

Syncope & Driving

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Risk Syncope during Driving & Motor Vehicle Crash (MVC)

- Danish Cohort Study: JAMA Intern. Med. **2016**: 176(4):503-510.
- **41,039** patients with 1st Syncope. Median Age: **66 years**(47-78).
- Median Follow-Up: **2 years** (0.8-3.3).
- **4.4%**(1791) had motor vehicle crash.
- **78.1%** (1398) which led to an injury. **0.3%**(fatal)
- **Crude Incidence rate (CIR)** for MVC with Syncope: **20.6 per 1000 person-years** (95% C.I. 19.7-21.6) V **12.1** (95% C.I.:12-12.1) CIR General Population
- **5 year MVC risk: 8.2% V 5.1%** for general population

Risk Syncope during Driving

- In a retrospective analysis of 3877 patients referred to a tertiary centre (Mayo Clinic) **9.8% (381)** had their index syncope during driving.
 - **28.6%** had an injury while driving, due to their syncope.
 - The rate of recurrence during driving was **0.7% at 6 months** and **1.1% at 12 months**.
- [Sorajja D et al :Circulation 2009;120:928-934].

Risk Syncope during Driving

- **4/19 =21%** of the syncopal episodes while driving, (no pacemaker group) **resulted in injury** [North American Vasovagal Pacemaker study Connolly S.J. et al:J Am Coll Cardiol **1999**;33:16-29]
- **28.5%** of the syncopal episodes, while driving, (medical treatment group) **resulted in injury** [SYDIT : permanent pacemaker vs medical treatment for the prevention of recurrent syncope study : Ammirati F et al:Circulation **2001**;104:52-57] .

Risk of Recurrence Syncope

No. syncopes during life	Prognosis patient <40yrs	
	Risk of recurrence after index episode.	
	Actuarial 1 year risk (%)	Actuarial 2 year risk (%)
1	10	10
2	19	29
> 3	40	54
> 6	43	60

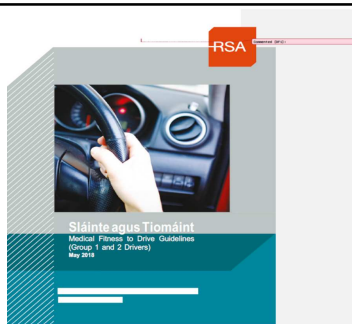
Risk of Recurrence Syncope

No. syncopes during life	Prognosis patient >40yrs	
	Risk of recurrence after index episode.	
	Actuarial 1 year risk (%)	Actuarial 2 year risk (%)
1-2	15.4%	19.7%
3	36.5%	41.7%
4-6	37%	43.8%
7-10	37.5%	43.7%

Risk of Recurrence Syncope

No. Syncope during last 2 years	Prognosis >40 years		
	Actuarial 1 year risk (%)	Actuarial 2 year risk (%)	Actuarial 4 year risk (%)
1-2	22.8	27.5	37.1
3	29.1	35.7	48.9
4-6	43.0	50.8	66.3
7-10	43.2	48.8	59.9
>10	85.6	98.1	100

Medical Assessment Fitness to Drive



Fitness to Drive

- **Two licence categories:** Group 1 & Group 2
- **Group 1:** A, A1, A2, AM, B, B1, BE. [Ordinary/Private car driving, taxi, motor cycles and other small vehicles with/without a trailer]
- **Group 2:** C, CE, C1, C1E, D, De, D1, D1E. [Vocational/Professional driving e.g. Vehicles >3.5 tonnes or vehicles designed for carriage >9 passengers including the driver]. Includes Ambulance driving.
- **Medical guidance standards:** RSA via NOTM (RCPI).
- Supported by **medical advisory panels** in:
 - Cardiology, Psychiatry, Neurology, Diabetes, Vision, Drugs & Alcohol

Assessing Fitness to Drive Requirements of the Driving Task

- Complex, rapidly repeating cycle requiring the driver to interact with the vehicle and the external environment and execute the appropriate driving manoeuvre.
- Information is obtained via the Visual, Tactile and Auditory senses.
- Information is processed using Cognitive processes including short and long term memory and judgement
- Decision is reached what to do.
- Execution is via the musculoskeletal system acting on the gears, brakes and steering wheel.



Medical factors that influence the Driving Task

- Vision
- Visuo-spatial perception
- Hearing
- Sensation
- Muscle power
- Coordination

Medical factors that influence the Driving Task

- Judgement
- Adaptive Strategies
- Reaction Time
- Attention and Concentration
- Memory
- Insight

Significant Issues for Occ. Medicine

- **Impaired Cognitive Function:** ability to process information; including attention, concentration and memory.
- **Impaired Vigilance:** reduced sustained attention.
- **Impaired Visuospatial functioning:** Interpretation of surroundings linked to appropriate motor responses.
- **Poor impulse control:** high degree of risk taking.
- **Poor judgement:** reduced ability to predict and anticipate.
- **Decreased problem solving:** in complex and dynamic situations.
- **Indecisiveness:** inability to respond in an appropriate and timely manner.

