

## Mechanical Ventilation in PA Hospitals—Pre-COVID-19



The COVID-19 pandemic has highlighted the important role mechanical ventilators play in the management of severe respiratory illness. A mechanical ventilator is a machine that does the work of breathing for a patient by delivering oxygen into the lungs and helping to remove carbon dioxide. Mechanical ventilators may be used to treat critical illnesses such as acute respiratory failure, sepsis and severe pneumonia or in conditions where a patient can no longer safely breathe independently (e.g., drug overdose). PHC4 examined this important life-saving treatment modality to serve as a baseline for future analyses on hospitalizations involving the novel coronavirus responsible for the infectious respiratory illness seen during the COVID-19 pandemic. This brief includes hospitalizations involving a mechanical ventilator for patients discharged from Pennsylvania general acute care hospitals in fiscal year (FY) 2019: July 1, 2018 through June 30, 2019.

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- There were **46,257** hospitalizations involving mechanical ventilation in FY 2019 (**nearly 3%** of all hospitalizations that year).
- Hospitalizations involving mechanical ventilation occur most often for adult patients with critical illnesses such as acute respiratory failure, sepsis and severe pneumonia. For patients less than age 18, mechanical ventilation is used most often to treat premature or low birth weight newborns.

### Hospitalization Rates Involving Mechanical Ventilation per 10,000 Pennsylvania Residents

Statewide Rate: 33.4

In general, population-based data showed higher hospitalization rates\* involving mechanical ventilation among older residents, black (non-Hispanic) residents, residents living in higher poverty areas and male residents. These characteristics are similar to those believed to be at higher risk of developing serious illness from COVID-19.

<p><b>Age</b></p> <p>Age less than 18 ..... 14.2</p> <p>Age 18-44 ..... 13.6</p> <p>Age 45-64 ..... 39.2</p> <p>Age 65-84 ..... 82.0</p> <p>Age 85 and older ..... 91.1</p>	<p><b>Race/Ethnicity</b></p> <p>Black (non-Hispanic) ..... 53.2</p> <p>White (non-Hispanic) ..... 31.7</p> <p>Hispanic ..... 16.8</p>
<p><b>Poverty<sup>†</sup></b></p> <p>High Poverty ..... 49.6</p> <p>Low Poverty ..... 26.8</p>	<p><b>Female/Male</b></p> <p>Male ..... 37.5</p> <p>Female ..... 29.4</p>

\* Rates are based on Pennsylvania residents only (42,760 hospitalizations or 92% of all mechanical ventilation cases) and US Census Bureau data.

† High Poverty: Residents living in areas where 25% or more of the population lives in poverty. Low Poverty: Residents living in areas with <10% of the population living in poverty (2018 US Census Bureau estimates at the zip code level).

- Patients on mechanical ventilation stayed in the hospital an average of **12.6 days** compared to an average of **4.6 days** for all other patients.
- The in-hospital mortality rate for patients on mechanical ventilation was **25.9%** compared to the rate of **1.1%** for all other patients.
- **34.1%** of patients on mechanical ventilation were transferred to skilled nursing, rehab, long-term care, or other acute care facilities after discharge from the hospital compared to **16.7%** for all other patients.

## Mechanical Ventilation and Infectious Pneumonia

Approximately **23.7%** of the adult patients on mechanical ventilation had, at the time of admission, a diagnosis of infectious pneumonia—an infection of one or both lungs caused by organisms such as bacteria and viruses. The novel coronavirus responsible for COVID-19 can also infect the lungs and cause pneumonia and acute respiratory disease. Future analysis comparing the rates of mechanical ventilator use for patients with *infectious pneumonia* versus those with *COVID-19 related pneumonia* can provide insight into the severity of illness associated with each type of pneumonia.

- **93.9%** of adult patients on mechanical ventilation with a diagnosis of infectious pneumonia had at least one serious underlying condition (e.g., heart failure, compromised immune system, chronic lung diseases, etc.) with **73.9%** of these patients having more than one serious underlying condition—information that will be important in future COVID-19 analysis as patients with these conditions are thought to be at greater risk of developing a more severe case of COVID-19 related pneumonia.
- **26.7%** of adult patients on mechanical ventilation with a diagnosis of infectious pneumonia died in the hospital.
- **12.5** days was the average length of stay for these hospitalizations.

