Hi Deirdre,

I’ll take your message, point by point, and try to answer……in blue text.

Apologies for the delay in response, I wanted to get a clearer picture of my concept before contacting you.

**My project concept is a mobile application which could enable sleep apnoea sufferers (mild to moderate) to monitor their condition at home using non-intrusive sensor technology. This is more of a proof-of-concept project as some of the sensors have not received FDA approval yet. I will be testing the accuracy of data and comparing it to that in clinical polysomnograms. If you are interested in my concept I would love to meet with you in person at some point. Could you have a look at the following questions? Don't worry if you're not able to answer most of them, any input at all would be appreciated!**

 First off, cpap machines are equipped with a recording/monitoring system that records compliance and effectiveness on a data card. These data cards are downloaded either by Home Care Companies or Sleep Clinics in advance of a consultation or at timed intervals.

There is also free Open Source Software available on the internet (which I actually use), named Sleepyhead which facilitates data downloads and produces reports in graph and data format.

FDA Approval is of no use in Europe. You will require CE Approval, otherwise you are at an immediate disadvantage.

Clinical Polysomnogram is really only used for diagnostics, as cpap machines can now report on areas that used to be reported by Polysomnogram. In some cases Polysomnogram is used to reiterate a patient, usually a difficult case. The medical fraternity would have a problem with your concept, as they still haven’t fully accepted Domiciliary Testing (limited home studies).  
  
**Roughly how many people are suffering with sleep apnoea in Ireland?**

If we take the 1990’s figures of 4% of the adult male population and 2% of the adult female population we are probably looking at 120/130,000 sufferers. These percentages did not take into account the numbers of children that have the condition, which is now estimated at 2/3%. More recent studies in the US indicate that ‘conservatively’, probably 8% of the adult population (and greater) have the condition. If we take the 1990 percentages plus the paediatrics the figure moves to 150/165,000 sufferers. If we take the more recent figures, the figure goes well over 200,000.

The longer the condition is left untreated, the worse it gets. In many cases people don’t get diagnosed until such time as they have caused an accident, lost their job or their spouse or had a heart attack or stroke.

Best estimates are that there are probably 20,000 sufferers undergoing treatment in Ireland.

**What conditions/diseases is sleep apnoea associated with?**

Hypertension, Enlarged Heart, Right Ventricular Heart Failure, Stroke, Depression, Severe Mood Swings, Reduced Libido, Impaired Short Term Memory, Impaired Cognitive Function, Brain Fog, Morning Headaches, Glaucoma, Diabetes Mellitus, Excessive Daytime Sleepiness.

**What are the repercussions of delayed diagnosis?**

 Severe deterioration of any of the above. Increased risk of stroke/diabetes/hypertension/higher risk of a Road Traffic Accident or Workplace Accident.

**How does at home monitoring compare to a polysomnogram in regards to accuracy of data?**

 Polysomnogram is used only in a hospital setting, with the exception of a Domiciliary Study, however neither of these are used for monitoring a patient.

Preferred method for monitoring is to have the patient on treatment and use the data from a download.

**How does at home monitoring compare to a polysomnogram in regards to patient comfort?**

 Refer to last question/answer.

**Do you know of any web or mobile applications which aid at home monitoring? If so, what are they and what functionality do they provide?**

 There are a number of mobile apps that monitor sleep……supposedly.

ResMed have developed a new product called Sleep Minder (I think). It is wireless and is just placed bedside the bed.

Home monitoring is carried out via the cpap machine.

**Do you think sleep apnoea sufferers would like to be able to monitor their condition at home? (i.e. be able to view their vital and non vital signs (blood oxygen, heart rate, airway pauses, movement, etc.))**

 Yes and No. Currently they have access to compliance data and residual AHI, which seems more than adequate.

Heart rate/SpO2 etc might be of interest to a few, but I believe that the vast majority are not interested.

**Would they like to view statistics and graphical representations of this data over long periods of time?**

 This is already available to them. In my own case I can access over 1,200 days of data (the age of my current cpap machine) through Sleepyhead. I just have to point to a date on the calendar and the data is produced in graphic format.

**Would a mobile app which integrates with affordable and non-intrusive sensors for at home monitoring be beneficial to sufferers?**

 As a ‘techie’, I like the concept…..BUT realistically I don’t believe there would be much interest, particularly if there is a cost factor.

**Could it be helpful to GPs/sleep specialists to view this patient data online?(especially over a long period for progress tracking?)**

 A number of the CPAP Manufacturers have already produced this type of facility. I know it has been introduced in Spain, BUT the Irish psyche mitigates against this.

Respiratory Consultants here are slow to embrace technology, and the current clinical guidelines (produced by the consultants) don’t favour it, or third parties.

**Do you think an application like this could reduce monitoring and treatment costs?(especially for mild/moderate sleep apnoea?)**

 No. At present nine Home Care providers provide this service by way of data download, with the data being forwarded directly to the Consultant.

If not instructed by the Consultant (prior to a clinical review), they carry them out at least annually when they service the equipment.

**Could this concept be used to view the impact of weight loss/weight gain on sleep apnoea over a long period?**

 See previous questions and answers

**Would a wearable sensor which detected when the user is lying on their back and alerted them to change their position be of benefit to a sufferer? Do you think waking the patient to change position would allow them to get a better nights sleep overall?**

 There is such a device on the market. To be successful it could only relate to a condition called ‘Positional Sleep Apnoea’, whereby the only cause of the condition is sleeping in the supine position. The primary drawback is that the sensor would continually wake the patient, thereby ruining the sleep architecture……and after a period of time the patient would probably ignore the alert. There are also a number of devices on the market to stop patients sleeping on their back (one comes to mind called Zzoma).

So, I doubt they would get a better night’s sleep.

**Would it be useful to provide daily suggestions to the user based on their data from the previous night?(eg. avoid consuming alcohol at least 5 hours before bedtime)**

 It might.

**Could this application give those who suspect they may have sleep apnoea a better indication as to whether they suffer from this condition or not?**

I’m not sure. In most cases the trigger to get a diagnosis is an accident (road traffic or workplace) or a spouse refusing to put up with it anymore.

If they follow up with a visit to a Sleep Site they might complete the ESS (Epworth Sleepiness Scale).

**Would it helpful to include a feature to detect if a patient's heart rate is at an alarming level or blood oxygenation is too low?**

Too many variables. First question is, how accurate would it be? Second is that it is probably Too Much Information (TMI), which can lead to other complications.

Overall, we have found that if patients have too much information about their condition, particularly if that information might alarm them in any way it can be self-defeating.

The vast majority of our members seem satisfied that once the treatment seems to work, and they feel better, more energy etc, they don’t want to know much more.

I’m sorry that this sounds negative, but there has been a lot of activity in the Sleep Apps market recently many of which seem to lack integrity.

The sleep medicine market in Ireland is fairly well tied up between device suppliers and the clinicians, the guidelines favour traditional methods rather than the technology approach.

If I can be of any more help, don’t hesitate to contact me.

Kind regards,

 Dan