

Bronchiolitis is the leading cause of hospital admissions for infants in the United States. 15-25% of these patients are admitted to the pediatric intensive care unit (PICU), where 25-40% require intubation and invasive mechanical ventilation (IMV). IMV carries substantial risk of complications including vocal cord dysfunction, ventilator-induced lung injury and infection. Methods of respiratory support such as noninvasive positive pressure ventilation (NPPV) with continuous positive airway pressure (CPAP) or bilevel positive airway pressure (BiPAP) and high-flow nasal cannula (HFNC) have been shown to reduce eventual conversion to IMV. It is unclear, however, whether there is an initial modality of airway support that reduces risk of eventual IMV use.

This study compiled data using the Virtual Pediatric Systems (VPS) database, which includes over 135 PICUs, mostly in the US with a minority of centers in Canada and Saudi Arabia. Patients up to two years of age were included if they were both admitted to the PICU with a primary diagnosis of bronchiolitis and received HFNC or NPPV, but were excluded if they had a history of tracheostomy or received IMV prior to NPPV. The primary outcome was the use of IMV following initial treatment with HFNC or NPPV. Secondary outcomes were mortality and PICU length of stay (LOS). Additional variables collected for matching and analysis included but were not limited to demographics, PIM (Pediatric Index of Mortality) 2 scores, comorbidities, positive respiratory syncytial virus (RSV) testing, maximum heart rate and respiratory rate during the first twelve hours of PICU care.

6496 children admitted to 92 PICUs between 2009-2015 were included in the analysis. The median PIM 2 risk of mortality was 0.21% (IQR 0.18-0.31%), and the median PICU LOS was 2.9 days (IQR 1.8-4.9 d). IMV was used in 798 patients (12.3%), and 20 patients (0.31%) died prior to PICU discharge. IMV was more common in subjects initially supported with NPPV than in those supported with HFNC (20.1% vs 11.0%; $p < 0.001$). Also associated with higher rates of IMV were lower age, lower weight, comorbidities and higher PIM 2 risk of mortality. NPPV was also associated with a longer PICU length of stay and increased mortality. Regression indicated that not only was NPPV independently associated with increased odds of IMV (OR 1.53 [95% CI, 1.24-1.88]), but so was lower age, lower weight, presence of comorbidities, negative RSV test, and higher PIM 2 score.

The authors conclude that HFNC may be the preferred initial support modality for critically ill children with bronchiolitis, due to the lower association with subsequent IMV. They admit that there may be unmeasured confounders affecting the outcomes of each cohort and that a retrospective trial cannot establish causation. They recommend a prospective interventional trial to establish causality and confirm the superiority of a particular form of ventilatory support in reducing incidence of IMV, but point out that powering such a study would be extremely difficult due to the volume of enrollments required.

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Comment: To date, randomized controlled studies comparing NPPV with HFNC in pediatric bronchiolitis do not

show significant differences in IMV rates. However, intubation rates are relatively low for bronchiolitis and thus detecting differences is difficult. This is the largest retrospective database review assessing the correlation of IMV in NPPV or HFNC for bronchiolitis. While there is significant risk of selection bias in this study, and there is no way to gauge baseline work of breathing in the database, the increased association of IMV after NPPV remains after controlling for severity of illness scores and comorbidities. HFNC already tends to be the modality of choice for infants, when available, due to ease of set up and titration. This study provides additional evidence that emergency physicians should strongly consider HFNC as first-line in the treatment of respiratory distress in pediatric bronchiolitis.

□ NEUROPSYCHIATRIC SEQUELAE IN ADOLESCENTS WITH ACUTE SYNTHETIC CANNABINOID TOXICITY.



Anderson SA, Oprescu MA, Callelo D, et al. *Pediatrics*. 2019;144(2):e20182690

Amongst users of synthetic cannabinoids, adolescents make up the largest group that present to the Emergency Department. Compared to tetrahydrocannabinol (cannabinoids), synthetic cannabinoids (SC) have more adverse cardiotoxic and neurotoxic effects, especially in pediatric populations. Patients seek medical attention after SC abuse 30 times more than cannabis. The acute neuropsychiatric toxicities that adolescents experience after SC abuse are poorly understood. The goal of this study was to better characterize the neuropsychiatric toxicities of SC use compared to cannabis.

This retrospective cohort study was derived from the Toxicology Investigators Consortium (ToxIC), which is a multicenter registry that includes over 62,000 cases from 65 hospitals, from January 2010 to September 2018. Patients included were aged 13 to 19, had either self-reported or witness-reported use of SC or cannabis, and were all evaluated at bedside by a board certified medical toxicologist. Drug use was not routinely confirmed through bioanalytical testing. Patients were categorized into one of four subgroups: SC-only exposure, SC and other drug exposure, cannabis only exposure and cannabis and other drug exposure. The primary outcome was the occurrence of neuropsychiatric signs and symptoms, as determined by the toxicologist, which were classified by 6 specific exam findings including agitation, coma and/or central nervous system depression, seizures, hallucinations, delirium and/or psychosis and extrapyramidal signs.

Of the 348 patients enrolled in this study, 107 were assigned to the SC-only group, 38 to the SC-polydrug group, 86 to the cannabis-only group, and 117 in the cannabis-polydrug group. Compared to the cannabis-only group, the SC-group had higher odds of CNS depression (OR 3.42; 95% CI 1.51-7.75) and seizures (OR 3.89, 95% CI 1.39-10.94), but lower odds of agitation (OR 0.18; 95% CI 0.10-0.34). The SC-polydrug group had higher odds of agitation (OR 3.11; 95% CI 1.56-7.44) and seizures (OR 4.8; 95% CI 1.80-12.74) compared to cannabis-polydrug exposures. The authors also note that in the SC-polydrug group, sympathomimetic were used in about 1.5 times the rate of cannabis group, while the cannabis-polydrug group use ethanol 3.8 times more than SC-polydrug group. This

correlation may explain the higher odds of agitation and seizure in the SC-polydrug group compared to the cannabis-polydrug group.