### About PHC4

Created by the PA General Assembly in 1986, the PA Health Care Cost Containment Council (PHC4) is an independent state agency charged with collecting, analyzing and reporting information that can be used to improve the quality and restrain the cost of health care in the state. Today, PHC4 is a recognized national leader in public health care reporting. PHC4 is governed by a board of directors representing business, labor, consumers, health care providers, insurers and state government.

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## Hospitalizations Involving Mechanical Ventilation by County, FY 2019

Rates are based on Pennsylvania residents only (42,760 hospitalizations or 92% of all mechanical ventilation cases).

	FY 2019	
	Total Number of Hospitalizations	Rate per 10,000 Residents
<b>Statewide</b>	<b>42,760</b>	<b>33.4</b>
<b>Adams</b>	272	26.5
<b>Allegheny</b>	3,821	31.4
<b>Armstrong</b>	212	32.5
<b>Beaver</b>	675	41.0
<b>Bedford</b>	163	33.8
<b>Berks</b>	1,039	24.7
<b>Blair</b>	542	44.2
<b>Bradford</b>	163	26.8
<b>Bucks</b>	1,971	31.4
<b>Butler</b>	434	23.1
<b>Cambria</b>	630	47.8
<b>Cameron</b>	35	77.9
<b>Carbon</b>	249	38.8
<b>Centre</b>	252	15.5
<b>Chester</b>	959	18.4
<b>Clarion</b>	122	31.5
<b>Clearfield</b>	315	39.7
<b>Clinton</b>	96	24.8
<b>Columbia</b>	238	36.4
<b>Crawford</b>	319	37.5
<b>Cumberland</b>	743	29.6
<b>Dauphin</b>	907	32.7
<b>Delaware</b>	1,919	34.0
<b>Elk</b>	108	35.8
<b>Erie</b>	1,071	39.4
<b>Fayette</b>	579	44.4
<b>Forest</b>	17	23.4
<b>Franklin</b>	496	32.0
<b>Fulton</b>	48	33.1
<b>Greene</b>	78	21.4
<b>Huntingdon</b>	105	23.2
<b>Indiana</b>	299	35.4
<b>Jefferson</b>	178	40.8

	FY 2019	
	Total Number of Hospitalizations	Rate per 10,000 Residents
<b>Juniata</b>	63	25.5
<b>Lackawanna</b>	828	39.3
<b>Lancaster</b>	1,214	22.3
<b>Lawrence</b>	353	41.0
<b>Lebanon</b>	438	31.0
<b>Lehigh</b>	920	25.0
<b>Luzerne</b>	1,429	45.0
<b>Lycoming</b>	364	32.0
<b>McKean</b>	106	25.9
<b>Mercer</b>	429	38.8
<b>Mifflin</b>	143	30.9
<b>Monroe</b>	572	33.7
<b>Montgomery</b>	2,521	30.4
<b>Montour</b>	63	34.5
<b>Northampton</b>	912	29.9
<b>Northumberland</b>	326	35.8
<b>Perry</b>	139	30.1
<b>Philadelphia</b>	7,564	47.7
<b>Pike</b>	109	19.5
<b>Potter</b>	53	31.9
<b>Schuylkill</b>	614	43.2
<b>Snyder</b>	131	32.3
<b>Somerset</b>	245	33.1
<b>Sullivan</b>	28	46.1
<b>Susquehanna</b>	75	18.5
<b>Tioga</b>	111	27.2
<b>Union</b>	88	19.6
<b>Venango</b>	187	36.5
<b>Warren</b>	118	29.9
<b>Washington</b>	681	32.8
<b>Wayne</b>	154	30.0
<b>Westmoreland</b>	1,431	40.8
<b>Wyoming</b>	108	39.9
<b>York</b>	1,188	26.5