Sleep & Depression

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Does anyone here know what causes depression? No? You're not alone; the experts don't know what causes depression.

I don't know either, but I do have a theory.

I believe that some depressions may be caused by too much sleep.

Not just any sleep, but too much REM sleep.

How can a person possibly have too much sleep? Isn't sleep good for you? And isn't it stress that causes depression? Don't a lot of depressed people have difficulty sleeping? For them, it sure doesn't seem to be too much sleep!

Development of Depression

Let's consider a couple of scenarios: in the first scenario, an elderly person has just had a stroke resulting in severe impairment, requiring hospitalization.

Scenario 1: severe impairment

In the hospital, our patient spends most of the day and night in bed, at least initially. Under these conditions, it's easy to sleep longer than usual. Cytokines such as the interleukins which are produced during an Acute Phase Inflammatory Response, cause drowsiness, thus contributing to sleeping more. Some patients attempt to avoid the painful feelings they experience after a stroke as they become aware of their deficits, by escaping into sleep. If the person manifests anxiety or agitation, it is likely they will be sedated with benzodiazepines, such as ativan, and/or antipsychotics, such as haldol; these medications increase drowsiness and cause the patient to sleep more.

Now we have a patient who is sleeping more than usual, almost certainly getting more sleep than he or she needs. What happens when we get more sleep than we need? We develop difficulty falling asleep or staying asleep; this is called insomnia. And what do we doctors do when the nursing staff or the patient himself or herself reports difficulty sleeping? We prescribe sleeping pills, usually benzodiazepines, such as ativan, rivotril, serax, halcion, dalmane, and others. And of course, sleeping pills cause the individual to sleep longer.

Does too much sleep have any bad effects other than insomnia? It's not a simple question, because sleep has a number of components or stages, which can be identified by recording the electrical activity of the brain. An electroencephalogram recorded during sleep, called a polysomnogram when it

also records the electrical activity of the muscles which move the eyes, shows that there are 5 distinct sleep stages, stages I thru IV of successively deeper sleep, and Rapid Eye Movement Sleep, REM sleep for short. This slide shows how sleep is organized, at 3 different stages of life (slide 1).

REM sleep typically takes up 20 to 25% of total sleep time. The first period of REM sleep usually occurs 90 minutes after falling asleep, and subsequent REM sleep episodes occur at 90 minute intervals. REM sleep seems to be the only component of sleep which is necessary for normal functioning of the brain, probably for long-term memory. It seems that REM sleep is also the only component of sleep where too much is bad for you. This shouldn't come as a surprise; consider all the other things that our bodies need: food, water, vitamins and minerals, sunshine, oxygen, and so on. Too much of any of these necessities of life is bad for us. Too much food leads to obesity, diabetes, high blood pressure, heart disease, etc. Drinking too much water can cause seizures. Too much of certain vitamins is dangerous. Too much oxygen in premature infants causes blindness. Too much sun causes cataracts and skin cancer.

In the same way, even though we must have some REM sleep, too much is bad for us. In what way? It seems that too much REM sleep can cause a clinical depression, in people who are genetically predisposed. In the rest of us, too much REM sleep seems to cause minor depressive symptoms, especially fatigue or lack of energy or lack of motivation.

So, the average elderly person will function well with perhaps 6 hours of sleep at night. When they suffer a stroke and are hospitalized, the number of hours spent sleeping increases to 8 or 10 or even more, per day. Since REM sleep takes up say 25% of total sleep time, adding 4 hours of sleep will add 1 hour of REM sleep.

But it's not quite so simple. It turns out that the amount of REM sleep a person gets increases throughout the night, from a minimum in the early evening to a maximum in the morning around 8 am, but the actual timing of the peak is probably tied to the time of sunrise. REM sleep follows a diurnal rhythm, and we know that the signal which most strongly programs our diurnal rhythms is light.

Thus, if you were to sleep 6 hours, from midnight to 6 am, about 25%, or 1.5 hours, of your sleep might be REM sleep. If your 6 hours of total sleep were taken earlier in the night, say from 9 pm to 3 am, the percent REM would be less, say 15%, for a total of 0.9 hours of REM sleep. But if you took the same 6 hours of sleep later in the morning, from 5 am to 11 am, the percent REM would be considerably higher, for example 40%, giving 2.4 hours of REM sleep. Thus, "sleeping in", staying in bed past sunrise, may lead to excessive REM sleep. For example, many teenagers tend to sleep very late on weekends; when they finally get up, they have little energy or motivation, until late at night when they get into a party mood.

