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CLINICAL REVIEW

Societal costs of insomnia

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SUMMARY

Insomnia is the most common sleeping disorder and has been recognized as a major public health issue, associated with a high societal cost. The aim of this review is firstly to understand how the socio-demographic and career characteristics of insomniacs may influence the economical consequences of this disease. Secondly, it also tries to explain how patients seek help to cope with their insomnia. The review aims to carefully describe the possible links between insomnia and public health concerns as to point out what are the certitudes and the missing data on the consequences of insomnia on work, economics, accidents, costs and health related quality of life (HrQol).

Introduction

Today, sleep disorders such as insomnia are better recognized as major public health issues, associated with numerous societal consequences: accidents, lost lives, lost income, disability, lost educational opportunities, etc. Sleep disorders affect the quality of life of millions of people around the world. Insomnia is the most common sleep disorder.[1–4]

To start with, epidemiological studies made in multiple countries have clearly shown that millions of adults are chronically ill with various sleep disorders: insomnia, sleep apnea, sleep deprivation and hypersomnia. The consequences of these sleep disorders are diverse. Some sleep disorders may be fatal; some affect the whole life, others have less important consequences but may disturb several months of the life. In adults, insomnia affects one in five men and one in three women. In the elderly, disturbed sleep with night wandering is amongst the most frequently cited causes of dependence. In the last decade, several consensus meetings about insomnia, its recognition, diagnosis and treatment, have published recommendations.[5–7] All these consensus groups have underlined the impact of insomnia on public health and the need to better understand the consequences of insomnia on work, economics and quality of life. However, insomnia is still unrecognized by health professionals. One issue lies in the fact that insomnia is frequently considered as a symptom rather than as a disease in itself. Moreover, it is not clear for practitioners whether it is a symptom or a disease. Another difficulty lies in the decision made by the patient and the health professional, as to when insomnia becomes severe enough to need treatment. Finally, there is still insufficient knowledge about the management of insomnia.

The aim of this review is to carefully describe the possible links between insomnia and public health concerns and to point out what are the certitudes and the missing data on the consequences of insomnia on work, economics and health related quality of life (HrQol).

Epidemiology: the magnitude of insomnia, screening the disorders and seeking help

Although the aim of this review is not to describe the epidemiology of insomnia, it is necessary to put its prevalence, socio-demographic characteristics and access to care in a universal and economical perspective. Recent international studies have shown that insomnia concerns a large amount of individuals everywhere. Independent of the country and of the socio-economical characteristics of the patients, insomnia has common features around the planet which require equal care.

Prevalence

National and international studies of the last decades have consistently confirmed the high frequency of insomnia in the

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general population of many countries. However, the prevalence found in these studies may vary from 10 to 40%, which often reflects variations in the methodologies and definitions used to assess insomnia. Despite considerable effort made these last years to adopt consensual and common definitions, it is still not always applied in all the surveys.[7–10]

At the national level: Ohayon and Smirne[11] in a national survey on insomnia conducted in 2002, used a representative sample of the United Kingdom population of 3970 individuals aged 15 years or older. Insomnia symptoms were reported by 27.6% of the sample. Sleep dissatisfaction was found in 10.1% and insomnia diagnosed in 7% of the sample. The use of sleep-enhancing medication was reported by 5.7%. Leger et al. also performed a national questionnaire based survey on insomnia in a representative sample of the French population that included 12,778 individuals.[12] They found a prevalence of insomnia of 19% with 9% presenting severe insomnia (at least two symptoms of insomnia according to the DSM-IV definition). Kim et al. found a prevalence of 21.4% of insomniacs in a 3000 sample representative of the general population of Japan.[13] In the United States, the most recent study was carried out by the National Sleep Foundation in 2004 on a representative sample of 1506 subjects aged over 18.[14] Twenty-one percent of the sample complained of insomnia according to the ICSD definition, but only 9% had insomnia and daytime consequences. A compilation of the recent studies by Ohayon in 2002, confirmed that insomnia usually concerns around one adult in three in the general population.[1] However 16–21% of these only have insomnia at least three times a week, 13–17% describe their trouble as important or as a major concern and 9–13% have insomnia and daytime consequences. It seems understandable that those who had continuous daytime impairment may more accurately constitute the clinically significant group of patients who need to be treated for insomnia.

International studies were also carried out to observe the geographic distribution of insomnia. They demonstrated the universality of the insomnia complaint. Ohayon observed, in a survey on non-restorative sleep among 25,580 individuals from 7 European countries, that the prevalence seems to follow a north–south line, with the United Kingdom having the highest prevalence and Spain the lowest.[15] The author explains these differences with factors such as varying sleeping habits, climate and cultural approaches to answering questionnaires. Soldatos et al. in a survey of 35,327 from 10 countries found that 31.6% of subjects had 'insomnia', while another 17.5% could be considered as having 'sub-threshold insomnia'.[2] More recently, Leger et al. found in a survey comparing sleep disorders of representative samples of 3962 north Americans, 5005 Europeans and 1165 Japanese that insomnia reaches significantly higher in the US (39%) than in Europe (28%) and in Japan (21%).[3] A major issue is to have a better understanding of the cultural differences between insomniacs as no criteria are sensitive enough to explain why the Japanese complain less of insomnia than US citizens.

Socio-demographics factors contributing to insomnia

Almost all studies show an increasing prevalence of insomnia with age and a sex ratio in favor of women.[1–4, 11–16] In a 12,778 sample, Leger et al., found that severe insomnia was almost twice as frequent in women as it was in men (12% vs. 6.3%; $p < 0.0001$).[12] Older subjects usually have more severe complaints than the younger. In a representative sample ($n = 5622$) of the general population of France aged 15 years or older, Ohayon and Lemoine found that the prevalence of insomnia was twice as frequent in subjects of 65 years or older compared to subjects younger than 45 years.[16] Moreover, in this last study, 47.1% of subjects above 65 years reported three symptoms of insomnia compared to 32.2% of subjects under 44 years old ($p < 0.001$). However, younger subjects (under 45 years) and females had significantly more daytime consequences of insomnia than older subjects and the male population.

There are few studies which aim to support the link between perceived job stress and the prevalence of insomnia. The exception is the study by Nakata et al. of 1161 male white-collar employees of a Japanese electric equipment company surveyed by a mailed questionnaire.[17] This study found an overall prevalence rate of insomnia of 23.6% of the workers. After adjusting for multiple confounding factors high intra group conflict (OR = 1.6), and high job dissatisfaction (OR = 1.5) had a significantly increased risk of insomnia. Low employment opportunities, physical environment and low coworker support were also weakly associated with a risk of insomnia among workers.

