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Review

Driving restrictions for patients with reflex syncope

Masataka Sumiyoshi*

Department of Cardiology, Juntendo University Nerima Hospital, 3-1-10 Takanodai, Nerima-ku, Tokyo 177-9521, Japan

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ABSTRACT

Reflex syncope is the most common form of syncope that occurs while driving. The 2014 revision of Japanese Road Traffic Laws placed stricter driving restrictions, along with some associated legal penalties, on individuals with recurrent syncope. "Recurrent syncope" is defined as the occurrence of more than two episodes of syncope over a period of 5 years. No restrictions are recommended for private drivers unless they experience syncope without a reliable prodrome while driving or sitting. For commercial drivers, a driving restriction is recommended unless the efficacy of treatment can be confirmed. The "risk of harm" (RH) to other road users appears to be particularly high when commercial driving is involved. The RH formula is calculated using the time of driving, the type of vehicle driven, the risk of sudden cardiac incapacitation, and the probability of a fatal or injury-producing accident. Reducing the driving time or driving a lighter vehicle can reduce the RH. Physicians should talk to their patients about driving and advise their high-risk patients to refrain from driving.

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Contents

| | |
|---|---|
| 1. Introduction | 1 |
| 2. Syncope while driving: Crash, injury, and mortality rates | 2 |
| 3. Reflex syncope while driving: Crash, injury, and mortality rates | 2 |
| 4. Recurrence of syncope while driving | 2 |
| 5. Risk of harm | 3 |
| 5.1. Definition of private and commercial drivers | 3 |
| 5.2. Risk of harm for private driving | 3 |
| 5.3. Risk of harm for commercial driving | 3 |
| 6. Driving restrictions for patients with reflex syncope | 3 |
| 7. Recommendations to prevent syncope while driving | 4 |
| 8. Conclusions | 4 |
| Conflict of interest | 4 |
| References | 4 |

1. Introduction

Reflex syncope is the most common cause of syncope while driving. Syncope while driving has dangerous implications for personal and public safety; thus, considering the restriction of driving privileges is necessary to protect both the individuals with syncope and the public. However, since most patients do not want to give up driving, restricting driving privileges leads to strained

physician-patient relationships. This must be balanced with public safety [1]. In Japan, motor vehicle driving by patients with recurrent syncope is restricted by the Guidelines for the Diagnosis and Management of Syncope; Japanese Circulation Society (JCS) published online in 2012 [2]. The 2014 revision of the Japanese Road Traffic Law placed stricter restrictions on driving for individuals with loss of consciousness, along with some legal penalties. The Working Group of the Japanese Heart Rhythm Society recently issued a statement regarding driving restrictions for individuals with recurrent syncope; this was to provide a practical application of the JCS 2012 guideline [3]. In this review, I address the current

* Fax: +81 3 5923 3217.

E-mail address: sumi@juntendo.ac.jp<http://dx.doi.org/10.1016/j.joa.2017.03.009>1880-4276/© 2017 Japanese Heart Rhythm Society. Published by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

evidence concerning syncope while driving, specifically reflex syncope, and the current recommendations for driving fitness in individuals with reflex syncope.

2. Syncope while driving: Crash, injury, and mortality rates

Table 1 provides a summary of the published studies on syncope while driving, which has been reported to occur in 2.9–9.8% of syncopal patients [4–6]. The reported syncope-while-driving crash rate was 0.96–4.4% with a crash-related injury rate of 0.96–3.4% and a crash-related death rate of 0–0.3% [4–7]. Although most of the studies shown in Table 1 involved a very limited number of patients, Soraija et al. [5] studied 3877 consecutive patients who underwent evaluation for syncope at the Mayo Clinic (Rochester, MN, U.S.). Of these 3877 patients, 381 patients (9.8%) had experienced syncope while driving, with a crash-related injury occurring in 109 patients (2.8%) but no crash-related deaths. Soraija et al. also demonstrated that the long-term (> 8 years) survival in patients who experienced syncope while driving was comparable to that of an age- and sex-matched cohort from the Minnesota population ($p=0.15$) [5]. In their study, syncope while driving was commonly caused by reflex syncope (37.3%) and cardiac arrhythmia (11.8%) [5]. A 2016 Danish nationwide cohort study further showed that 1791 of 41,039 patients (4.4%) with syncope had a motor vehicle crash through a median follow-up of 2 years, of which 3.4% ($n=1398$) led to injury and 0.3% ($n=6$) led to death [7]. The author of this study concluded that prior hospitalization for syncope was associated with an increased risk of motor vehicle crashes throughout the follow-up period: the 5-year crash risk following syncope was 8.2% compared with 5.1% in the Danish general population [7].