Our stroke patient may be not only sleeping more hours than usual, it is also highly likely that some of those sleep hours occur after sunrise, when REM sleep is at its peak. For example, many hospitalized patients nap after breakfast.

Scenario 2: a case of flu

The patient who becomes sick, for example, with a flu, will likely stay at home and is therefore much less likely to be spending all day in bed compared to a hospitalized stroke patient. However, there is still a risk of getting too much REM sleep. During the acute phase, the patient will be sleeping more; it is easy to get into this habit, and also to get into the habit of sleeping late, when the usual routine of work or school, hobbies, volunteer work, Golden Age, and so on is disrupted by illness.

As we saw earlier, sleeping longer and sleeping late both increase the amount of REM sleep. Sleeping longer may lead to insomnia, and excessive REM sleep causes, at the least, fatigue.

Many people assume, incorrectly, that their insomnia means that they're not getting enough sleep. And they further assume, again incorrectly, that their fatigue is proof that they're not getting enough sleep. So what do they do? They increase their time in bed, they stay in bed later, and they take sleeping pills! All of these interventions increase sleep time, making the insomnia worse; and they increase REM sleep, making the fatigue worse. Thus, a vicious cycle sets in. This slide (slide 2) shows the sequence of events leading to insomnia or fatigue. If the person is genetically predisposed to depression, the excessive REM sleep brings on a clinical depression.

It is possible that this scenario, where the individual experiences fatigue and insomnia following a viral illness, may be important in the development of chronic fatigue syndrome or fibromyalgia.

The following slides are from a study I did with cancer outpatients, who received a questionnaire asking them about sleep habits, fatigue, and depression. This slide (slide 3) shows how the people who got up later, in this case after 7 am, had significantly higher scores on the Beck Depression Inventory.

This slide (slide 4) looks at two aspects of fatigue. Again, as people get up later, their self-rated fatigue goes up. Now, this study simply picked up on an association between sleeping later and depression and fatigue; it can't tell us anything about cause and effect. You could argue that the depression and fatigue are responsible for the patient getting up later.

We also looked at attitudes about sleep. Here (slide 5) are some results. I suggest that many of the people who get up late, do so because of their beliefs about sleep and what they should do if they don't sleep well.

Scenario 3: After a loss

Yet another scenario has to do with a person who has experienced a significant loss, eg a spouse had died, their company has closed its doors putting them out of work, a child has moved away. While it's normal to experience mourning and sadness, and to attempt to avoid painful feelings, it may be counterproductive to try to escape these painful thoughts through sleep. Some people do attempt to sleep more, which produces insomnia; if they sleep longer in the morning, they will increase REM sleep, and run the risk of turning a normal mourning reaction into a full-blown depression.

Treating Depression by Reducing REM Sleep

If too much REM sleep can cause depression, could we treat depressions by reducing REM sleep? A lot of evidence suggests that this works. For example, almost all antidepressant medications strongly suppress REM sleep. So do other antidepressant treatments, including electroconvulsive therapy, stimulants such as methylphenidate, and even exercise, which in some studies is as effective as medication against depression. But by far the simplest way to reduce REM sleep is simply to sleep less, or to sleep earlier in the night. It turns out that total sleep deprivation is a very effective treatment for depression, as is partial sleep deprivation when the person gets up earlier than usual. Unfortunately, even though staying awake all night leads to a total remission of depressive symptoms in about 70% of patients the very next afternoon, when the person has a sleep which includes REM sleep, the depression returns.

Practical issues in treating Depression

So, how can we apply this business of excessive REM sleep to our patients with depression?

Evaluation

Sleep history

For patients presenting with major depression, dysthymic disorder, subsydromal depressive disorder, bipolar affective disorder with depressed phase, is is important to obtain a careful sleep history. This is important even when there is little or no depression, but there is significant fatigue, lack of energy, lack of motivation, or insomnia.

This slide shows the sort of questions you want to ask (slide 6)

Quality of sleep

Time of going to bed

How long to fall asleep

Waking during the night

- Reasons for waking
- Number of times
- How quickly to fall asleep again

Time of waking in the morning

What does the person do after waking?

Time of getting out of bed for the day

Daytime drowsiness/sleepiness

Very important; failure to identify and appropriately refer cases who subsequently have accidents can engender civil, possibly criminal liability.