Insomnia is usually more frequent in persons with a low socio-economical status.[17] However, in the French population, the prevalence of insomnia was highest in the white-collar group (20.8%).[12] lower rates of insomnia were also found in upper level executives, liberal professions and in farmers. Similarly, Doi et al. showed, in a cross-sectional study including 4868 day time white-collar workers that poor sleep was significantly more prevalent in white-collars (30–45%) than in the Japanese general working population.[18] Recently, Gellis et al., investigated the incidence of insomnia and insomnia-related health consequences among a sample of at least 50 men and 50 women of different socioeconomic status in each age decade from 20 to 80+ years old.[19] Results indicated that individuals of lower education were significantly more likely to experience insomnia, even after researchers accounted for ethnicity, gender, and age. Additionally, individuals with fewer years of education, particularly those who had dropped out of high school, experienced greater subjective impairment because of their insomnia.

Seeking help for insomnia and access to the treatments

Mild and even severe insomniacs do not always seek help for treatment. Years ago, a Gallup study made in the USA found that only 5% of insomniacs had ever visited a physician to specifically discuss their sleeping problem and that only 21% had ever taken prescription medication for sleep.[20] In France also, only 53% of severe insomniacs vs. 27% of subjects with occasional sleep problems reported they had ever visited a doctor specifically for insomnia ($p < 0.0001$).[21] Many people with sleep dissatisfaction just watch television, read, use non-prescription medication, or drink alcohol to promote sleep.[1] In a survey performed in the Detroit area (USA) of a representative sample of 2181 adults aged 18–45, Johnson et al. found that 13.3% had used alcohol as a sleep aid in the past year and 10.1% had tried over-the-counter medication.[22] Fifteen percent of those who used alcohol as a sleep aid did it for at least one month; however the duration of use was short for the majority of users (less than one week). Only 5.3% used a prescription medication. However, 10.8% of French adults regularly used prescription medication to promote sleep.[21] Recently, a consecutive sample ($n = 700$) of adults attending a non-urgent primary care appointment in the U.S was screened for sleep problems. A follow-up mailed survey then assessed insomnia symptoms, daytime impairment, beliefs about sleep, medication use, sleepiness, fatigue, and medical help-seeking.[23] They interestingly found that 52% of patients with probable insomnia reported discussing it with a physician. Multivariate logistic regression analyses indicated that discussing one's probable insomnia with a physician was independently associated with having a greater number of medical conditions (OR = 2.19 [95%

confidence intervals (CI), 1.13 to 4.22]), being more educated (OR = 1.67 [95% CI, 1.11–2.51]), sleeping less per night (OR = 0.71 [95% CI, 0.52–0.96]), and feeling more accurately daytime impairment due to insomnia (OR = 2.07 [95% CI, 1.06–4.03]). Pires et al. have compared two studies made in Brazil in 1987 and 1995.[24] They have shown that only 12.5% of the Brazilian insomniacs had sought medical help for their sleep problems or had informed their physician of sleep problems during evaluation of other problems in 1987 and even less in 1995: 10.8%. In a study carried out in the US in five managed care organizations, Hatoum et al.[25] indicated that only 0.9% of American patients were seeing physicians due to sleep problems. Of those, only 11.6% were taking prescription medications specifically for sleep problems and 21.4% were taking over-the-counter treatment. Moreover, the diagnosis of insomnia is not always followed by treatment. In Germany, a Nationwide Insomnia Screening and Awareness Study (NISAS-2000) found that close to 50% of all patients with insomnia did not receive a prescription for a specific insomnia therapy.[26] In Norway, Sivertsen et al. (30) have shown, in a group of 47000 subjects from 20 to 89 years old, that having insomnia is an independent risk factor of using the health care system (both services and medications). All kind of medications are concerned, but also specific ones such as: sleep medications (OR = 8.38; CI 95% = 7.48–9.38), sedatives (OR = 2.14; CI 95% = 1.9–2.40), antidepressive drugs (OR = 1.89; CI 95% = 1.69–2.12).

Comorbidity of insomnia with depression and anxiety: respective impact on economics

Insomnia is associated with a variety of medical and psychiatric conditions. It is easier to clarify how insomnia is due to one medical problem than understanding insomnia as the cause or consequence of psychiatric diseases. Comorbidity with depression and anxiety is estimated to occur in 35–60% of chronic insomniacs.[1,7,11,21,28,29] In Norway, Sivertsen et al. [30] found a strong association between insomnia and anxiety (OR = 2.42; 95% CI = 2.28–2.56) and depression (OR = 1.99; 95% CI = 1.88–2.10). Several longitudinal studies have also shown that insomnia may represent a substantial and statistical risk for the development of depressive disorders.[1, 28] To clarify public health consequences due to insomnia itself, it seems important to differentiate between insomniacs with psychiatric diseases and those without in the design of the studies as to better individualize the consequences of insomnia independently of psychiatric disorders. Depression and anxiety have a well-documented impact on economics and quality of life.[31–33] Overland et al. in the same cohort reported by Sivertsen et al. have compared insomnia and depression, as causes of claiming disability pension 18–48 months after a first health survey.[34] In the fully adjusted model, the relative contribution from insomnia complaints alone towards disability pension (6.69% (3.80–9.50)) was larger than that for depression (3.79% (1.51–6.01)). Insomnia by itself is therefore found as a strong risk factor for a disability pension.

Impact of insomnia at work

Insomnia at the workplace

As we previously argued insomnia has a high prevalence in adults and therefore also in professionals. Very few studies are specifically devoted to insomnia in the workplace. However, it is commonly accepted that insomnia affects daytime functioning and working ability of professionals.[35] Riedel and Lichstein have recommended using objective measures of work performance (absenteeism, work limitation, errors, job promotion…) to clarify the impact of insomnia on daytime activity.[36] Insomnia is not a visible handicap in the workplace and it is difficult for insomniacs to explain to their colleagues and managers that they have had a poor night's sleep and that they need to rest. Insomniacs have to face a regular work load and they frequently complain of difficulties in their professional life.[37,38] However, there are few studies assessing the true impact of insomnia on daily work. This is a crucial point in the evaluation of the impact of insomnia on absenteeism and other work measures in a real setting.

