OSA and traffic accidents

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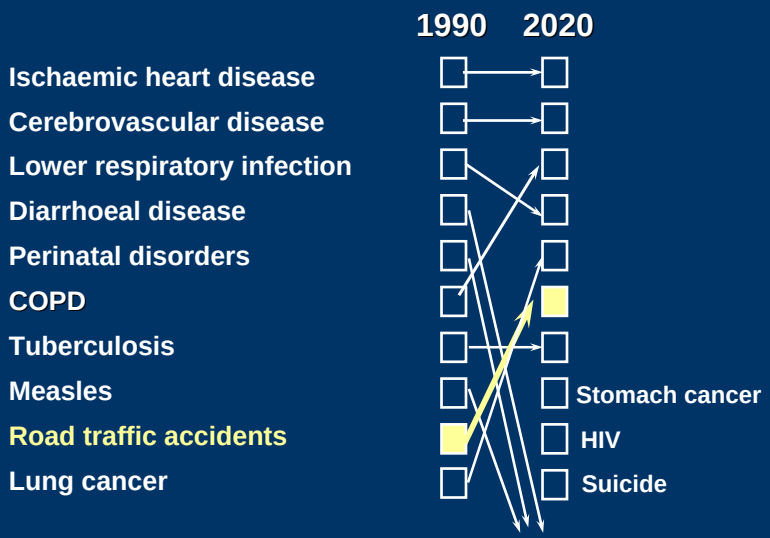
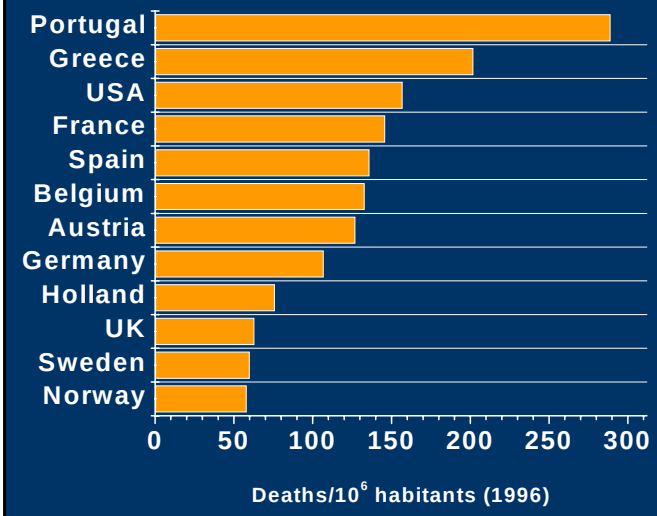
Future Global Mortality



Murray & Lopez: Lancet 1997

Deaths and traffic accidents



- Prevalence
- Importance
- Associated factors
  - Alcohol
  - Speed
  - Age (20-40 yr.)
  - Vehicle pitfalls
  - Road and meteo changes
  - Medical conditions:
    - SAS
    - Epilepsy
    - Narcolepsy
    - Others

The questions

- What is the evidence for an association?
- How big is the risk?
- What are the mechanisms?
- Can the patient at risk be identified?
- Can the risk be lowered ?
- What are the legal / social implications?

The evidence

- *First hints*
  - George *Lancet* 1987;8556:447
  - Findley *ARRD* 1988;138:337
  - Aldrich *Sleep* 1989;12:487
  - Haraldson *JORS* 1990;52:57
- *Epidemiological studies*
  - Young *Sleep* 1997;20:608
  - Teran *NEJM* 1999;340:847
- *Studies in patients*
  - Wu *Neurology* 1997;46:1254
  - Barbé *AJRCCM* 1998;158:18

Magnitude of the risk
OR (95% CI)

	Any MVA	Multiple MVA
Young 97	1.6 (0.8-3.1)	7.3 (1.8->25)
Teran 99	8.1 (2.4-26.5)	-
Wu 97	2.6 (1.3-5.2)	-
Barbé 98	2.3 (0.9-5.3)	5.2 (1.1-25.3)