- How often
- What time of day or evening
- How distressing
- Accidents/near-accidents due to drowsiness

Fatigue/tiredness (differentiated from drowsiness/sleepiness)

- How often
- What time of day or evening
- How distressing
- Impact on life (work, play, relationships)

Daytime naps

- What time of day
- How long
- How often
- How long to fall asleep

Use of sleeping aids

- Prescribed medications (including somebody else's pills)
- OTC drugs
- Alcohol or other substances

Frequency of sleep problems

- Difficulty falling asleep
- Difficulty staying asleep
- Waking too early
- Inability to get up

How distressed by their sleep problem

Sleep habits when working and doing well

Attitudes towards sleep

- If you feel sleepy, does that always mean you're not getting enough sleep?
- If you feel fatigued, does that mean you need more sleep?
- If you sleep poorly at night, do you make up for it by sleeping late or by taking a long nap?
- If you've slept poorly, would you go in to work late or call in sick?

I particularly want to emphasize a couple of things: first, the arising time. Many patients with depressive symptoms will tell you that they wake up very early. It's important to persist, to ask what the person does when they wake up, and to ask if they go back to bed. I can't give you numbers, but many people with chronic illness will tell you if you are persistent, that they go back to bed, perhaps after breakfast, and they may not get up until 9 or 10 am, or even later.

A second important question has to do with their typical sleep habits when they were well, not depressed, and working.

Intervention

Fatigue or mild depression

If the patient experiences fatigue, lack of energy, or lack of motivation, or is mildly depressed:

Early rising

Symptoms of fatigue or depression can be treated by reducing REM sleep.

Although antidepressants, exercise, psychostimulants, and ECT suppress REM sleep, avoiding sleep after sunrise is an effective, inexpensive, and safe method to decrease REM sleep.

What I ask patients to do is to get up at 6 am, and to not sleep or take naps until at least after lunch. To prevent what are called microsleeps, they should avoid even lying down during this same time.

This is also a worthwhile first intervention for the stroke victim who is fearful of taking antidepressant medication, or refuses it.

People who are taking sleeping pills may find it impossible to get up earlier. In this case, it is essential to gradually taper the sleep medication dose.

Daytime sleep

Controlling daytime sleep is essential to making this approach work. Research shows that short naps are refreshing, relieve drowsiness, and increase alertness

and feelings of wellbeing. Longer naps can induce sluggishness and torpor, and may also impair nighttime sleep.

Approach: when patients feel drowsy or sleepy, they should have a brief nap, ie lie down for not more than 15 or 20 minutes (a kitchen timer may be useful for waking up). If the person has not fallen asleep after 15 minutes, they do not need a nap; if they fall asleep after 5 or 10 minutes and thus sleep for only a few minutes, they will be able to get going again easily.

Major depression

If the patient is suicidal, homicidal, severely agitated, psychotic, or neglecting self, then hospitalize; commitment if dangerous to self or others

Most depressed patients can be started on an SSRI, such as paroxetine, taken in the morning, ideally at 6 am.

Associated hypersomnia

When your evaluation reveals excessive sleep, particularly morning sleep, or lethargy, fatigue, or lack of drive, consider adding methylphenidate. This can be helpful all by itself if the usual antidepressants cannot be used. Avoid psychostimulants if anxiety or agitation are problems.

Methylphenidate is also useful in insomnia. By inhibiting daytime sleep, the patient may experience better nighttime sleep.

Usual starting dose is 5 mg bid, in the morning and at noon, again, ideally the first dose is taken at 6 am; increase at weekly intervals up to maybe 15 or 20 mg bid (some people reportedly go up to 70 or even 90 mg daily).

Associated insomnia:

When the sleep history identifies significant insomnia, I recommend (slide 7):

Sleep hygiene measures

- Arise at the same time each day.
- Limit daily in-bed time to “normal” amount.
- Discontinue use of drugs that act on the central nervous system; eg, caffeine, nicotine, alcohol, and stimulants.
- Avoid daytime napping except when sleep diary indicates a better night’s sleep as a result.
- Establish physical fitness with a routine of exercise early in the day, followed by other activity.
- Avoid evening stimulation; substitute either listening to the radio or leisure reading for watching television.
- Try a warm 20-minute body bath or soak near bedtime.

- Eat on a regular schedule; avoid large meals near bedtime.
- Practice an evening relaxation routine.
- Maintain comfortable sleeping conditions.
- Spend no longer than 20 minutes awake in the bed.
- Adjust sleep hours and routine to optimize daily schedule and living situation.