Medical factors that influence the Driving Task

- Given these requirements it follows that body systems need to be functional, to an adequate degree, in order to ensure safe and timely execution of the skills required for driving.
- Either a single major impairment or multiple minor impairments may make it unsafe to drive.

Medical Standard

- Should not suffer from medical condition likely to cause :
 - - **Sudden loss of consciousness**
 - - **A reduction in concentration or attention**
 - - **Sudden incapacity**
 - - **A loss of balance or coordination**
 - - **Significant limitation of mobility**
- Likely to: - render driver a source of danger when driving
 - - cause a sudden disabling event at the wheel
 - - unable to control the vehicle

Medical Guidelines Risk Assessment

Risk Matrix:

Chance of Accident Occurring
X
Consequences [outcome] of Accident

Risk of Harm Formula

- **Canadian guidelines** state that a risk of third party death or injury, as a consequence of driver impairment/incapacity, of **1 / 20,000 (0.00005)** is acceptable. This is a basic assumption of risk acceptance and not a calculated or derived value

Canadian Cardiac Society Consensus Conference 2003

- **Can. J. Cardiol 2004; 20(13): 1313-23.**

Risk of Harm Formula
 $RH = TD \times V \times SCI \times Ac$

- **RH** = Risk of Harm
- **TD** = Time spent driving.
 Professional Drivers = 25% [0.25]
 Private car drivers = 4% [0.04]
- **V** = Type of vehicle
 Set as 1 for heavy trucks/buses/tankers
 Set as 0.28 for car.
 Can. J. Cardio. 1992,8, no.4. 406-412

Risk of Harm Formula
 $RH = TD \times V \times SCI \times Ac$

- **SCI** = Allowable yearly risk of sudden incapacitation while driving due to an disease/illness :
 1% [0.01] for Professional drivers.
 22% [0.22] for Private car drivers.
- **Ac** = Probability that an episode of impairment/incapacity , while driving, will result in a third party fatal or injury producing road traffic crash :
 2% [0.02] in all drivers.

Risk of Harm Formula
 $RH = TD \times V \times SCI \times Ac$

- **Ac** the risk that SCI leads to a crash, causing injury to others, is a crucial number. It is stated to be 2% [0.02] for all drivers.
- This number is derived from autopsy studies :
- (1) Sweden: J. Forensic Sciences, 1987; 32(4): 988-998.
- 126 autopsy cases of sudden death while driving lead to 2 passengers being injured giving an Ac of slightly below 2% (the passengers).

Risk of Harm Formula

- (2) Am. J. Cardiol. 1990; 66: 1329-1335
- Publishes series : Reported incapacity while driving.
- 3/8 drivers with fits while driving resulted in a crash where 5 other people were killed giving an Ac = 5/8 (63%)
- 17/66 cases of SCI led to a collision where 3 third party deaths were recorded, giving an Ac = 3/66 (4.5%).
- 38 incidents of driver falling asleep injuring 51 other people, giving an Ac = 51/38(134%).

Risk of Harm Formula
 $RH = TD \times V \times SCI \times Ac$
 Risk of SCI in Professional Drivers

$SCI = RH / TD \times V \times Ac$

- **RH** = 0.00005
- **TD** = 0.25
- **V** = 1
- **Ac** = 0.02

0.00005

 0.25 x 1 x 0.02

Risk of Harm Formula
 $RH = TD \times V \times SCI \times Ac$
 Risk of SCI in Personal Drivers

$SCI = RH / TD \times V \times Ac$

- **RH** = 0.00005.
- **TD** = 0.04.
- **V** = 0.28.
- **Ac** = 0.02.

0.00005

 0.04 x 0.28 x 0.02

Relative Risk Accident

- The **relative risk** is the risk of an accident in a person **with the condition** divided by the risk in a person **without the condition**.
- In the “Epilepsy & Driving in Europe” EU report [2005] it is shown that if one accepts a **relative risk of 2-3, the yearly risk of SCI could be 20-37% in group 1 drivers**.
- Similarly because of TD and damage potential of large vehicles, **the acceptable yearly risk of a SCI is only 1-2% in group 2 drivers**.

Relative Risk/Risk Harm

- Both methods yield similar estimates for **acceptable yearly risk of SCI: 20-40% for Group 1 and 1-2% for Group 2**.
- These figures form the **basis of the EU requirements for Epilepsy and Driving** and will likewise be recommended for use in assessing fitness to drive in cardiovascular diseases including **Syncope by the EU**.

What does Risk Assessment Achieve?

Safety Wider Community?

- Examining Doctor's Responsibility may be to the Public not to the Applicant.
- Ethical considerations as well as legislation is to ensure that the rights of the individual do not exceed the safety of fellow citizens and at the same time ensure that the rights of society to restrict individual action are limited.