Absenteeism

In economic and epidemiological studies, overall measures of the respondent's health appeared to be the most important covariate of absenteeism.[39,40] In a large, cross-sectional, national probability sample of 1308 workers in the USA, Leigh demonstrated that complaining of insomnia was the most predictable factor of absenteeism among 36 variables.[40] In a study comparing 80 insomniacs at work to 135 good sleepers, it was found that insomniacs had double the rate of absenteeism than the controls.[21] Lavie et al. also found a higher rate of absenteeism in insomniacs, which is significantly linked to a higher rate of work accidents in insomniacs.[41] They hypothesized that co-workers of the absent insomniacs are more exposed to accidents due to their work overload.

However, these preliminary studies were based on general population samples: insomnia was not always clearly defined and the groups of insomniacs were heterogeneous. Furthermore, the absenteeism data were mainly based on the patients' report, not on objective data.

In a recent study,[42] we specifically surveyed the absenteeism of a group of insomniacs at work compared to a matched group of good sleepers. Insomniacs showed almost twice the same rate of absenteeism than that of good sleepers. The difference between insomniacs and good sleepers was particularly high for managers (OR = 2.29) and women (OR = 2.31). We believe that this study is of particular interest because a) we processed objective (rather than subjective) data on absenteeism, b) insomnia was defined according to international classifications, c) subjects with depression and anxiety were excluded, d) subjects were all full-time workers and representative of the active population in the area and e) subjects with chronic disease (which may interfere with sleep) and pregnant women were excluded from the study. Hence, in the group studied here, it seems more probable that significant differences between insomniacs and good sleepers reflect the impact of insomnia itself, rather than the effects of comorbidities. In another study on long term absenteeism (including absence above 6 months) 986 insomniacs were compared to 584 controls: subjects with insomnia (whatever the cause) reported poorer quality of life and higher absenteeism rate than controls (9.6 ± 31 vs. 5.8 ± 19 days, $p < 0.01$).[43] In insomniacs with depressive complaints associated with insomnia, after logistic regression, absenteeism was shown to more accurately reflect depression than insomnia itself. However, as recently shown by Sivertsen et al., insomnia itself may be an independent predictor of absenteeism.[44] The authors used a historical cohort design with 4 years of follow-up. Information on sick leave was obtained from Norwegian official registry data and merged with health information from the Hordaland Health Study in Western Norway, from 1997 to 1999. Six thousand eight hundred and ninety two participants aged 40 to 45 years were assessed for self-reported symptoms of insomnia, socio-demographic factors, lifestyle behaviours, body mass index, symptoms of sleep apnea, anxiety, depression, as well as a range of somatic diagnoses, somatic symptoms, and pain. The outcome was the total number of

Table 1
Insomnia and absenteeism.

Study, (year of publication)	Design of the study and sample	Absenteeism
Leigh (1991)[40]	Cross-sectional national sample 1308 workers	Number of self-reported absences during the past 14 days: Insomniacs had a double rate of absenteeism than good sleepers.
Leger et al. (2006)[42]	369 insomniacs vs. 369 good sleepers	Subjects with at least 1 work absence in the last 2 years: OR = 1.93 [1.44–2.61] OR (manager) = 2.29 [1.29–4.07] OR (women) = 2.31 [1.38–3.88]
Philip et al. (2006)[43]	986 insomniacs vs. 584 controls	Duration of absenteeism in the last 12 months: 9.6 ± 31 vs. 5.8 ± 19 days; $p < 0.01$
Sivertsen et al. (2009)[44]	Prospective study 4-years follow up 6892 participants: - No insomnia = 6131 - Insomnia with daytime impairment = 351 - Insomnia without impairment = 410	Number of sick days during the follow up (insomnia with impairment vs. no insomnia): OR = 2.20 [95% IC = 1.77–2.74] OR adjusted[a] = 1.51 [95% IC = 1.19–1.94]
Daley et al. (2009)[46]	948 adults divided into three groups: - Good sleepers = 508 - Insomnia symptoms = 295 - Insomnia syndrome = 153	Hours of work missing during the previous 3 months: 5.9 h (GS) vs. 14.3 h (SYMP) vs. 19.9 h (SYND); $p < 0.05$
Akerstedt et al. (2007)[45]	1542 subjects with disturbed sleep vs 6824 with not disturbed	Increased long term sickness (>/90 days) OR = 1.9; 95%CI 144–261 And short term sickness OR = 1.16; 95%CI 1.24–1.71

[a] model adjusted on age, gender, education health behaviour, BMI, anxiety, depression, somatic diagnoses, sleep apnea, somatic symptoms, pain.

sick days during a 4-year follow-up period, as registered in the official registries by the National Insurance Administration. Overall, insomnia was found to be a significant predictor of sick leave (OR = 2.2) and the effect remained significant when adjusting for possible confounders (OR = 1.51). The effect increased with longer durations of sickness leave.

Akerstedt et al. have also studied long term sickness absence (>/90 days) and short term sickness absence (14–89 days) in the subjects with disturbed sleep (1542 individuals) of a national Swedish cohort, compared to people with not disturbed sleep (6824 individuals).[45] The report showed that disturbed sleep is associated with an increasing risk of long term sickness (OR = 1.90; 95%CI 1.44–2.61) and short term sickness (OR = 1.16; 95%CI 1.24–1.72). This link seems to be stronger in females than in males.

Daley et al. recently showed the impact of insomnia on absenteeism in a group of 953 French-speaking adults from Québec, categorized as having insomnia syndrome (SYND) or insomnia symptoms (SYMPT) or as good sleepers (GS).[46] Data for absenteeism were also obtained from the Québec-government-administered health insurance board: they calculated that 25.0% of the SYND had been absent from work relative to 17.1% of GS (OR = 1.7). The main results of these studies are summarised in Table 1.

