

# Driving With Upper Extremity Immobilization: A Comprehensive Review

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Driving with upper extremity immobilization can be potentially dangerous. The aim of this article is to review current medical literature, state laws, and guidelines on driving with upper extremity immobilization and appraise the available evidence. A literature search was conducted to identify citations related to driving with upper extremity immobilization and included a law literature search. Each state's Department of Motor Vehicle handbook was reviewed. Fourteen studies were reviewed and 5 provided subjective and/or objective assessments of upper limb immobilization. Of 2 studies that evaluated only below-elbow immobilization, 1 found driving in a wrist splint had no perceptible effect on driving ability, and the other supported safe driving under normal conditions. The studies that evaluated both below- and above-elbow immobilization recommended against driving with left arm above-elbow immobilization. Two of them found a trend toward worse driving performance in both below- and above-elbow splints. The following organizations' policies on driving are (1) The American Medical Association and National Highway Traffic Association have a joint recommendation for older drivers recommending referral to a rehabilitation specialist, (2) the U.S. Public Health Service recommends normal motor function and adequate mobility of both upper extremities and a performance examination when impaired, and (3) the U.S. Department of Transportation recommends a performance evaluation to determine fitness of *commercial* motor vehicle drivers. There are no state statutes or multijurisdictional surveys on the topic. This review finds that driving is hindered in some splints, there are substantial variations in physician practice patterns, there are no formal guidelines for physicians and patients to consider, and there is a paucity of published literature on this topic in the United States. Both physicians and patients would benefit from evidence-based recommendations or practice guidelines. (*J Hand Surg Am.* 2015;40(5):1042–1047. Copyright © 2015 by the American Society for Surgery of the Hand. All rights reserved.)

**Key words** Car, cast, driving, law, splint.

UPPER EXTREMITY INJURIES OFTEN require a period of postinjury immobilization to allow healing. Pain, stiffness, soft tissue healing, and diminished strength are all mitigating factors on the road to recovery, and reintegration of normal daily

activities is often progressive. Driving with upper extremity immobilization can be potentially dangerous. Pertinent questions to answer (and which are often posed by patients themselves) are: Who should be involved in the decision about driving with upper extremity immobilization? How should we decide when it is safe? To what extent should driver retesting be required? There are notable patient safety, public safety, and medicolegal concerns involved with the return to motor vehicle use. The aim of this review is to appraise current medical literature, state laws, and guidelines on driving with upper extremity immobilization in order to provide a comprehensive review of the available evidence.

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## LITERATURE REVIEW

A MEDLINE search using “arm injury,” “safety,” “automobile driving,” and “arm immobilization” as key words identified English language citations related to driving with upper extremity immobilization published between 1950 and 2013. Potentially relevant articles were identified by title and abstract and full articles assessed. In addition, a law literature search was completed with the assistance of law librarians at our institution. LexisNexis, HeinOnline, and Westlaw Classic databases were searched for relevant articles, state statutes, codes, and regulations. Department of Motor Vehicle handbooks were reviewed for all 50 states in the United States.

### Influence of upper extremity immobilization

Fourteen studies were reviewed (Table 1).<sup>1–14</sup> Five studies provided subjective and/or objective assessments of motor vehicle operation with upper limb splint immobilization.<sup>3,5,10,12,13</sup>

Blair et al<sup>5</sup> tested 1 person in 3 different below-elbow casts (referred by the authors as Colles, scaphoid, and Bennett’s casts) (left-side-drive vehicle). The Colles cast allowed the thumb and fingers to be free but immobilized the wrist. In the scaphoid cast, the wrist and thumb up to the interphalangeal joint were immobilized. In the Bennett cast, the thumb was immobilized in extension, and the wrist was also immobilized. The subject provided a subjective assessment. The right Colles cast had no effect on driving, and the left Colles cast had the most limitation on driving ability secondary to difficulty using the hand brake. The scaphoid and Bennett casts had substantial limitations on driving control.

Kalamaras et al<sup>13</sup> had one person perform driving tests in below-elbow and above-elbow casts (left-side-drive vehicle). The subject failed all tests when evaluated by the driving instructor. However, when evaluated by an occupational therapist, the subject passed driving with both the right and the left below-elbow casts.

Gregory et al<sup>10</sup> used a driving simulator to provide an objective assessment of 8 subjects in below-elbow casts (left-side-drive vehicle). The wrist was immobilized, but the thumb and metacarpophalangeal joints were free. Rural, urban, and hazardous conditions were tested. Overall, participants were more cautious when immobilized. There was decreased performance in response to hazards, and performance was worse when the right arm was immobilized.

Chong et al<sup>3</sup> provided an objective and subjective evaluation of 30 police officers-in-training driving a

timed course wearing above- and below-elbow splints (right-side-drive vehicle). Driving performance was tested on a standardized course and scored by a driving instructor. All splints were associated with poor driving performance, with the left above-elbow splint the worst and statistically significant when compared with other splints. Participants documented increased perceived difficulty and decreased perceived safety. Perceived difficulty was highest and perceived safety lowest with the left above-elbow splint (both statistically significant).

Stevenson et al<sup>12</sup> evaluated 6 subjects in above-elbow, below-elbow, and Bennett’s casts (below-elbow incorporating the thumb), with a formal driving test (left-side drive vehicle). Participants were evaluated by both occupational therapists and driving examiners. Most cast wearers were able to pass the tests; however, the left above-elbow cast was deemed unsafe by both occupational therapists and driving instructors.

Of the 2 studies that evaluated only below-elbow immobilization, 1 found driving in a right wrist cast with the fingers and thumb free had no perceptible effect on driving ability, and the other supported safe driving in right and left wrist casts with the fingers and thumb free under normal (but not hazardous) conditions.<sup>5,10</sup> The vehicle drive side in both of these studies was on the left.

All 3 studies that evaluated both below- and above-elbow immobilization recommended against driving with left above-elbow immobilization.<sup>3,12,13</sup> Collectively, these studies included both left- and right-side-drive vehicles. Two of them found an association with worse driving performance in both below- and above-elbow casts.<sup>3,13</sup>

### Physician surveys

Four studies surveyed physicians: Rees and Sharp<sup>6</sup> surveyed 66 U.K. orthopedic consultants about common limb fractures at various stages of healing and fitness to drive and found disagreement regarding safety to drive in most upper extremity injury scenarios. Von Arx et al<sup>9</sup> surveyed 62 U.K. orthopedic surgeons and found their advice to patients was often varied, not evidence-based, and not standardized. Chen et al<sup>2</sup> surveyed 41 U.S. orthopedic surgeons and found 76% had no consistent return-to-driving policy and that criteria and timelines for allowing driving varied widely; individual practices ultimately formulated their own return-to-driving policies. Hobman and Southern<sup>8</sup> formulated a questionnaire with pictures of 12 upper extremity splints and found that patients and primary care providers generally

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