Risk and sex
OR (95% CI)

	Women	Men
Snorer	0.9 (0.5-1.6)	3.4 (1.8-6.9)
AHI 5-15	0.8 (0.3-2.0)	4.2 (1.6-11.3)
AHI >15	0.6 (0.2-2.5)	3.4 (1.4-8.0)

Young *et al Sleep* 1997:20:608

Risk according to OSA and alcohol intake the day of the accident

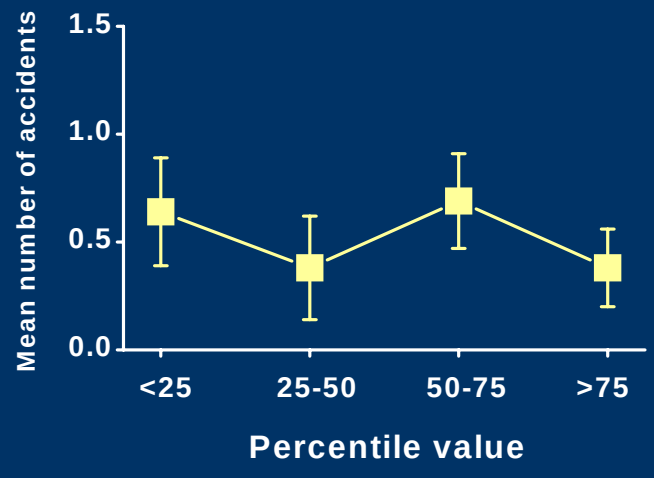
VARIABLE	APNEA–HYPOPNEA INDEX ≥10	APNEA–HYPOPNEA INDEX <10	OR (95% CI)*
Case patients			
Alcohol consumed on day of accident	11	24	11.2 (3.8–32.9)
No alcohol consumed on day of accident	8	49	4.0 (1.3–12.0)
Controls	6	146	1.0

Teran *et al. NEJM* 1999:340:847

Potential mechanisms

- Is the increased risk related to sleepiness ?

Sleepiness (Epworth scale)



Barbé *et al. AJRCCM* 1998; 158:18-22

Sleepiness (MSLT)

TABLE 3. *Sleepiness by MSLT and MVA history status; Sleep Cohort Study (n = 453)*

	MSLT score[ab]	
	Women mean (SE)	Men mean (SE)
No MVA	9.3 (0.4)	8.8 (0.3)
1 MVA	9.7 (0.8)	7.9 (0.7)
>1 MVA	9.1 (1.6)	4.5 (2.7)

MSLT, multiple sleep latency test; MVA, motor vehicle accident; SE, standard error.

[a] $p > 0.05$ for all comparisons.

[b] Sleep latency average over four trials.

Young et al. Sleep 1997:20:608

Potential mechanisms

Is the increased risk related to sleepiness ?

NO

Self-reported sleepiness while driving as a risk factor for traffic accidents in patients with OSAS and in non-apnoeic snorers

Lloberes P, Levy G, Descals C, Sampol G, Roca A, Segales T, de la Calzada MD

Serveis de Pneumologia I Neurofisiologia Clinica, Hospital Vall de Hebron. Barcelona

