Research Protocol

The effects of video consultation on patients' CPAP use regarding CPAP treatment in patients with sleep apnea, a randomized controlled trial

Protocol ID	
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Subsidising party	NA
Independent expert (s)	Dr. N.J.M. Claessens
Laboratory sites >	NA
Pharmacy	NA

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LIST OF ABBREVIATIONS AND RELEVANT DEFINITIONS

AHI	Apnea-hypopnea index
CCMO	Central Committee on Research Involving Human Subjects In Dutch: Centrale Commissie Mensgebonden Onderzoek
CPAP	Continuous Positive Airway Pressure
ODI	Oxygen desaturation index
OSA	Obstructive Sleep Apnea
SEMSA	Self-Efficacy Measure for Sleep Apnea
WMO	Medical Research Involving Human Subjects Act (in Dutch: Wet Medisch-wetenschappelijk Onderzoek met Mensen

1. INTRODUCTION

Obstructive Sleep Apnea (OSA) is a sleep disorder that affects at least 2% - 4% of the adult population [1] and is characterized by repeated episodes of full or partial occlusion of the upper airway during sleep [1, 2]. OSA can be considered a chronic disease [3] and can have multiple effects on patients' health such as cognitive dysfunction [1], a decrease in health-related quality of life [1, 4], an increase in cardiovascular disease risk and sleepiness during daytime [4]. Treatment of OSA is dependent on the severity, which can be expressed as the apnea-hypopnea index (AHI), the oxygen desaturation index (ODI) and symptoms. The AHI represents the number of apneas and hypopneas per hour [1] and is classified as mild (5-15 per hour), moderate (15-30 per hour) or severe (>30 per hour) [5]. Continuous Positive Airway Pressure (CPAP) is the treatment of choice [4], especially for moderate to severe OSA [2]. CPAP prevents the airway to narrow or collapse by applying a positive pressure via a nasal mask during sleep [6] and tailored to each individual patient [7]. However, treatment adherence is often problematic [8, 9] especially due to the discomfort of the mask and the machine [8, 9]. As the effectiveness of CPAP is dependent on the use [2, 10] good adherence is essential.

Participation of patients in their own treatment [11], a closer follow-up [12] and support during treatment [13] can positively affect adherence. Patients often decide at an early stage of the treatment process whether or not to use the CPAP machine [14], and this start can be predictive of further use [15]. Behavior change is considered a relevant factor for CPAP use [14] and treatment self-efficacy can be an important factor for behavior change [16]. Patients' perceived self-efficacy is "is concerned with judgments of how well one can execute courses of action required to deal with prospective situations" [16].

Video consultation is a useful way of supporting OSA patients during their treatment [12, 17] and is defined as a "technology used to realize a real-time visual and audio patient assessment at a distance" [18]. It has been successful in chronic conditions for example diabetes [19], cancer [20] and in care for OSA patients [17]. A recent review described five studies that used video consultation for CPAP treatment [21], of which the outcomes included patient satisfaction [12, 17, 22] and compliance [17, 22, 23]. Isetta et al. [12] conducted two studies, one to assess patients' satisfaction about the video consultation. The second study was an RCT in which 40 patients were trained to use CPAP. The results show that patients were positive about the use of video consultations and willing to replace future face-to-face consultations with a video consultation. Patients' knowledge after receiving training about OSA and CPAP via video consultation was comparable to the knowledge of patients that received the same training face-to-face [12]. In a nurse educational intervention, supported by video consultation, satisfaction and adherence was also evaluated in patients who were nonadherent during the first 3 months of their treatment. This study showed a positive effect on CPAP treatment adherence and patients' satisfaction [22]. In a multicenter RCT a telemedicine follow-up intervention was compared with hospital (face-to-face) follow-up to evaluate effects on cost-effectiveness, compliance and quality of life. Patients in the telemedicine group received access to a website with

information about CPAP and OSA. Professionals' monitored patients' answers to questionnaires about for example CPAP, status and sleep time. The website was also used for communication and video consultation. Patients in hospital group received face-to-face follow-up consultations. The results show that telemedicine was more cost-effective. The levels of CPAP compliance and satisfaction were comparable in both groups [23].
Parikh et al [17] compared the effects of video consultations, used for OSA patients that will receive CPAP treatment, in a controlled setting to compare satisfaction and CPAP adherence. Surveys were used to measure satisfaction and adherence was analyzed using a retrospective cohort. No differences in patients' satisfaction and compliance comparing a group patients with CPAP treatment [17].