3. Reflex syncope while driving: Crash, injury, and mortality rates

Studies of individuals who experienced reflex syncope (or neutrally mediated syncope or vasovagal syncope) while driving are also summarized in Table 1. In patients with reflex syncope,

the occurrence rate of syncope while driving has been reported to be 0.48%–9.4%, whereas that of crash-related injury is reported to be 0%–3.7% [8–11]. There has been only one crash-related death due to reflex syncope [8–11]. Tan et al. [11] assessed the prospective risk of syncope during driving in 418 patients who had multiple episodes of vasovagal syncope. Only two patients experienced syncope while driving without fatality or injury during the follow-up of 0.77 years per person, with a likelihood of 0.62% per person-year. Tan et al. concluded that the estimated risk of serious harm or death was < 0.0035% per person-year in highly symptomatic vasovagal syncope patients, less than the risk of serious harm or death in the general population of the U.S., United Kingdom, and Canada [11].

4. Recurrence of syncope while driving

The recurrence rate of syncopal episodes in individuals with a history of syncope while driving was reported as 3.4–26% [4,5,9,10], but the recurrence rate of syncope while driving was much lower at 1.0–4.3% (Table 1) [4,5,9,10]. Soraija et al. [5] reported that 14.1% of the 381 patients who experienced syncope while driving had another syncopal episode within 1 year of follow-up even though the annual recurrence of syncope while driving was 1.1%. Conflicting results concerning the estimated risk of driving a motor vehicle among individuals with syncope were reported in 2016. The author of the above-cited Danish nationwide cohort study [7] concluded that prior hospitalization for syncope was associated with an increased risk of motor vehicle crashes throughout the follow-up period, but as Chen-Scarabelli and Scarabelli [12] have pointed out, the patients in the Danish study were older (median age: 66 years) with a high incidence of cardiovascular disease (34.8%) [7]. Therefore, although the causes of syncope were not reported in the Danish study, this group of patients possibly had syncope due to causes other than reflex syncope [12]. In contrast, in Tan et al.'s recent study of highly symptomatic patients with vasovagal syncope, the subjects were younger (mean age: 38 ± 17 years) and had a low incidence (0.48%) of syncope while driving and a low estimated risk of serious harm or death (< 0.0035% per person-year) [11].

Table 1
Studies of syncope while driving.

| Author | Sheldon | Bhatia | Li | Maas | Soraija | MacMahon | Nume | Tan |
|-------------------------------------|--------------------------------|----------------|----------------|-------------|-----------------------------|-----------------|-----------------|--------------------------------|
| Reported year | 1995 | 1999 | 2000 | 2003 | 2009 | 2012 | 2016 | 2016 |
| Area | | Milwaukee | Nebraska | | Minnesota | | Denmark | |
| Objective | NMS | NMS | NMS | syncope | syncope | syncope | syncope | vasovagal syncope |
| No. of patients | 209 | 155 | 245 | 104 | 3877 | 64 | 41039 | 418 |
| Age of patients | 42 ± 19 yrs | 49 ± 19 yrs | | 48 ± 16 yrs | | 72 yrs (median) | 66 yrs (median) | 38 ± 17 yrs |
| Syncope while driving | 5 (2.3%) 0.33%/driver-year | 2 (1.3%) | 23 (9.4%) | 3 (2.9%) | 381 (9.8%) | 2 (3.1%) | | 2 (0.48%) 0.62%/person-year |
| Presence of prodrome | | | 61% | | 87% | | | |
| Crash | 4 (1.9%) 0.26%/driver-year | 1 (0.65%) | | 1 (0.96%) | | 1 (1.6%) | 1791 (4.4%) | 0 |
| Crash-related injury | 2 (0.96%) 0.13%/driver-year | 1 (0.65%) | 9 (3.7%) | 1 (0.96%) | 109 (2.8%) | 1 (1.6%) | 1398 (3.4%) | 0 |
| Crash-related death | 0 | 0 | 1 | 0 | 0 | 0 | 6 (0.3%) | 0 |
| Cessation of driving | | 6 (3.9%) | 4 (17%) | 2 (1.9%) | | | | |
| Recurrence of syncope | | 5/149 (3.4%) | 6 (26%) | 19 (18%) | 72 (19%) | | | |
| Recurrence of syncope while driving | | 0 | 1 (4.3%) | 1 (1%) | 10 (2.6%) | | | |
| Follow-up period | | 22 mo (median) | 4.3 yrs (mean) | 1 yr | 1.1%/year 3.9 yrs (mean) | | | |
| Reference no. | 8 | 9 | 10 | 4 | 5 | 6 | 7 | 11 |

NMS: neurally mediated syncope.

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