Work limitation and other occupational characteristics

The most original preliminary study relevant to this point was conducted by Johnson and Spinweber [47] who demonstrated that insomniacs in the Navy were slower at work and had poorer career advancement than good sleepers. The difficulty with comparing the respective work contents of insomniacs and good sleepers is a major concern in the discussion of these results. Insomniacs' impairment at the workplace has been assessed by very few authors. In a study comparing 240 severe insomniacs (SI) with 391 good sleepers (GS), Leger et al. explored the consequences of insomnia on work.[21] Fifteen percent of SI vs. 6% of GS ($p < 0.001$) reported having made errors at work over the previous month, which could have resulted in serious consequences. For 6% of SI vs. 2% of GS, errors had occurred more than once during the previous month ($p = 0.0032$). Twelve percent of insomniacs vs. 6% of GS reported being late at work during the previous month (NS). Moreover, 18% of SI vs. 8% of GS ($p = 0.0004$) felt that they had exhibited poor efficiency at work. Thirteen percent of SI vs. 9% of GS reported difficulties completing complicated tasks at work (NS). In a recent study, Daley et al. interviewed 930 adults from the province of Quebec about sleep and professional consequences.[48] Reduced productivity was assessed by visual analog scale (VAS). Thirty-five percent of insomniacs vs. 9.8% of the good sleepers group reported reduced productivity. More recently, Bolge et al. reported in a sample of 19711 adults from the 2005 US National Health and Wellness Survey (5161 insomniacs, 14.550 non-insomniacs),[49] that insomniacs had significantly greater activity impairment scores assessed by the work productivity and activity impairment questionnaire (WPAI) (+18.04) than subjects in the non-insomniac group. Using the same WPAI score, employed subjects in the insomniac group had greater absenteeism (+6.27), impairment at work (+13.20), and work productivity loss (+10.33) scores than the non-insomniacs ($p<0.001$ for all differences). In Norway, Sivertsen et al. also showed that insomnia was a strong predictor of permanent work disability.[50] Using a retrospective cohort design with 4-year follow-up, insomnia data, sleep duration and potential confounders were gathered from 6599 working persons (40–45 years). The outcome was the award of a disability pension, as registered by the National Insurance Administration. After controlling for baseline exposure to disability and sick leave, insomnia was found a strong predictor of permanent work disability (OR = 4.56), and this effect remained significant after controlling for sleep duration, as well as for other possible confounders (OR = 1.88). Short sleep duration was not significantly associated with subsequent work disability, while long sleep duration (>8.5 h) did predict work disability (OR = 2.96), as well as in the fully adjusted model (OR = 2.14). This study demonstrated that both insomnia and long sleep duration are strong and independent risk factors for subsequent work disability.

The work limitation questionnaire (WLQ) has been developed to assess the on-the-job impact of chronic health problems and/or treatment ("work limitations"). It includes 25 items and 4 dimensions (time management difficulties, physical, mental-interpersonal, output demands and work productivity loss) over a 2-week reporting period. The higher the work limitation of employees, the worse the productivity.[51] In insomnia, the WLQ has been first used by Walsh et al. [52] to assess the effects of Eszopiclone on work limitations at baseline, Month 1, Month 3 and Month 6. The mean of the WLQ scores were similar at baseline between eszopiclone and placebo groups for all 5 domains. Averaged out over the month 1–6 period, the eszopiclone group had significantly lower mean scores relative to the placebo on all domains of the WLQ ($p < 0.05$). Additionally, there were significant improvements with eszopiclone relative to placebo at months 1, 3 and 6 for the Work Productivity Loss domain, months 1 and 6 for Time Demand, months 1 and 3 for Physical Demand, and month 3 for the Output Domain (p values <0.05 vs. placebo). Erman et al. have also tested the effects of zolpidem extended-release (12.5 mg) with the WLQ. Scores of all WLQ sub-scales were substantially elevated at baseline in this population, reflecting impairment relative to healthy controls.[53] The zolpidem extended-release 12.5 mg group had significantly greater improvement at all time points on the WLQ Time Management ($p < 0.0001$) and Work Output ($p < 0.01$) scales. Despite substantial evidence that insomnia has significant negative effects on work ability, the diagnosis of insomnia does not qualify for obtaining a disability pension in the United States or in Europe. Using the HUNT-2 cohort, Sivertsen et al. [54] gathered baseline data from a sample of 37,809 Norvegians of working age. The outcome was the obtention of disability pension, 18–45 months after the health screening by the National Insurance Administration. Subjects with insomnia had a stronger elevated risk of getting disability pension compared to non-insomniacs (OR = 3.90, 95%; CI 3.20–4.96). This effect was only marginally attenuated by the adjustment on age, gender, socio-demographics and health behaviour (OR = 3.57, 95%CI 2.91–4.39). Adjustment for anxiety and depression explained a substantial part of this result (OR = 2.29, 95%CI 1.83–2.87). After adjustments for somatic diagnoses and somatic symptoms the effect of insomnia on obtaining a pension remains significant (OR = 1.75, 95%CI 1.40–2.20). This study suggests that insomnia should be recognized as an independent factor of work disability for disabled workers claiming for disability pensions.

Insomnia and accidents

The impact of sleep disorders on automobile accidents is a crucial issue from a public health point of view. Public authorities and the media are actually well informed of the risk of sleepiness at the wheel during the night and of the effects of sleep debt and sleep pathologies (sleep apnea, hypersomnia) on accidents. Surprisingly, there are very few data on the risk of accidents due to insomnia.

Insomnia may impact on the risk of accidents in different ways: sleep deprivation, lack of attention, side effects of hypnotics. Motor vehicle accidents (MVA) and work accidents (WA) have been the choice of observation.

In a French study comparing 240 severe insomniacs (SI) to 391 good sleepers (GS),[21] WA were eight times more common over the past 12 months in SI (8%) than in GS (1%) ($p = 0.015$), with an average number of 0.07 (± 0.25) accidents per SI vs. 0.01 ± 0.11 per GS ($p = 0.055$). There was however no statistical difference for MVA over the past 12 months between the groups (9% vs. 10%). The authors explained the discrepancy between WA and MVA by the fact that SI may have avoided driving or driven shorter distances: 65.8% of SI vs. 72.5% of GS drove a car ($p = 0.012$). Lavie also showed a higher rate of WA in insomniacs (in their lifetime) than in GS (52.1% vs. 35.6%, $p < 0.01$).[41] The rate of MVA due to fatigue (5% vs. 2%, NS) was slightly but not significantly increased in insomniacs.

Daley et al. did not find a different MVA rate in the last 6 months between insomniacs and good sleepers, in a group of 930 adults in Quebec.[48] However, 23.5% of drivers reporting an accident felt that insomnia played an important role in the event. Moreover, 39.5% of participants saw a link between their sleep difficulties and other types of accidents ($p < 0.001$).