Multiple studies have evaluated the use of video consultation for OSA patients treated with CPAP on treatment adherence [17, 22, 23]. However, there is lack of knowledge about the effects of video consultation on CPAP treatment adherence for new patients during their CPAP treatment. Because self-efficacy can be an important element for treatment adherence [24], more knowledge is also needed about the effects of video consultation on patient's self-efficacy.

2. OBJECTIVES

We will evaluate the effects of video consultation versus face-to-face and consultations by telephone for patients with sleep apnea in terms of patients' CPAP use (minutes/per night) (primary outcome). Also the effects on self-efficacy, risk perception, outcome expectancy, CPAP adherence, video consultation expectations and experiences, and patients' and professionals' satisfaction will be assessed (secondary outcomes).

3. STUDY DESIGN

The study will be a randomized controlled trial with an intervention group (video consultation) and a usual care control group (1:1 allocation), with assessments at baseline and after four weeks. The intervention group, receiving video consultation combined with face-to-face consultations during their treatment with CPAP, will be compared to a control group receiving face-to-face and consultations by telephone. A detailed description of the intervention can be found in paragraph 5.1 and a detailed description of the study procedure in paragraph 8.3.

4. STUDY POPULATION

4.1 Population (base)

We will include Dutch patients with confirmed obstructive sleep apnea (OSA) (AHI > 15) that will be starting treatment with CPAP at the Rijnstate hospital in Arnhem. Annually, approximately 475 patients

(2017) with OSA (AHI > 15) are being treated with CPAP in Rijnstate. We will be able to include approximately 140 patients in a 6 month period assuming an uptake of 60%.

4.2 Inclusion criteria

In order to be eligible to participate in this study, a subject must meet all of the following criteria:

- diagnosed with moderate or severe sleep apnea AHI > 15
- patients will be treated with CPAP
- Age > 18 years
- no history of CPAP treatment
- having (access to) a tablet or smartphone
    - with a (integrated) webcam, speakers, microphone
    - working internet connection
    - access to the browsers Chrome, Firefox, Internet Explorer or Safari.
- able to use a tablet or smartphone (including a web-cam)
- ability to read and understand the Dutch language
- signed informed consent

4.3 Exclusion criteria

A potential subject who meets any of the following criteria will be excluded from participation in this study:

- having a severe cognitive or psychiatric disorder

4.4 Sample size calculation

In total, 126 patients will be required for our primary study objective, n=63 in the intervention and n=63 in the control group. For CPAP adherence we assumed that a difference of 1 h/day of average CPAP use is clinically significant (SD 2.0)[23, 25]. Using a t-test, alpha of 0.05, and 80% power, 63 subjects per group (a total of 126 patients) are needed. Correcting for 10% drop out, 70 patients in each group will be included.

5. TREATMENT OF SUBJECTS

5.1 Investigational product/treatment

Patients are informed about the video consultation study by their physician during their first face-to-face consultation in the hospital, after they received their treatment plan. After this consultation the researcher will provide patients with additional information and, if asked for, answer questions. Because of clinical necessity patients have to start treatment the same day and therefore the researcher will ask patients for their informed consent and to fill in the baseline questionnaire (approximately 20 minutes) in the hospital. After that, patients will be randomized by the researcher

using the software program ‘research manager’. Participants in the intervention group are also provided with information to install the video consultation system – using FaceTalk – at home (see Appendix 2 for specifications). If necessary, they can call a researcher for support. Two days after the start all participants will have a consultation by telephone and approximately 1 week after start with CPAP the participants in the intervention group will have a video consultation planned and the controlled group a face-to-face consultation (with a nurse). Three focus points will be discussed during the consultations: (1) adherence (> 6 hours per night); (2) rest AHI <5 (or <10 if age >70); and (3) improvements or complaints. As long as these objectives are not achieved a video consultation will be planned weekly for the intervention group and face-to-face consults in the control group. If the objectives are achieved one week after start with CPAP, a video consultation will be planned four weeks later. See appendix I for the total CPAP treatment process.