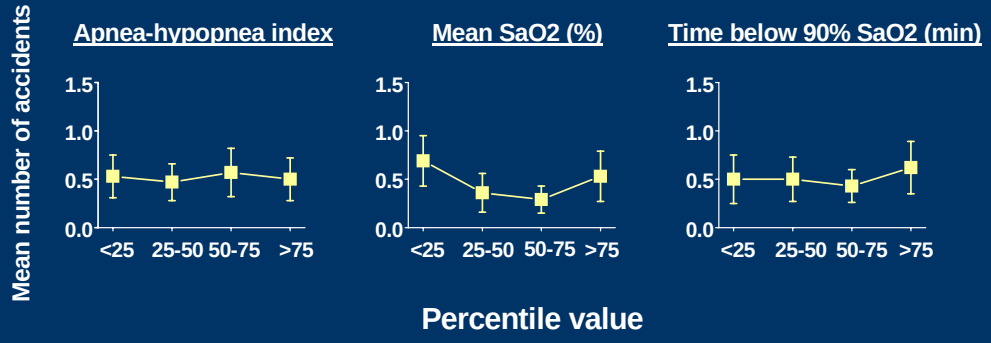
Respir Med 2000;94:972-6 (PMID: 11059950)

OR: 5 (95% IC 2.3-10.9)

Potential mechanisms

- Is it related to the abnormal nocturnal events?

Nocturnal events



Barbé *et al. AJRCCM* 1998; 158:18-22

Potential mechanisms

- Is it related to the abnormal nocturnal events?

NO

Other potential mechanisms

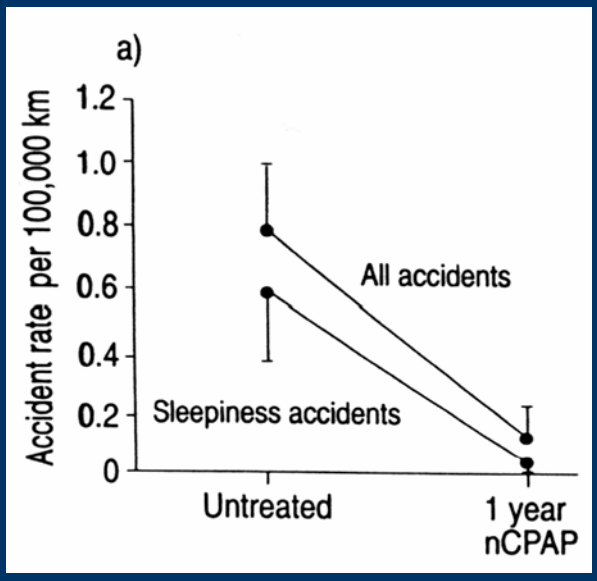
- Concentration
- Attention
- Activation
- Coordination
- Fatigue
- Alcohol
- Others

Can the patient at risk be identified?

- Currently we are unable to identify a specific risk profile.
- Risk appears increased in **all patients** with OSAS, particularly in men.

Can the risk be lowered?

Cassel *et al Eur Respir J* 1996;9:2606



Reduction in accidents following CPAP treatment

George *Thorax* 2001;9:2606

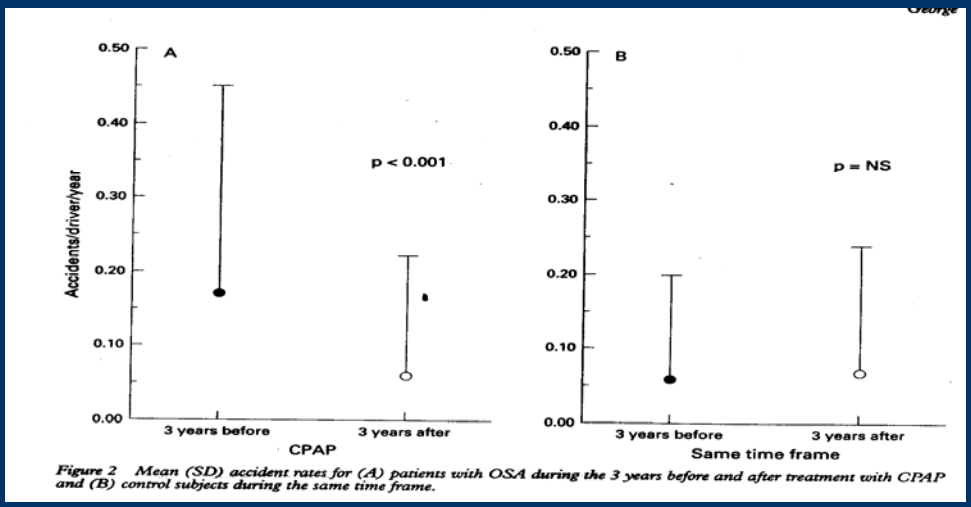


Figure 2 Mean (SD) accident rates for (A) patients with OSA during the 3 years before and after treatment with CPAP and (B) control subjects during the same time frame.

