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16. Abstract

Due to a rise in global urbanization and motorization, pedestrian injuries continue to be a major public-health problem worldwide. To design pedestrian-friendly vehicles, knowledge of common pedestrian injuries, technologies available for reducing these injuries, and benefit estimations for these technologies are essential. In this report, we present a literature review and provide insights into vehicle designs for improving pedestrian safety.

Pedestrian-injury data show that heads and lower extremities are the most commonly injured body regions in vehicle-to-pedestrian crashes, but chest injuries are the second most common injuries after head injuries to cause fatalities. Pedestrian injuries are strongly related to impact speed, pedestrian age, and vehicle type. The increased proportion of older pedestrians and SUVs will likely result in more pedestrian injuries, especially those involving the torso.

Adding energy-absorbing materials to the vehicle front-end structures is the most cost-effective way of developing pedestrian-friendly vehicles. However, such improvements often conflict with other design considerations, such as styling, aerodynamics, and safety standards for low-speed crashes and rollovers. Deployable passive safety designs, such as pop-up hoods and windshield airbags, and active safety designs, such as brake-assist systems and autonomous-braking systems, have demonstrated considerable benefits for reducing pedestrian injuries. Integrated passive and active systems are recommended for a further enhancement of pedestrian protection. However, the benefits from different pedestrian-safety designs vary with different types of vehicles and pedestrians with different statures and ages. Consequently it is important to consider implementing specific safety designs to a specific vehicle for maximizing the effectiveness, and population-age profile may also play an important role in selecting pedestrian safety features.

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