

# Injury Risk and Comfort Assessment Applied to Ambulance Transportation

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**Abstract** - Speed humps are an effective means to moderate the speed of traffic but can have adverse effects on the circulation of emergency vehicles. This study aims to use various comfort and injury risk metrics to evaluate the effects of speed hump traversal on the comfort of the passengers. Studies of human comfort during ambulance transport typically consider the peak acceleration and the whole-body vibration dose value from ISO 2631-1. The novel application of other metrics in the ambulance transport scenario, which were derived for naval and aviation settings, provided additional insight to the human biodynamic response and comfort. The following parameters were considered in the study: peak seat acceleration, dynamic response index, peak lumbar acceleration, bandwidth-limited power-spectral density, and the average acceleration onset derivative (average jerk). In-vehicle road tests were conducted in a Type III ambulance on flat-top and sinusoidal speed humps at various traversing speeds. Results from this experiment show that speeds over 20 km/hr will result in some degree of discomfort to passengers in the ambulance. Additional experiments are needed to verify the consistency of these parameters, but this study has provided a proof of concept for further studies.

**Keywords:** Speed hump; Ambulance; Injury risk; Comfort