5.2 Use of co-intervention (if applicable)

NA

5.3 Escape medication (if applicable)

NA

6. INVESTIGATIONAL PRODUCT

NA

7. NON-INVESTIGATIONAL PRODUCT

NA

8. METHODS

8.1 Study parameters/endpoints

8.1.1 Main study parameter

8.1.1.1 Use (minutes/per night)

CPAP use will be measured with Encore anywhere (Philips) and information will be obtained from the Electronic Medical Record.

8.1.2 Secondary study parameters/endpoints (if applicable)

8.1.2.1 Treatment self-efficacy (SEMSA subscale)

Self-efficacy is a subscale of the Self-Efficacy Measure for Sleep Apnea (SEMSA).The SEMSA is a 26-item scale and indicated good psychometric properties with reported internal consistency (Cronbach’s alpha = 0.92) and test-retest reliability (0.68) [24]. The subscale self-efficacy consists of 9 questions including “I would use CPAP…if have to wear a tight mask” and “I would use CPA…if it

disturbed my partner". These items will be rated on a 4-point scale ranging from not at all try – very true. A sum score for this subscale will be calculated by taking the mean score of the nine items.

8.1.2.1 Risk perception (SEMSA subscale)

Risk perception is a subscale of the Self-Efficacy Measure for Sleep Apnea [24], and consists of 8 questions, for example "having OSA, my chances of falling asleep driving" and "having OSA my chances of difficulty concentrating". These items will be rated on a 4-point scale ranging from "very low to very high". A sum score for this subscale will be calculated by taking the mean score of the eight items.

8.1.2.2 Outcome expectancies (SEMSA subscale)

Outcome expectancies will be measured, which is a subscale of the Self-Efficacy Measure for Sleep Apnea [24], and consists of 9 items for example "If I use CPAP…I will be more active". These items will be rated by a 4-point scale ranging from "not at all true – very true." A sum score for this subscale will be calculated by taking the mean score of the eight items.

8.1.2.3 Adherence

Adherence will be measured with Encore anywhere (Philips) and information will be obtained from the Electronic Medical Record. Adherence for CPAP use is defined as using CPAP at least seven nights a week for at least six hours a night, according to the protocol in Rijnstate hospital.

8.1.2.4 Expectations and experiences – according to constructs of the UTAUT model

Questions covering constructs of the Unified Theory of Acceptance and Use of Technology (UTAUT) model will be used to measure expectations and experiences of use of the video consultation system. The UTAUT consist of four constructs that influence behavioral intention and behavior: (1) performance expectancy, (2) effort expectancy, (3) social influence, (4) facilitating conditions [26]. Eight items will be rated on a seven point scale. Results will be presented as mean and standard deviation (SD).

8.1.2.5 Satisfaction

All patients will be asked to fill in a questionnaire assessing effects on satisfaction with the video consultation system (for the intervention group only) and patient-professional communication.

Healthcare professionals will also be asked to fill in a questionnaire, after patients' treatment, measuring effects on:

- Experiences with the system;
- satisfaction
- organizational benefits (e.g. time, efficiency of work processes)

8.1.3 Other study parameters (if applicable)

The patients' age, marital status, education, experience with internet and internet use, tablet/smartphone skills and support (with tablet/smartphone use) will be assessed via a questionnaire. We will also use information from the Electronic Medical Record about patients' daytime sleepiness (results from the *Epworth Sleepiness Scale*), comorbidities, (re)admissions to the hospital and emergency room visits.

8.2 Randomisation, blinding and treatment allocation

8.2.1 Randomization

The researcher will randomize participants to the intervention or control group using the software program 'research manager'.

8.2.2 Blinding

Health care professionals (pulmonologists and nurses) and the researcher are not blinded to the participants intervention group**.**

8.2.3 Treatment allocation

In total, n=140 patients will be randomized. All patients diagnosed with sleep apnea that will be treated with CPAP will be informed about the study. Patients will be included in the study when they meet the inclusion criteria and agree to participate.