In Japan, in a study collecting occupational injuries in 1298 workers of small scale manufacturing firms, Nakata et al. found that insomnia symptoms were significantly associated with occupational injuries in both genders (OR = 1.64; 95% IC [1.23–2.18]).[55]

Regarding the effects of treatments on driving ability, it is usually admitted that long half-life hypnotics (medium long half-life BZD and antihistaminics) may induce a risk of accidents while driving in the morning, and a risk of falls during the night in elderly. In Europe, the vast majority of hypnotics are labelled with a sign indicating the possible risk of accidents due to the treatment. There is however little information published on the side-effects of common hypnotics on driving ability. Partinen et al. have performed a double-blinded, randomized, placebo-controlled, three-treatment and three-period cross-over study investigating the effects of zolpidem (10 mg) and temazepam (20 mg) vs. a placebo in 18 insomniacs, in a real life condition on driving performance.[56] After polysomnography at baseline and at each night of treatment,, 5.5 h after drug intake, at 7:30 a.m. on the next morning, patients underwent a driving simulator test. There was no difference between treatments for the primary outcome measure (mean time to collision; baseline: 0.120 s, P: 0.124, T: 0.118, Z: 0.124; $p \leq 0.12$ for all pairwise comparisons). No difference was recorded for speed deviation and reaction time to tasks for the treatments, however lane position deviation was greater after administration of zolpidem in comparison to both placebo and temazepam ($p = 0.025$ and 0.05, respectively). They underlined the necessity to strongly advocate against the late intake of hypnotics if patients intend to drive a car early the next morning. Using a mathematical model, Menzin et al. calculated the potential effects of sleep medications on motor vehicle accidents and their cost, and applied the model to France.[57] They used the model of standard deviation of a vehicle's lateral position (SDLP), and hypothesized that compared with zaleplon, the use of zopiclone over 14 days in France would be expected to result in 503 excess accidents per 100,000 drivers.

Costs of insomnia

Comorbidities and health care use

Several studies have looked at the links between insomnia and general health status. Although insomnia appears to be associated with poorer health status, it is difficult to know whether insomnia is the result or the cause. Comorbid insomnia includes not only psychological but also physical diseases associated with insomnia and it may represent at least 50% of chronic insomniacs, and therefore impact health care use. Poor health leads to an increase in the use of medical services. This includes visits to doctors and other health professionals, medication intake, and the number and duration of hospitalizations (see Table 2).

Weyerer and Dilling [58] found an average annual consultation rate among mild and moderately severe insomniacs significantly higher than among those without sleep disorders (10.61 and 12.87

Table 2
Costs of insomnia

Study, country, year of publication	Hospitalization		
Weyerer and Dilling, 1991 [58]	Hospitalization rate 21.9% (severe insomniacs) vs. 12.2% (good sleepers)		
Kales et al., 1984 [59]	Annual hospitalization rate for insomniacs = 15.7%		
Leger et al., 2002 [21]	18% of insomniacs and 9% of good sleepers had been hospitalized during the previous 12 months ($p < 0.0017$)		
	Total costs		
Leger, US, 1988 [66]	Cost of accident related to sleep disorder: $43.15 billion to $56.02 billion		
NCSDR, US, 1990 [65]	Direct cost of insomnia: $15.4 billion		
Stoller, US, 1994 [67]	Economic cost: $92.5 billion to $107.5 billion		
	Direct costs		
	Outpatients visits	Sleep recordings	Medications
Walsh and Engelhardt, US, 1999 [68]	$11.96 billion		$1.97 billion
Leger et al., France, 1995 [69]	$1.75 billion	$1.75 million	$310.59 million
Daley et al., Quebec, 2009 [71]	Can$191.2 million		Can$16.5 million
	Indirect costs		
	Cost of absenteeism	Loss of productivity	
Stoller, US, 1994[67]	$143 per day or more $57 billion/year	$41.1 billion	
Leger et al., France, 2006[42,72]	€77/employee/year	€1062	
Ozminkowski et al., US, 2007[60]	Average additional cost: $405 (6 months period)		
Daley et al., Quebec, 2009[71]	Can$970.6 million/year	Can$5.0 billion/year	

NCSDR: National Commission for Sleep Disorders Research.

consultations per year, respectively, vs. 5.25 per year for good sleepers). They also reported a hospitalization rate of 21.9% (severe insomniacs) vs. 12.2% (good sleepers). Lavie also found a higher rate of hospitalizations in insomniacs [41] as did Kales et al.,[59] who found an annual hospitalization rate of 15.7%. In the Leger et al. [21] study: 18% of SI and 9% of GS had been hospitalized during the previous 12 months ($p = 0.0017$), with an average of 0.17 (± 0.40) hospitalizations for SI vs. 0.11 (± 0.45) hospitalizations for the GS (NS). The average duration of stay in hospital was 1.19 (± 3.45) days for SI vs. 0.76 (± 3.83) days for the GS (NS). Fifty-nine percent of SI and 49% of GS had undergone a medical evaluation in the previous six months ($p = 0.0138$) with an average of 2 (± 3.6) evaluations for SI vs. 1.2 (± 2.2) for the GS ($p = 0.0198$). SI had more blood studies (48% vs. 34%, $p = 0.0005$) and radiological procedures (17% vs. 10%, $p = 0.0142$) than the GS. SI also had more outpatient visits and used more medication (particularly cardio-vascular, central nervous system, genito-urinary, and gastro-intestinal medications) than good sleepers. However, there was no difference in the use of analgesic medications, despite the fact that 46% of insomniacs vs. 29% of good sleepers ($p < 0.001$) said they were particularly sensitive to pain. This is an important point, as pain may be an obvious cause of sleep disturbance. Kales et al. [59] have reported that poor mental and physical health were far more prevalent among insomniacs than controls. Recently, Katz et al. [60] calculated the odds ratio between chronic diseases and complaints of insomnia. Severe insomnia was strongly linked to current depression (OR = 8.2), as well as to congestive heart failure (OR = 2.5), obstructive airway disease (OR = 1.6), and prostate problems (OR = 1.6).

Finally, the fact that insomnia can be a risk factor for psychiatric diseases as well as alcoholism was also firmly demonstrated by Katz et al.[61] These findings have two implications. First, insomnia seems to be associated with poorer health status. Indeed, insomniacs should be evaluated for psychiatric and somatic disorders. Second, although we cannot conclude whether insomnia is the cause or the result of worsened health status, insomniacs are clearly at superior risk for certain diseases and greater users of medical services. Many of the findings reported to be consequences of insomnia are actually correlates. Until a cause-effect relationship is established, correlation or comorbidity may be more accurate terms to describe the relationship between insomnia and poor medical status. Finally, taking care of insomnia may significantly reduce the severity of comorbidities as Dirksen and Epstein demonstrated: women receiving cognitive behavioural therapy for insomnia had significant improvements in fatigue, trait anxiety, depression and quality of life.[62] Finally, in a 47 000 norvegians sample aged 20 to 89 years (the HUNT-2 study), Sivertsen et al. [27] assessed the use of health care services in the last 12 months of subjects presenting with insomnia symptoms compared to non-insomniacs. Insomniacs were, as previously found, significantly more frequently admitted to hospitals (OR = 1.20; 95% CI = 1.13–1.27) and used health care services more often that non-insomniacs including: visiting general practicioners (OR = 1.24; 95% CI = 1.16–1.33), mental health care (OR = 1.69; 95% CI = 1.57–1.82). Novak et al. also found in a sample of 12,643 Hungarians that insomnia increased the utilization of health care services, emergency visits and hospitalization, compared to non-insomniacs.[64]