International Conference Ophthalmology Brazil, 2006

MEDICAL GUIDELINES ON FITNESS TO DRIVE IN SYNCOPE

Slainte agus Tiomaint (NOTM) 2017

Condition	Group 1 Licence	Group 2 Licence
Reflex Vasovagal Syncope	No Driving Restrictions	No Driving Restrictions
If recurrent will need to check the 3 "Ps" apply on each occasion : Provocation/ Prodrome Postural.	NDLS need not be informed	NDLS need not be informed

Condition	Group 1 Licence	Group 2 Licence
Solitary L.O.C. Likely Unexplained Syncope Probably Reflex V.V. Syncope (no structural heart disease & normal E.C.G.)	NO DRIVING RESTRICTIONS	Can drive 3 months after the event if no further recurrence NB. Cough Syncope

Condition	Group 1 Licence	Group 2 Licence
Solitary L.O.C. Likely to be Cardiovascular in origin. Factors indicating high risk: (next slide)	NO DRIVING FOR 6 MONTHS IF NO CAUSE IDENTIFIED	NO DRIVING FOR 12 MONTHS, IF NO CAUSE IDENTIFIED
SPECIALIST OPINION WITH 48 HOUR AMBULATORY ECG, ECHO, AND EXERCISE STRESS TESTING MAYBE INDICATED. N.B. PACEMAKERS	CAN DRIVE 4 WEEKS AFTER THE EVENT IF CAUSE IDENTIFIED AND TREATED SATISFACTORILY DRIVER MUST NOTIFY NDLS	CAN DRIVE 3 MONTHS AFTER THE EVENT IF CAUSE IDENTIFIED AND TREATED SATISFACTORILY. DRIVER MUST NOTIFY THE NDLS

High Risk Factors

- (1) ABNORMAL E.C.G.
- (2) CLINICAL STRUCTURAL HEART DISEASE
- (3) SYNCOPE CAUSING INJURY , OCCURING AT THE WHEEL, OR WHILST SITTING OR LYING
- (4) MORE THAN 1 EPISODE IN THE PREVIOUS 6 MONTHS.

CONDITION	GROUP1 LICENCE	GROUP 2 LICENCE
Solitary L.O.C. / Altered awareness with seizure markers. Strong clinical suspicion of seizure but no definite evidence. Factors to be considered: - (see next slide) -Group 1 and Group 2 Driver must notify the NDLS	6 months off driving from date of episode. If previous history of Epilepsy or a solitary seizure, 12 months symptom free required. If person experiences recurrent episodes L.O.C. With seizure markers 12 months free of such episodes required.	5 years off driving from the date of episode if no relevant abnormality found on investigation E.G. Brain Scan and E.E.G.

Factors to be considered:

- Without reliable prodrome symptoms.
- L.O.C. For > 5 minutes.
- Amnesia for > 5 minutes
- Injury.
- Tongue biting.
- Incontinence.
- Conscious but confused.
- Headache post event

CONDITION	GROUP 1 LICENCE	GROUP 2 LICENCE
Solitary L.O.C./ Altered Awareness with no clinical pointers.	No Driving 6 Months	No Driving 1 Year if no recurrence
Negative Cardiac / Neurological investigations	Driver must notify the NDLS	Driver must notify the NDLS
2 or more episodes of L.O.C. / Altered Awareness without reliable prodromal symptoms.	No driving for 12 months or until the risk is reduced to <20% per annum. Driver must notify the NDLS	No driving for 5 years or until risk is reduced to <2% per annum. Driver must notify the NDLS

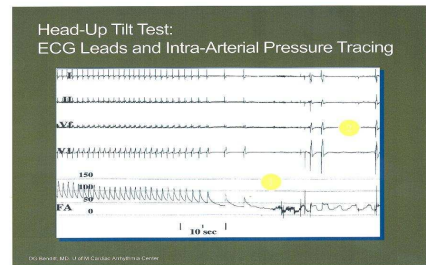
Case Report

- 32 year old female bus driver.
- Presented to E.D. following a RTC 1 hour after starting work (8 AM.)
- Sudden temporary L.O.C.(1-2 minutes) while driving bus. No tongue biting or incontinence.
- No reliable prodromal symptoms and full recovery (10 minutes) without CNS sequelae. ? Amnesia
- 1 previous episode of syncope 18/12 earlier (standing).
- No relevant P. Med. Hx. or F. Hx. Syncope /L.O.C.
- No medication except O.C.P.
- Recent low calorie diet.
- Spent 1 hour in gym prior to starting work.

Case Report

- Physical exam was normal. No orthostatic hypotension.
- Mental state : no confusion. Orientated in T/P/P
- Routine bloods were normal as was resting ECG.
- CT brain was unremarkable.
- 24 hour Holter was scheduled and subsequently reported as normal/negative.
- ? **Fit or Unfit to return to Bus driving.**

Tilt Table Test



Thanks for
listening