8.3 Study procedures

Patients receive a letter from the hospital about their appointments (eg sleep study and consultation with the doctor or nurse practitioner). Patients will receive information about the video consultation study together with this letter.

Patients are also informed about the video consultation study by their physician during their face-to-face consultation in the hospital. After this consultation the researcher will provide patients with additional information and, if asked for, answer questions. Because of clinical necessity patients have to start treatment the same day and therefore the researcher will ask patients for their informed consent and to fill in the baseline questionnaire (approximately 20 minutes) in the hospital. After that, patients will be randomized. Participants in the intervention group are also provided with information about how to install the video consultation system at home. Two days after the start all participants will have a consultation by telephone and approximately 1 week after start with CPAP the participants in the intervention group will have a video consultation planned and the controlled group a face-to-face consult. Three focus points will be discussed during the consults: (1) adherence (> 6 hours per night); (2) rest AHI <5 (or <10 if age >70); and (3) improvements or complaints. As long as these objectives are not achieved a video consultation will be planned weekly for the intervention group and face-to-

face consultations in the control group. If the objectives are achieved one week after start with CPAP, a video consultation will be planned four weeks later. See appendix I for the CPAP treatment process.

8.4 Withdrawal of individual subjects

Patients can leave the study at any time for any reason if they wish to do so without any consequences. The investigator can decide to withdraw a patient from the study for urgent medical reasons.

8.4.1 Specific criteria for withdrawal (if applicable)

NA

8.5 Replacement of individual subjects after withdrawal

Subjects will not be replaced after withdrawal.

8.6 Follow-up of subjects withdrawn from treatment

NA

8.7 Premature termination of the study

NA

9. SAFETY REPORTING

It is not expected that this study will jeopardize subject health or safety or will result in adverse effects.

10. STATISTICAL ANALYSIS

10.1 Primary study parameter(s) – CPAP use (minutes/per night)

Use will be reported after week 1, week 2, week 3 and week 4 using descriptive statistics (mean and SD). Difference in use between the two groups will be tested after 4 weeks using independent samples t-test. Also difference in use between the two groups after week 1, week 2, week 3 and week 4 will be tested using mixed-model analyses.

10.2 Secondary study parameter(s) – self-efficacy (SEMSA subscale), perceived risk (SEMSA subscale), outcome expectancies (SEMSA subscale), adherence, expectations and experiences and satisfaction

Difference in the variables of the parameters “self-efficacy”, “perceived risk”, “outcome expectancies” and “satisfaction” between the two groups will be tested after 4 weeks using independent samples t-

test. Difference in adherence rates will be tested by Chi-square analyses. The analyses will be conducted according to the intention-to-treat principle. “Experiences” and “expectations will be will be presented as mean and standard deviation (SD).

10.3 Other study parameters

Descriptive statistics (frequencies, percentages, means, standard deviations) will be used to present sociodemographic variables and differences at baseline will be tested by relevant statistic (t-test or chi square depending on the type of outcome variable).

10.4 Interim analysis (if applicable)

NA

10.5 Missing data

If the missing values are more than 10% we will use multiple imputation analyses.

11. ETHICAL CONSIDERATIONS

11.1 Regulation statement

This study will be conducted in accordance with the principles of the Declaration of Helsinki (version 10, amended in October 2013 by the 64th WMA General Assembly) and in accordance with the Medical Research Involving Human Patients Act (WMO) and this research protocol. The handling of personal data will be in accordance with the Dutch Personal Data Protection Act (In Dutch: Wet Bescherming Persoonsgegevens (WPB)).

11.2 Recruitment and consent

During their first consultation with the pulmonologist, patients are informed about their treatment with CPAP. Because of clinical necessity patients have to start treatment the same day. When patients are eligible they will receive written information about the study during their first consultation from their treating physician. Subsequently, a researcher will provide patients with further information about the study. Patients will be asked to participate and sign the informed consent form. After consent and randomization the participants will receive additional information, if applicable, about the video consultation system.