Sleep restriction/sleep compression

In addition to the usual sleep hygiene measures, I recommend an approach which has been shown by a number of studies to be the most effective treatment for what is called psychophysiological, or primary, insomnia. This intervention is called sleep restriction by some, and sleep constriction by others, but the technique is the same:

Start with the person's own estimate of how many hours of sleep they get in 24 hours; they should then spend only that many hours in bed each night.

Once they have been sleeping well for a week at a given stage, increase the time in bed by a half-hour.

Daytime drowsiness can be relieved by short naps, as I talked about earlier.

Light

The most important cue to adjusting the biological clock is the length of the day/night cycle.

Individuals who are insufficiently exposed to light, especially morning light, may develop delayed sleep phase syndrome. This can occur if people keep their bedrooms dark, or possibly even if windows are small or views obstructed with trees, fences, walls, etc.

Approach: encourage patients to keep their drapes/blinds open at night while they're asleep. When buying or renting housing, look for bedrooms that receive plenty of natural light.

Caffeine

Caffeine may induce its own metabolism, thus individuals who use small amounts, or who use it irregularly, may have more severe and longer-lasting effects, such as insomnia or anxiety, than those who consume larger quantities.

Caffeine acts as a mood elevator: in the ongoing Nurses' Health Study involving about 90,000 nurses in the U.S., those who drank no coffee committed suicide at 2 1/2 times the rate of those who drank 2 or more cups daily.

Approach: encourage consistent caffeine consumption, eg 2 cups coffee daily.

Exercise

Vigorous cardiovascular (ie aerobic) exercise of at least 30 minutes stimulates endorphin production, which makes the person feel good, and suppresses REM sleep, which has an antidepressant and antifatigue effect. For patients who are capable, walking, jogging, aerobic routines or aerobic dance, swimming, cross-country skiing, or cycling. Aquafitness is often useful for people with functional limitations. Use your imagination!

If not engaged in too near bedtime, exercise can also improve sleep.

Hypnotic medications

Benzodiazepines can be dangerous, especially in elderly patients: risk of falls, automobile accidents, cognitive impairment, disinhibition, depression, and dependence.

For dependent individuals, taper very gradually.

For those people who have difficulty sleeping and are unable or unwilling to comply with sleep hygiene and sleep restriction, trazodone (25 or 50 mg hs) is an effective hypnotic, even though relatively ineffective as an antidepressant.

I am continually seeking a better understanding of why things are the way they are. For example, why does bright light treatment help people with the winter depression type of seasonal affective disorder? For that matter, why is it that, though most studies show increasing prevalence of SAD the further north you go, there is very little SAD in Iceland, which is really far north?

I was interested to read, just two days ago, that bright light suppresses REM sleep. Of course, this may be because people usually have to get up earlier so as to be able to fit their light treatment into their usual morning routine.

Did you know that Iceland has two oddities. The first is that even though it is far enough west of Britain that it should be on a time schedule two hours ahead of Greenwich Mean Time, it actually follows GMT.

What this means is that while our sunrise today was at 6:39 am local time, their sunrise occurred at 9:23 local time, almost 3 hours later. So in the winter, Icelanders get up while it's still very dark, well before the peak of REM sleep, so they are likely getting less REM sleep than we do.

The second oddity is that Icelanders do not observe Daylight Savings Time. Thus there was no switching the clocks back an hour as we did a couple of weeks ago. Why is this important?

When we switched our clocks back, the result was that we all started sleeping an hour later, based on our biological clocks, which follow the light cycle, particularly sunrise. Sleeping late increases REM sleep, so this extra hour of morning sleep increases the likelihood of developing fatigue, and it might even trigger a winter depression.

Can we avoid this effect? Possibly, if we stick with our biological clocks for getting up when the time changes. What I did, was to set my alarm to go off an hour earlier, when the time changed two weeks ago. Has it worked? Hard to tell, as I don't think I'm prone to depression. But I feel good, I have plenty of energy, and is sure is nice to have an extra hour of productive time!

Thank you very much!

The following information is provided for Montreal (longitude W73.6, latitude N45.5):

Thursday
5 November 1998 Universal Time - 5h

	SUN
Begin civil twilight	06:08
Sunrise	06:39
Sun transit	11:38
Sunset	16:36
End civil twilight	17:07

The following information is provided for Reykjavik Iceland (longitude W21.9, latitude N64.1):

Thursday
5 November 1998 Universal Time

	SUN
Begin civil twilight	08:28
Sunrise	09:23
Sun transit	13:11
Sunset	16:58
End civil twilight	17:53