

Muscle atrophy among critically ill kids occurs within one week of mechanical ventilation

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Michael Shoykhet, M.D., Ph.D., of the Department of Critical Care Medicine at Children's National Health System, the study's senior author. Credit: Michael Shoykhet, M.D., Ph.D

Children with life-threatening respiratory failure who require mechanical ventilation in a pediatric intensive care unit commonly experience rapid muscle atrophy, according to a study published online Dec. 19, 2018, in *PLOS ONE*. More than 80 percent of children enrolled in the study experienced atrophy in at least one muscle group, and almost half experienced atrophy in two or more muscle groups after just one week on the ventilator. Older children and kids with traumatic brain injury appeared to experience even more pronounced muscle loss.

"Our study, so far the largest prospective assessment of wasting in multiple muscle groups in critically ill children, comes as the field of pediatric critical care medicine begins to focus on preventing long-term morbidity and on improving functional outcomes in children after a critical illness," says Michael Shoykhet, M.D., Ph.D., the study's senior author. "It will be important for future multi-center studies to explore how skeletal muscle loss in critically ill kids impacts their recovery. We know that [adult patients](#) with similarly weakened muscle tone take longer to wean from ventilators, have longer hospital stays and face heightened mortality risk. Prospective interventions to prevent muscle loss, such as improved nutrition and early physical therapy, may be required to improve pediatric outcomes."

Dr. Shoykhet, who led the single-center study while employed at Washington University School of Medicine, now works at the Department of Critical Care Medicine at Children's National Health System.

The research team used bedside ultrasound to serially measure thickness of the right diaphragm, biceps, quadriceps and tibialis muscles in 30 critically ill children receiving mechanical ventilation for at least 48 hours. The [children](#) were enrolled from June 2015 to May 2016 and ranged in age from 1 week to 18 years of age. Their mean age was 5.4 years. The most common diagnoses that triggered hospitalization in the

[intensive care unit](#) were airway/respiratory (33 percent), central nervous system (24 percent) and trauma (15 percent).

The research team performed at least two ultrasound assessments at a median interval of six days. Among the findings:

- Diaphragm thickness decreased by 11 percent between ultrasounds, or 2.2 percent per day
- 47 percent of patients experienced diaphragm thinning
- Quadriceps thickness decreased by 8.6 percent, or 1.5 percent per day
- Children older than 1 year experienced muscle atrophy in their arms and legs, a finding not seen in infants younger than 1.

The [research team](#) notes that the imaging tools they leveraged are ubiquitous across the nation's pediatric intensive care units, so kids' [muscle](#) status can be monitored easily in real time during their illness and recovery.

In addition to Dr. Shoykhet, study co-authors include Lead Author Ryan W. Johnson, MPH; Kay W.P. Ng, M.D.; Alexander R. Dietz, M.D.; Mary E. Hartman, M.D.; Jack D. Baty, BA; and Craig M. Zaidman, all of Washington University School of Medicine; and Nausheen Hasan, PharmD, BCPPS, St. Louis Children's Hospital.

More information: Ryan W. Johnson et al, Muscle atrophy in mechanically-ventilated critically ill children, *PLOS ONE* (2018). [DOI: 10.1371/journal.pone.0207720](https://doi.org/10.1371/journal.pone.0207720)

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