Costs of insomnia

At this time, few publications address the economic consequences of insomnia. The National Commission of Sleep Disorders Research (NCSDR) in the United States gave an estimate of the direct cost of insomnia in 1990 of $15.4 billion, extrapolating from available data.[65] However, in the judgment of the Commission, "the absence of hard epidemiological data makes it impossible to calculate the precise cost of sleep disorders, but some data do exist to show that the costs are substantial." Leger has examined in 1988, for the NCSDR, the cost of accidents related to sleep disorders in the United States and has estimated the cost to be between $43.15 billion and $56.02 billion.[66] Stoller [67] made an estimate of the total cost of insomnia in 1988, in the United States, based on a literature review on the economic costs and effects associated with insomnia. Her cost estimate was $92.5 billion to $107.5 billion.[67] All consensus reports agree on the lack of socio-economical data to better understand the burden of insomnia on society. One difficulty stands in the little information about insomnia-related use of health care services. Another is the degree of overlapping between insomnia and many somatic and psychiatric diseases. We have tried to summarize the work that has been accomplished in the field and underlined what could be undertaken to better understand economic consequences of insomnia.

The economic impact of insomnia can be divided into direct costs, indirect costs, and related costs. Direct costs of insomnia are charges for medical care or self treatment that are borne by patients, government, organized health care providers, or insurance companies. Indirect costs refer to patient and employer borne costs that result from insomnia-related morbidity and mortality. Related costs are other costs which can be rationally associated with the illness, such as the cost of property damage resulting from accidents associated with insomnia.

Direct costs of insomnia

Direct costs of insomnia include outpatient visits, sleep recordings, and medications directly devoted to insomnia. There is very little knowledge about this kind of cost. In 1999, Walsh and Engelhardt estimated (using 1995 dollars) direct costs of insomnia to be $13.93 billion, which consisted of health care services ($11.96

billion), including nursing home care ($10.9 billion), and medications/substances used for treatment ($1.97 billion).[68] Leger et al., estimated the direct costs of insomnia in France in 1995 (based on 1995 dollars values).[69] They gave a $2.067billion value divided mainly into $1.75 billion for outpatient visits, and $310,59 million for substances used for insomnia. It was of particular interest to observe the very little costs of sleep centers in this estimate: $1.75 million. In both estimates, the cost of prescriptions was very little compared to other costs. However, the direct costs related to sleep disorder evaluation by practitioners seem to be a small part of the total cost of insomnia. Recently, an update of the direct and indirect costs of untreated insomnia in adults was made in the United States.[70] With the help of a self-insurer, employer sponsored plan, the authors compared direct costs of insomnia (including inpatient, outpatient, pharmacy) and emergency room costs for all diseases, for six months before the diagnosis of insomnia or the first prescription of hypnotics was made. They compared 138,820 younger adults and 75,558 elderly with insomnia to control groups. After logistic regression, they found a $924 direct costs difference per 6 months between insomniacs and controls and $1143 estimated direct costs in elderly. In Quebec, Daley et al. reported a carefully designed cost study on insomnia based on a sample of 948 adults, with the help of the social security system (Regie de l'Assurance maladie du Québec and MedEcho).[71] They estimated the total costs for Quebec based on an average cost per individual adapted to the prevalence of insomnia in Quebec (29.9% had insomnia symptoms and 9.5% insomnia syndrome). The insomnia-related direct cost per person was Can$293 for individuals with an insomnia syndrome, Can$160 for individuals with insomnia symptoms and insomnia and Can$45 for good sleepers. At the country level, the estimate of total direct cost of insomnia was Can$547.5 million including costs associated with insomnia-motivated health care consultations (Can$191.2 million), transportation for these consultations (Can$36.6 million), prescription medications (Can$16.5 million), over-the-counter products (Can$1.8 million) and alcohol used as a sleep aid (Can$339.8 million). Walsh et al.[68] estimated the cost of alcohol used to promote sleep to be 0.6 billion US$ in 1995 (37.1% of the total costs of substances used for insomnia).

Indirect costs of insomnia

The indirect costs of insomnia are the potential consequences of insomnia on society, such as health problems, professional consequences (loss of productivity, and absenteeism) and accidents. The only estimate of the cost of accidents related to sleep disorders ($46.52 billion in 1988) was focused more on sleepiness at the wheel rather than insomnia.[66] Based on the study of Johnson and Spincoeber made in the us Navy [47], Stoller estimated the loss of productivity due to insomnia in the United States to be $41.1 billion in 1988.[67] The cost of absenteeism was evaluated among non-managerial personnel and was estimated at about $143 per day, or more than $57 billion per year. We recently studied the indirect costs of absenteeism due to insomnia in a sample of 369 employees of the Ile de France area with insomnia and 369 good sleepers (also professionals).[42,72] The costs of absenteeism at work associated with insomnia were estimated by comparing the 2 matched groups in terms of the number and duration of work absences. We considered that work absences incurred costs relating to salary replacement and loss of productivity: these were given a monetary value on the basis of the added value per hour worked. The percentages of employees with at least 1 work absence were 50% and 34% for insomniacs and good sleepers, respectively. The work absenteeism (expressed in days, per employee, per year $\pm$ CI) differed significantly between insomniacs and good sleepers: 5.8 ($\pm$1.1) and 2.4 ($\pm$0.5), respectively ($p < 0.001$). The extra cost ($\pm$CI) to the national health insurance system of insomnia-associated absenteeism was estimated at €77 (±€39) per employee, per year. The extra cost ($\pm$CI) to employers was estimated at €233 (±€101) for salary replacement and €1062 (±€386) for loss of productivity. Finally, employees themselves bore a cost (CI) of €100 (±€54). Ozminkowski et al. also assessed the indirect costs of insomnia in their impressive survey of 138820 young adults.[70] Indirect costs included costs related to absenteeism from work and the use of short term disability programs. They found an average additional cost of $405 for absenteeism due to insomnia (on a six months period). The total short term disability expenditures were however $86 lower in insomniacs than in the control group. In the Daley et al. study, the insomnia-related indirect cost per person was Can$4717 for individuals with an insomnia syndrome, Can$1271 for individuals with insomnia symptoms or insomnia, and Can$376 for good sleepers.[71] At the country level, the estimate of total indirect costs of insomnia was Can$6.0 billion of which annual indirect costs associated with insomnia-related absenteeism were estimated at Can$970.6 million, and insomnia-related productivity losses estimated at Can$5.0 billion.

