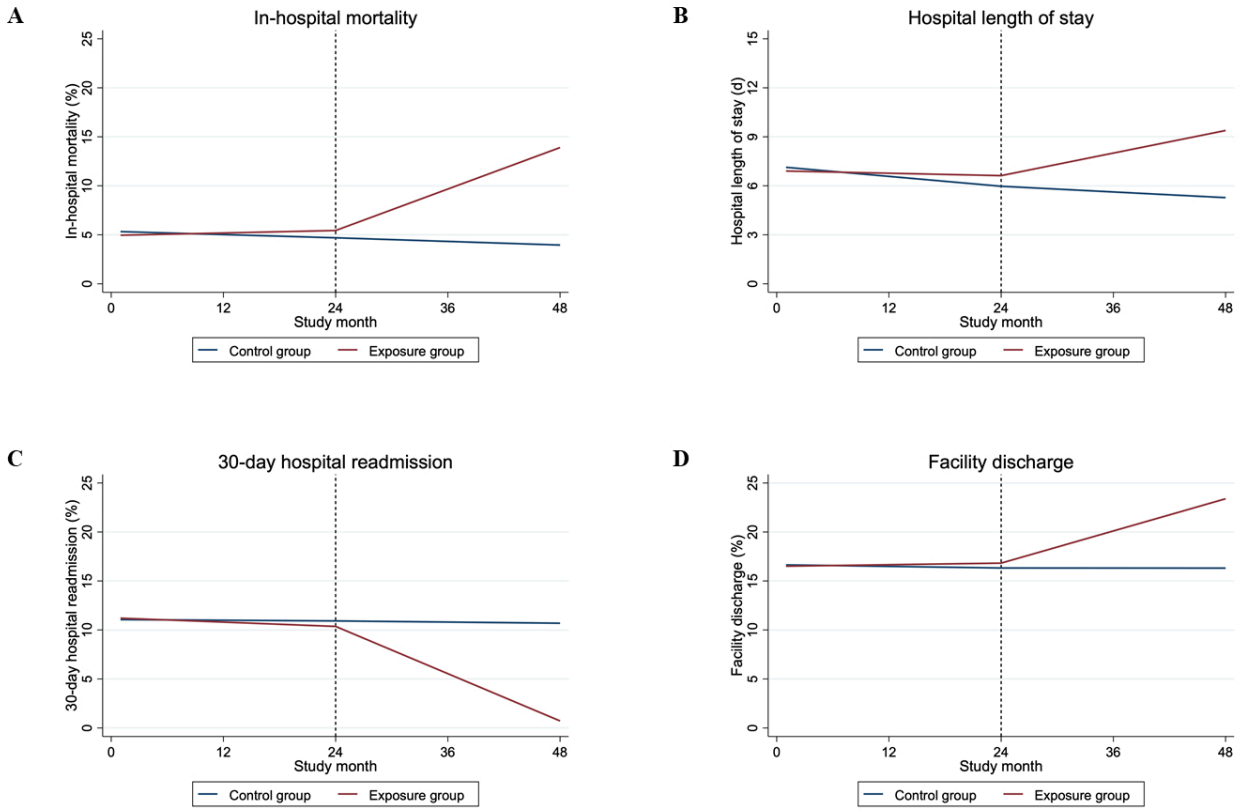

Figure S7 Trends in in-hospital mortality, hospital length of stay, 30-day hospital readmission, and facility discharge for exposure and control group in patients admitted to small hospitals before and during COVID-19 pandemic.
The exposure group included patients diagnosed with COVID-19 or a randomly split pre-pandemic subset, while the control group included those without COVID-19 or a randomly split pre-pandemic subset.

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