11.3 Objection by minors or incapacitated subjects (if applicable)

NA

11.4 Benefits and risks assessment, group relatedness

NA

11.5 Compensation for injury

Dispensation for the insurance obligation.

11.6 Incentives (if applicable)

NA

12. ADMINISTRATIVE ASPECTS, MONITORING AND PUBLICATION

12.1 Handling and storage of data and documents

Data will be handled confidentially. A subject identification code list will be used to link the data to the subject. The key code will be safeguarded by the investigator (Laura Kooij) and will be saved on a computer in the work office at Rijnstate hospital. The data will be coded using numbers in order enrolment, 1 / 2 / 3 etc. The intervention group will be added as a fixed code A and the control group as B. The first enrolled patient of the intervention group will be coded as A1, the second as A2. The first enrolled patient of the control group will be coded as B1, the second as B2. The investigators Laura Kooij and the pulmonologists P.J.E. Vos, MD, PhD and A. Dijkstra, MD will have access to the source data. Data will be stored for at least 15 years in an office at Rijnstate hospital.

12.2 Monitoring and Quality Assurance

Internal monitoring will take place once within three months after the start of inclusion and once after patient inclusion is finished. Monitoring will be handled by the monitoring coordinator in Rijnstate hospital. All data will be checked for anonymity, completeness and accuracy.

12.3 Amendments

Amendments are changes made to the research after a favorable opinion by the accredited METC has been given. All amendments will be notified to the METC that gave a favorable opinion.

All substantial amendments will be notified to the METC and to the competent authority.

Non-substantial amendments will not be notified to the accredited METC and the competent authority, but will be recorded and filed by the sponsor.

12.4 Annual progress report

This study will run for six months and therefore a report will be delivered at the end of the study period.

12.5 Temporary halt and (prematurely) end of study report

The investigator will notify the accredited METC of the end of the study within a period of 8 weeks. The end of the study is defined as the last patient's received follow-up questionnaire.

Within one year after the end of the study, the investigator will submit a final study report with the results of the study, including any publications/abstracts of the study, to the accredited METC.

12.6 Public disclosure and publication policy

The investigators will publish the results of the study as soon as appropriate.