Effect of Continuous Positive Airway Pressure on the Risk of Road Accidents in Sleep Apnea Patients

Ferran Barbé[a], Jordi Sunyer[b], Andrés de la Peña[a], Jordi Pericas[a], Lola R. Mayoralas[a], Josep María Antó[b], Alvar G.N. Agustí[a]

[a]Servei de Pneumologia, Hospital Universitari Son Dureta, Palma Mallorca, Universitat IIIes Balears, Palma de Mallorca, and [b]Institut Municipal Recerca Medica, Barcelona, Spain

Respiration 2007;74:44-49 (DOI: 10.1159/000094237)

DESIGN

- This investigation was designed as a pre-post intervention study.
- We compared the incidence of automobile accidents in a cohort of patients with severe SAS (that required CPAP treatment) with a control group of subjects individually matched for sex and age.
- In both groups, we explored number of accidents the 2 years before inclusion (retrospective) and 2 years post-inclusion (prospective), were patients were on CPAP treatment.

MEASUREMENTS

- Anthropometric data
- Epworth
- Number of accidents
  (self reported and insurance companies)
- Potential confounders variables:
  - Km/yr
  - Mean hours slept/night
  - Alcohol and coffee intake
  - Farmacs

POPULATION

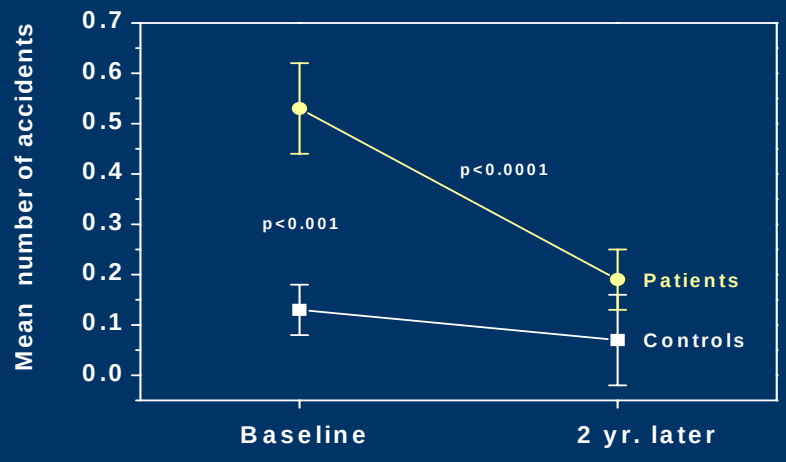
- Inclusion criteria:
  - having a valid driving license
  - being a permanent resident in our community
  - CPAP treatment (in patients group)
- Exclusion criteria:
  - drug consumption
  - psychiatric disorders
  - shift-work
  - epilepsy
  - narcolepsy, PLM

Subjects at inclusion

	Patients n = 80	Controls n = 80	p value
Males	78	78	
Age yr	48 ± 2	45 ± 2	< 0.05
BMI	33 ± 1	27 ± 1	< 0.001
Epworth	12 ± 1	3 ± 0.2	< 0.0001
AHI	60 ± 2	_	

Effects of CPAP on traffic accidents in SAS

Accidents in 80 patients and 80 controls.



Barbé *et al.* ERS Annual Congress. Berlin 2001.