Despite these several evaluations of the topic, the total cost of insomnia remains largely unknown and it is actually difficult to have a general view on the impact of insomnia on economics. The studies on direct costs have been made only in three countries [42, 68–72] and it is difficult to apply these results to other parts of the world. The studies on indirect costs are based on hypotheses which still have restricted foundations and have to be confirmed by larger studies of more representative samples. The same amount of insomniacs may not necessarily have the same impact in different countries and there is a need for cross-cultural studies to better understand the daily economic impact of insomnia around the world. Future studies might try to adopt economical values such as the national gross product for a better and more comprehensive implication of the results at each country level.

Quality of life in insomnia

There are still very few articles specifically designed to assess the impact of insomnia on Quality of life (Qol). Most articles were devoted to the impact of sleep disorders on the quality of life of patients suffering from cancer. Many were exploring Qol in relation to poor sleep in diabetes, depression, Parkinson's, chronic renal diseases with hemodialysis, patients with the human immunodeficiency virus (HIV) or with chronic psychiatric diseases. Actually, Qol is also systematically used to evaluate pharmacological and non-pharmacological treatments of insomnia.

The specific impact of insomnia on quality of life

The World Health Consensus report on sleep and health heavily recommends more studies on the Qol of insomniacs.[6] Surprisingly, until recently, there were relatively few studies specifically devoted to the subject.[45, 73–77] Five of them used the SF-36,[45, 73–77] a very widely used scale in Qol.[78]

Zammitt et al.[74] used several instruments to evaluate the impact of insomnia on Qol in a sample of 261 insomniacs compared to a control group of 101 good sleepers. Insomniacs were recruited by advertisements and fulfilled the Diagnostic and Statistical Manual of Mental Disorders (DSM) criteria for insomnia. Individuals with criteria of irregular sleep patterns, sleep apnea, restless leg syndrome, periodic limb movement disorders, history of psychiatric illness, alcohol or substance abuse, epilepsy and HIV positive were excluded from the study. They used the SF-36 and the Qol

Table 3
Impact of insomnia on quality of life.

Study, year of publication	Design of the study and sample	Quality of life
Zammit et al. (1999)[74]	SF-36 scale 261 individuals with insomnia vs. 101 individuals with no sleep complaints	Lower means scores on all subscales of the SF-36 ($p < 0.0001$ or lower)
Leger et al. (2001)[75]	SF-36 scale Three matched group: 240 severe insomniacs vs. 422 mild insomniacs vs. 391 good sleepers	Severe insomniacs had lower scores in eight dimensions of the SF-36 than mild insomniacs and good sleepers ($p < 0.05$)
Schubert et al. (2002)[76]	SF-36 scale 5-years-follow up 2800 adults aged 53–97 years	All eight domains of the SF-36 decreased as the number of reported insomnia traits increase ($p < 0.0001$)
Katz et al. (2002)[61]	SF-36 scale Cross-sectional sample 3445 patients: no insomnia = 1583 mild insomnia = 1145 severe insomnia = 540	All SF-36 subscales decrease between patients with mild insomnia vs. no insomnia and between patients with severe insomnia vs. no insomnia.
Bolge et al. (2009)[49]	SF-8 scale 19711 adults: 5161 insomniacs 14,550 non-insomniacs	Insomnia group had lower SF-8 physical (−5.40) and mental (−4.39) scores and greater activity impairment scores (+18.04) than the non-insomnia group (all $p < 0.01$)
Leblanc et al. (2007)[80]	SF-12 scale 953 participants: Insomnia syndrome = 147 Insomnia symptoms = 308 Good sleepers = 493	Individuals with insomnia syndrome had lower scores on the SF-12 vitality and role physical subscales

inventory. This is a 31 items questionnaire specifically designed for the study and including aspects related to sleep, cognitive function, daytime performance, social and family relationships, and health. The authors showed a significant difference between the two groups ($p < 0.0001$) on all eight SF-36 subscales. Insomniacs reported more health concerns that limited physical activity, greater interference of physical or emotional problems with normal social activities, greater bodily pain, poorer general health, less vitality, more emotional difficulties, and more mental health problems than the good sleepers. Using the Qol inventory, they also found a significant impact on the Qol of insomniacs. The authors suggested that the SF-36 can be used to assess differences between subjects with insomnia and healthy controls and that it may have clinically utility as a measure of impairment associated with insomnia.

Leger et al.[75] also used the SF-36 to evaluate the quality of life of three matched groups of 240 severe insomniacs, 422 mild insomniacs and 391 good sleepers selected from the general population. They eliminated from the original group those with DSM-IV criteria for anxiety and depression. They found that in eight dimensions of the SF-36 severe insomniacs had lower scores than mild insomniacs and good sleepers. Mild insomniacs also had lower scores in the same eight dimensions than good sleepers. No dimension was altered more than the other. However, the mental health status and the emotional state were worse in severe and mild insomniacs than in good sleepers. This result demonstrates a clear interrelation between insomnia and emotional state despite the fact that they had eliminated the subjects with DSM-IV criteria of anxiety. The authors concluded that SF-36 was sensitive to the severity of insomnia and seemed to be a reliable instrument to assess the impact of insomnia on Qol.

Schubert et al. [76] have found the same kind of relationship between the severity of insomnia and the decreased quality of life in a group of 2800 elderly (aged from 53 to 97 years). It was a telephone interview, part of a 5-year follow-up examination of the Epidemiology of Hearing Loss Study. Participants were asked about symptoms of poor sleep. A response of "often" or "almost always" was coded as positive for an insomnia trait. The SF-36 was administrated to assess Qol of these subjects. Twenty six percent of the population reported one insomnia trait, 13% reported two, and 10% reported three. The eight domains of the SF-36 were significantly decreased as the number of insomnia traits increased. The authors concluded that insomnia is common among older adults and is associated with a decreased Qol.

Idzikowski [77] discussed the concept of Qol applied to sleep and introduced the fact that short sleep is not necessarily deleterious, but that abnormally shortened or fragmented sleep can reduce an individual's Qol. Smith and Shneerson [73] have used the SF-36 in a sample of 223 subjects explored for snoring or daytime somnolence. They showed that the SF-36 score is sensitive to sleep disruption.