13. STRUCTURED RISK ANALYSIS

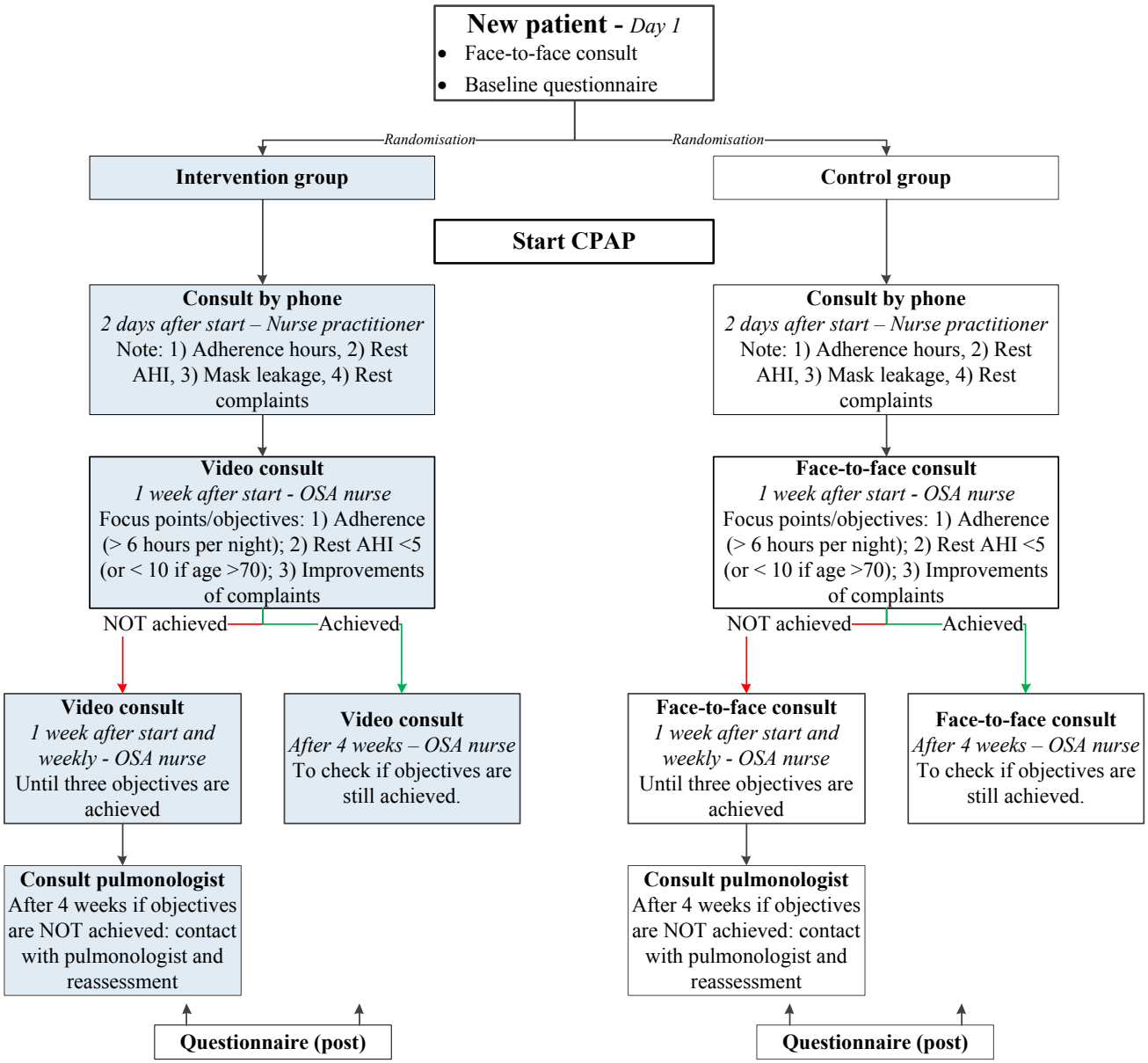
We used the risk analysis provided by Rijnstate. The use of this checklist resulted of the classification of the risk of this study as 'little'. Because the estimated change for damage is 'little', the level of severity of the damage is 'light' and there is no vulnerable population include in the study.

14. REFERENCES

1. Punjabi, N.M., *The epidemiology of adult obstructive sleep apnea.* Proc Am Thorac Soc, 2008. **5**(2): p. 136-43.
2. Kushida, C.A., et al., *Practice parameters for the use of continuous and bilevel positive airway pressure devices to treat adult patients with sleep-related breathing disorders.* Sleep, 2006. **29**(3): p. 375-80.
3. Epstein, L.J., et al., *Clinical guideline for the evaluation, management and long-term care of obstructive sleep apnea in adults.* J Clin Sleep Med, 2009. **5**(3): p. 263-276.
4. Gay, P., et al., *Evaluation of positive airway pressure treatment for sleep related breathing disorders in adults.* SLEEP-NEW YORK THEN WESTCHESTER-, 2006. **29**(3): p. 381.
5. *Sleep-related breathing disorders in adults: recommendations for syndrome definition and measurement techniques in clinical research. The Report of an American Academy of Sleep Medicine Task Force.* Sleep, 1999. **22**(5): p. 667-89.
6. Gibson, G., *Obstructive sleep apnoea syndrome: underestimated and undertreated.* British Medical Bulletin, 2005. **72**(1).
7. Sullivan, C., et al., *Reversal of obstructive sleep apnoea by continuous positive airway pressure applied through the nares.* The Lancet, 1981. **317**(8225): p. 862-865.
8. Yetkin, O., E. Kunter, and H. Gunen, *CPAP compliance in patients with obstructive sleep apnea syndrome.* Sleep Breath, 2008. **12**(4): p. 365-7.
9. Rolfe, I., L.G. Olson, and N.A. Saunders, *Long-term acceptance of continuous positive airway pressure in obstructive sleep apnea.* Am Rev Respir Dis, 1991. **144**(5): p. 1130-3.
10. Stuck, B.A., S. Leitzbach, and J.T. Maurer, *Effects of continuous positive airway pressure on apnea-hypopnea index in obstructive sleep apnea based on long-term compliance.* Sleep Breath, 2012. **16**(2): p. 467-71.
11. Tennstedt, S.L., *Empowering older patients to communicate more effectively in the medical encounter.* Clin Geriatr Med, 2000. **16**(1): p. 61-70, ix.
12. Isetta, V., et al., *Telemedicine-based approach for obstructive sleep apnea management: building evidence.* Interactive journal of medical research, 2014. **3**(1).