Analysis of risk

- At baseline, patients showed an increased risk of have had at least one road accidents:

  OR (CI 95%) = 3.28 (1.40 – 7.67), p = 0.006
  OR_{adj}(CI 95%) = 3.97 (1.33 – 11.87), p = 0.013

- CPAP treatment reduces de risk of traffic accidents:

  OR (CI 95%) = 2.06 (0.67 – 6.35), p = 0.28
  OR_{adj}(CI 95%) = 2.92 (0.68 – 12.52), p = 0.15

Analysis of confounder factors

- We explored potential confounder factors by using a univariate approach followed by a logistic regression were factors were included according to clinical or statistical relevance.

Drugs intake

	Patients n = 76		Controls n = 73	
	Pre	Post	Pre	Post
ß-blockers	1	2	0	2
Oral AD	4	6	4	3
Antihistam.	2	1	0	1
Benzodiaze.	7	2	2	6
Antidepres.	5	3	0*	3

Other potential confounders

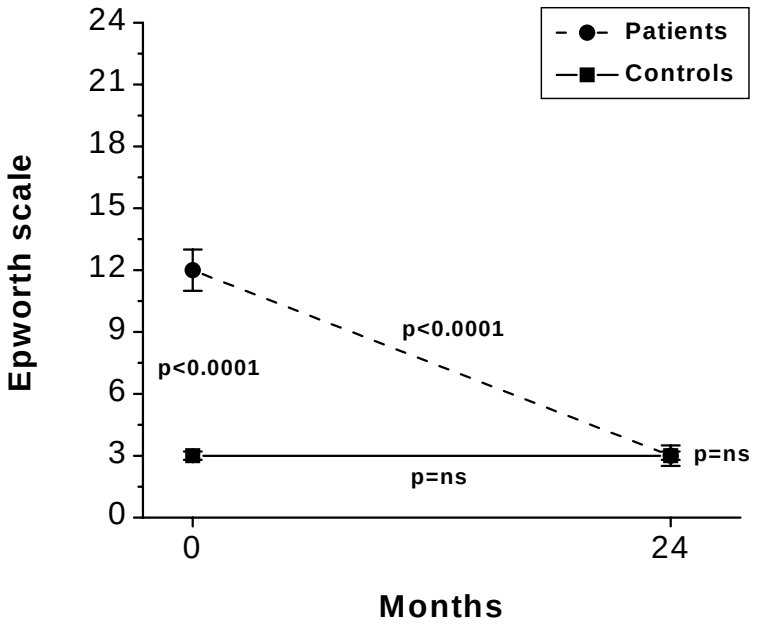
	Patients n = 76		Controls n = 73	
	Pre	Post	Pre	Post
Alcohol gr/d	14 ± 3	15 ± 3	10 ± 2	8 ± 2
Km / yr (th)	25 ± 2	21 ± 2*	21 ± 2	20 ± 2
Hours slept/d	8 ± .2	8 ± .1	8 ± .2	8 ± .3
Caffeine cups/d)	2 ± .2	2 ± .2	2 ± .2	2 ± .2
BMI (kg/m^2)	33 ± .7	32 ± .6*	27 ± .4	27 ± .4

Predictive factors

- Is CPAP compliance or the change in the Epworth scale related to the reduction in the risk?

NO

(CPAP compliance was 6.59 ± .2 h/day, and Epworth was reduced in almost all patients)



Legal & social implications

- For the patient
  - be aware of the increased risk
  - avoid alcohol
  - use CPAP
- For the doctor
  - inform the patient
  - check compliance with CPAP
- For the legislator
  - base new regulations on scientific evidence

Summary

What do we know?

- Patients with OSA had more car accidents
- Traffic accidents are not clearly related to sleepiness nor to abnormal nocturnal events
- CPAP treatment decreases the risk

Summary

What are the pending questions?

- What mechanism(s) underlie this association?
- Is there a "higher risk" clinical profile?
- Why the risk is not increased in women?
- Does snoring *per se* increase the risk?