Katz and McHorney,[61] finally demonstrated that insomnia acts by itself on the quality of life of patients suffering from chronic illness. Insomnia was severe in 16% and mild in 34% of these patients. Differences between patients with mild insomnia vs. no insomnia showed small to medium decrements across SF-36 subscales ranging from 4.1 to 9.3 points (on a scale of 100) and for severe insomnia from 12.0 to 23.9 points. Insomnia appeared in this study as an independent factor of a worsened Qol to the same extent as chronic conditions such as congestive heart failure and clinical depression.

Bolge et al. used a short form of the SF-36, the SF-8, in a US national survey including 19.711 adults (5161 with insomnia and 14.550 without).[49] Subjects in the insomnia group had significantly lower SF-8 physical (−5.40) and mental (−4.39) scores and greater activity impairment scores (+18.04) than subjects in the non-insomnia group ($p < 0.01$ for all). Gureje et al. explored the Qol of 2152 elderly Nigerians with various types of insomnia.[79] They used the WHO Quality of Life instrument controlling for comorbid chronic pain, chronic medical conditions and DSM-IV major depressive disorder. They found that every form of insomnia was associated with decrement in quality of life. After

controlling for comorbid mental and physical conditions, the beta coefficients ranged between −17.9 and −20.0. Leblanc et al. have categorized (according to DSM-IV and ICSD) 953 participants to studies on insomnia of the Laval Sleep Center (Quebec) into 3 categories: 1) insomnia syndrome ($n = 147$), 2) insomnia symptoms ($n = 308$), and 3) good sleepers ($n = 493$).[80] They estimated that compared to individuals with insomnia symptoms and good sleepers, individuals with insomnia syndrome presented lower quality of life (SF-12) and that a lower score on the SF-12 vitality and role physical subscales was one of the most useful variables to predict subgroup memberships. Some results of these various studies are presented in Table 3.

Sleep in comorbid insomnia and quality of life

In patients suffering from cancer, the quality of sleep has been recognized as a powerful factor acting on the Qol.[81] In a sample of 263 cancer patients undergoing chemotherapy the authors found that insomnia was negatively correlated to the Qol, probably by the way of depression. Insomnia explained only 4% of the variance of Qol and depression 47%. Stark et al. [82] also reported in 178 cancer subjects that insomnia was significantly and independently associated with a deficit of Qol. They recommended interviewing the subjects with cancer about sleep to better discriminate subjects with anxiety. Lindley et al. [83] considered insomnia as a good reflection of Qol in the adjuvant therapy for early-stage breast cancer. Treating insomnia by cognitive behavior therapy (CBT) in 72 women with breast cancer also statistically significantly increased quality of life, with a trend suggestive of lower depression post-treatment.[62]

In other chronic illnesses, several studies have shown that insomnia influences the Qol of patients with Parkinson's,[85] in hemodialysis patients,[86,87] or in patients with anxiety and depression.[88] In HIV disease, Nokes and Kendrew [89] also found that there was a correlation between sleep quality (assessed by the Pittsburgh Sleep Quality Index) and positive general well-being. In renal transplantation, Molnar et al. suggested that the appropriate diagnosis and management of sleep disorders may improve QoL in kidney-transplanted patients.[90]

Quality of life in the treatment of insomnia

Goldenberg et al.[91] and Leger et al.[92] demonstrated the effect of zopiclone in improving the quality of life of insomniacs by using questionnaires (on professional, relational, sentimental, domestic, leisure and safety aspects) which appear to not be significantly different from the good sleepers' one. Walsh et al. also reported an improvement in physical functioning, vitality, and social functioning dimensions of the SF-36 of patients treated with eszopiclone vs. placebo for the month 1 to 6 average ($p < 0.005$).[52] Baca et al. [93] showed that zolpidem improved patients' Qol assessed by a questionnaire including four factors: social support, general satisfaction, physical and psychological well-being and absence of work overload/free time. However, there is in our knowledge, no extensive survey comparing the effects of several hypnotics with well-validated Qol instruments. Regarding non-pharmacological therapies, Quesnel et al.[94] have shown the efficacy of cognitive behavioural therapy in insomnia in 10 women treated for non-metastatic breast cancer. They found an improvement of sleep assessed by polysomnography and in the global and cognitive subscales of the European organization for research and treatment of cancer Qol scale (QLQ-C30). Dixon et al. also stated that cognitive behaviour therapy (CBT), statistically improves SF-36 scores of physical functioning, emotional role limitation, and mental health assessed after 6 months of treatment.[95] Espie et al. performed a 150 patients randomized controlled clinical effectiveness trial of cognitive behaviour therapy compared with usual treatment for persistent insomnia in patients with cancer. CBT was associated with mean reductions in wakefulness of 55 min per night compared with no change in controls and a moderate to large effect sizes for five of seven QOL outcomes, including significant reduction in daytime fatigue.[96]

Insomnia affects the daily lives of patients. However, it is often difficult to evaluate this impact and the efficacy of treatment. Qol seems to be a good mean to better understanding the complaints of insomniacs regarding their day-to-day functioning. Several studies have shown the sensitivity of the SF-36 in evaluating the impact of insomnia by itself or in relation with other associated chronic diseases. We also recommend the development of more accurate Qol tools specifically designed for insomnia.

Final comments

Insomnia affects the daily lives of millions of people around the world. The economic impact of this sleep disorder on the collectivity seems enormous. There is also increasing evidence linking this disorder to several severe other public health major concerns: depression, anxiety, accidents… Sleep apnea, restless leg syndrome, shift work sleep disorders, hypersomnia have also been proved to have an important impact on a socio- economic perspective. Beside the patients themselves, their family and work relatives are also probably deeply affected in their own lives by the consequences of poor sleep. Public authorities seem to be more and more concerned by sleep education and hygiene. However, much work has to be done to convince them, that having good nights of sleep may benefit deeply to individuals and to the collectivity.

Practice points

- To assess the impact of insomnia on economics it is important to take into account that insomnia affects primalery women, increases with age and is frequently associated to medical and or psychological diseases.
- Insomniacs are not ususually seeking help for sleep.
- Short term absenteeism is affected by insomnia.
- It is not clear how insomnia influences the risk of accidents.
- The indirect costs of insomnia concern mainly these due to absenteeism and the loss of productivity.
- Insomnia affects all dimensions of the SF-36 quality of life scale.

Research agenda

- Understanding how insomnia may specifically impact some work tasks and contents.
- Understanding how insomnia may lead by itself to disability.
- Understanding how insomnia may limit driving and lead to accidents.
- Calculating utility scores of impaired insomniacs quality of life.
- Understanding how treating insomnia may impact health care use.

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