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**Preventing pediatric cardiothoracic trauma: Role of policy and legislation**

Mylonas KS *et al*. Preventing pediatric cardiothoracic trauma

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**Abstract**

Data from the last 50 years suggest that pediatric patients typically suffer cardiothoracic injuries following blunt traumatic force (70%) in the setting of either motor vehicle crashes (53.5%) or vehicle-pedestrian accidents (18.2%). Penetrating trauma accounts for 30% of pediatric cardiothoracic injuries, half of which are gunshot wounds. Graduated driver licensing programs, gun-control legislation, off-road vehicle regulation, initiatives such as “Prevent the Bleed”, as well as professional society recommendations are key in preventing pediatric cardiothoracic injuries.

**Key words:** Pediatric trauma; Blunt cardiac trauma; Penetrating cardiac trauma; Injury; Children; Policy; Legislation

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**Core tip:** Graduated driver licensing programs, gun-control legislation, off-road vehicle regulation, initiatives such as “Prevent the Bleed”, as well as professional society recommendations are key in preventing pediatric cardiothoracic injuries.

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**INTRODUCTION**

Trauma is a leading cause of pediatric mortality in the developed world and can have substantial physical and psychological sequalae in surviving victims[1]. Cardiothoracic injury is the second most commonly reported trauma-associated cause of fatality after head trauma[2,3]. Although isolated cardiothoracic injury is typically non-lethal, mortality rates can be as high as 20%-40% in multi-system trauma patients[4]. Our group recently analyzed epidemiological and outcomes data on a total of 1062 pediatric cardiac trauma patients that were treated at United States centers in the last 50 years[5]. In this editorial, we explore various policy interventions directed at reducing the incidence, morbidity, and mortality of cardiothoracic trauma in children.

Pediatric patients typically suffer cardiothoracic injuries following blunt traumatic force (70%) in the setting of either motor vehicle crashes (MVCs) (53.5%) or vehicle-pedestrian accidents (18.2%)[5,6]. A National Trauma Data Bank analysis revealed that teenagers are at a higher risk of suffering blunt cardiothoracic injury[7], at least partly due to sociobehavioral factors. In several states, teenagers can get a learner’s permit before age 16 and a driver’s license by age 16. Also, a number of risk factors predisposing to MVCs, such as reckless driving, cell phone use while driving, and driving while intoxicated (DWI) are frequently seen amongst adolescents[8-10].

Therefore, preventing MVCs is essential in diminishing pediatric cardiothoracic trauma rates. Graduated driver licensing (GDL) has been legislated in an effort to reduce MVC rates and is predicated on the concept of slowly and safely exposing young drivers to higher-risk driving conditions[11,12]. Traditionally GDL programs begin with restricted to supervised driving, followed by unsupervised driving under settings that involve intermediate risk, and ultimately lead to full licensure[12]. According to data from the Fatality Analysis Reporting System, National Automotive Sampling System General Estimates System, Census Bureau, and National Household Travel Surveys, per capita fatal and police-reported MVC rates in 2012 were higher for middle-aged drivers than for adolescent over 16 years old. Fatal DWIs also decreased for teenagers after introducing GDL programs[13]. In addition, implementing school-based pedestrian safety intervention programs has been shown to reduce the incidence of pediatric pedestrian collisions[14,15].

Off-road vehicles (ORVs) have also been associated with pediatric cardiothoracic trauma among various other types of injury[16-18]. The Eastern Association for the Surgery of Trauma supports the enactment and implementation of legislature as a way of reducing ORV-related injuries[17]. A landmark act regulating the use of ORVs was “Sean’s Law” which amended Massachusetts General Laws Chapter 90b (Sections 21-35). After the enforcement of “Sean’s Law”, the rate of emergency department discharges in Massachusetts declined by over 30% in children under the age of 10, 50% in 10- to 13-year-olds, and nearly 40% in 14- to 17-year-olds[16].

Our recent analysis also suggests that penetrating trauma accounts for 30% of pediatric cardiothoracic injuries, half of which are gunshot wounds (GSWs)[5]. Of note, in recent years, GSW-related mortality rates in U.S. adolescents exceeded deaths from MVCs[19]. In an attempt to reduce firearm injuries in children, both the American Academy of Pediatrics (AAP) and the American Pediatric Surgical Association support firearm-control legislation[20,21]. The AAP also endorses all efforts to identify adolescents at high risk for becoming GSW victims, including those with a history of family or peer violence, substance abuse, depression, previous suicide attempts, or carrying of weapons[20]. Child health care professionals are encouraged to engage in discussions with parents regarding making a gun-safe environment at home by either implementing safe storage techniques (ammunition and firearm stored separately and locked) or by removing firearms from the family’s house altogether[20,22]. Similarly, the American College of Surgeons (ACS) Committee on Trauma advocates towards firearm safety features such as proof locks and “smart gun” technology[23].

**CONCLUSION**

Data from the last 50 years suggest that, in the United States, the vast majority of pediatric cardiothoracic injuries occur due to MVCs and GSWs[5]. Although public education programs such as the ACS’s ‘‘Stop the Bleed’’ (teaching bystanders how to respond to life-threatening arterial hemorrhage) will save lives after traumatic wounds, we feel that advocating for methods that would prevent these injuries in the first place is equally, if not more, important[24]. Gun-control and ORV legislation, GDL programs, initiatives such as “Prevent the Bleed”, as well as professional society recommendations are applicable in pediatric cardiothoracic trauma and can prevent these injuries[25].

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