13. Hoy, C.J., et al., *Can intensive support improve continuous positive airway pressure use in patients with the sleep apnea/hypopnea syndrome?* American Journal of Respiratory and Critical Care Medicine, 1999. **159**(4): p. 1096-1100.
14. Stepnowsky, C.J., Jr., M.R. Marler, and S. Ancoli-Israel, *Determinants of nasal CPAP compliance.* Sleep Med, 2002. **3**(3): p. 239-47.
15. McArdle, N., et al., *Long-term use of CPAP therapy for sleep apnea/hypopnea syndrome.* Am J Respir Crit Care Med, 1999. **159**(4 Pt 1): p. 1108-14.
16. Bandura, A., *Self-efficacy mechanism in human agency.* American psychologist, 1982. **37**(2): p. 122.
17. Parikh, R., et al., *Sleep telemedicine: patient satisfaction and treatment adherence.* Telemedicine and e-Health, 2011. **17**(8): p. 609-614.
18. Kitamura, C., L. Zurawel-Balaura, and R.K. Wong, *How effective is video consultation in clinical oncology? A systematic review.* Curr Oncol, 2010. **17**(3): p. 17-27.
19. Fatehi, F., et al., *Patient satisfaction with video teleconsultation in a virtual diabetes outreach clinic.* Diabetes Technol Ther, 2015. **17**(1): p. 43-8.
20. Sabesan, S., K. Simcox, and I. Marr, *Medical oncology clinics through videoconferencing: an acceptable telehealth model for rural patients and health workers.* Internal medicine journal, 2012. **42**(7): p. 780-785.
21. Verbraecken, J., *Telemedicine applications in sleep disordered breathing: Thinking out of the box.* Sleep medicine clinics, 2016. **11**(4): p. 445-459.
22. Smith, C.E., et al., *Telehealth services to improve nonadherence: a placebo-controlled study.* Telemedicine Journal & e-Health, 2006. **12**(3): p. 289-296.
23. Isetta, V., et al., *A Bayesian cost-effectiveness analysis of a telemedicine-based strategy for the management of sleep apnoea: a multicentre randomised controlled trial.* Thorax, 2015: p. thoraxjnl-2015-207032.
24. Weaver, T.E., et al., *Self-efficacy in sleep apnea: instrument development and patient perceptions of obstructive sleep apnea risk, treatment benefit, and volition to use continuous positive airway pressure.* Sleep, 2003. **26**(6): p. 727-32.
25. Parthasarathy, S., et al., *A pilot study of CPAP adherence promotion by peer buddies with sleep apnea.* Journal of Clinical Sleep Medicine, 2013. **9**(06): p. 543-550.
26. Venkatesh, V., et al., *User acceptance of information technology: Toward a unified view.* MIS quarterly, 2003: p. 425-478.
27. Facetalk. *Veelgestelde vragen*. 2015 [cited 2018 23-05]; Available from: https://facetalk.nl/faq/#veiligheid.

Appendix 1 – Study process



Appendix 2 – FaceTalk specifications

Facetalk

Facetalk will be used in this study in hospital to enable video consultations with patients. This product is approved by the Information and Medical Technology department (IMT).

Information security

This service complies with the NEN 7510/NEN 7512 standards concerning information security in health care [27].

Requirements for using Facetalk (for patients)

- Tablets (Apple and Android) and smartphones (Apple and Android) with a (integrated) webcam, (integrated) speakers, (integrated) microphone and a working internet connection.
- Facetalks makes use of a “browser plug-in”. Chrome, Firefox, Internet Explorer and Safari can be used. Patients need to accept the browser-plug in before their first use. If patients want to use FaceTalk with iOS and Android it is necessary to download and install the free app “Vidyo” [27].