The authors concluded that adolescents with SC exposure have a higher odds of CNS depression and seizures while adolescents with SC with polydrug exposure have a higher odds ratio of agitation and seizures when compared to cannabis groups. These results should raise concern and adolescents need to be educated about the adverse neuropsychiatric effects potentiated by synthetic cannabinoids.

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Comments: This study highlights the high incidence of neuropsychiatric sequelae of synthetic cannabinoids compared to their natural counterparts. It is important for Emergency Medicine physicians to be familiar with the neuropsychiatric toxidromes in adolescents seeking medical attention after synthetic cannabinoid use including “Spice” and “K2”. In addition, public health awareness of the dangers associated with synthetic cannabinoids use is warranted.

□ **WHOLE-BODY CT AFTER MOTOR VEHICLE CRASH: NO BENEFIT AFTER HIGH-ENERGY IMPACT AND WITH NORMAL PHYSICAL EXAMINATION.**



Belabbas D, Auger M, Lederlin M, et al. *Radiology* 2019;00:1-8

Performing a whole body computerized tomography (CT) scan after a motor vehicle crash (MVC) when the physical exam suggests no new injury remains a source of debate. It remains a common practice despite prospective evidence of no reduction in mortality. Prior retrospective studies have shown a potential mortality benefit of whole-body CT following these traumas compared to selective scanning, but the overall quality of evidence is lacking. Proponents argue that whole-body CT finds more injuries and injuries that may have been missed on exam, but it comes with the cost of radiation exposure, possible adverse effects of iodine contrast, and added expense. The Vittel criteria, originally used for field triage, now guide whole-body CT decisions in France. The Vittel criteria include physiologic variables, kinetic components or mechanism of injury, injuries sustained, and resuscitation required. Use of these criteria as an indication to perform whole-body CT has lacked specificity. Investigators in this retrospective study hypothesized that patients involved in an MVC with a GCS of 15, a normal exam of the torso, and only a kinetic component of the Vittel criteria, whole-body CT is not indicated.

The goal of this study was to determine whether whole-body CT scan detected unexpected injuries and whether these unsuspected findings on CT led to changes in management. All consecutive adult trauma patients seen at the investigator’s facility over a one year period were screened. Inclusion criteria included whole-body CT performed, age greater than 18, normal physical exam of the chest, abdomen, and pelvis, a Glasgow coma scale (GCS) score of 15, and at least one kinetic element

of the Vittel criteria. These criteria include ejection of the patient from the vehicle, fall >6m, blast, no seat belt, vehicle deformity, no helmet, and death, ejection, or crush of a passenger. A normal physical exam was defined as no pain or tenderness on exam and no abnormalities with auscultation. Patients who met non-kinetic Vittel criteria were excluded, as were pregnant patients and children. Whole body CT was defined as a non-contrast CT of the head with contrasted studies of the neck, chest, abdomen, and pelvis. The methods state that all patients who were brought into this facility who met kinetic elements of Vittel criteria received a whole-body CT, but that senior emergency medicine residents and attendings were responsible for the exam of each patient and the decision to obtain a whole-body CT was made after the examination. Imaging was independently reviewed by both a radiology resident and an attending radiologist who were blinded to the initial read. If there were differences between the reads, a joint review was performed.

Of the 93 patient included out of 459 patients screened, sixty-nine were involved in car accidents, 17 in motorcycle accidents, four in pedestrian versus vehicle accidents, and three in bicycle accidents. Eighty-one percent of patients had injuries affecting body regions other than the trunk with the most common being the limbs (53%). Whole-body CT showed unsuspected injuries in 11 out of 93 patients (12%). Of these 11 patients, 8 had lung contusions, 1 had a sternal fracture, 1 had an acetabular fracture, and 1 had an adrenal hematoma. No patients with lung contusion, including one contusion that affected over 30% of the lung parenchymal volume, recorded adverse events at follow-up 2 days later. The sternal fracture, adrenal hematoma, and acetabular fracture all required no specific medical therapy as well. In a separate analysis using specific kinetic elements of the Vittel criteria to identify patients at risk for unsuspected injuries, absence of a seatbelt and leukocytosis of 15,000 cells/L had positive predictive values of 33% (95% confidence interval (CI): 1%,95%) and 30% (95% CI: 12%,54%), respectively. None of the individual kinetic elements had a high sensitivity for CT depicting unsuspected injuries with airbags deploying being the highest at 60% sensitive (95% CI: 15%, 95%).

The authors report that whole-body CT following MVC may not affect clinical outcomes if patients have a normal physical exam of the trunk, have normal mental status (GCS 15), and have only a kinetic element of the Vittel criteria present. Overall, they felt there was a low incidence of unsuspected injuries and none required further intervention. They reported that the double-blind review by radiology residents and attendings was a strength, but the retrospective nature of the study was a significant limitation as it weakens the overall quality of the evidence and introduces the risk of selection bias. In conclusion, the authors felt this study adds to the data suggesting that whole-body CT scan may not be beneficial in patients with a normal physical exam of the torso and without mental status changes following an MVC

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This is a retrospective study of the incidence of missed injuries in patients with a concerning mechanism but normal torso