THE FUTURE OF REMOTE SLEEP MEDICINE:
The Hybrid Telemedicine/Physician Extender Model for Rural British Columbia

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Financial Interest Disclosure
(over the past 24 months)

Dr. Alan GD Hoffman

- I have no conflict of interest.
Learning Objectives

1. Understand the key components of a successful SLEEP telemedicine program
2. How to Integrate physician extenders into a clinical sleep medicine practice and
3. Consider the expansion of the advanced sleep medicine practice into the rural community
Where is the Evidence in Sleep Telemedicine? Its Coming Slowly....

Telemedicine: A key tool for improving CPAP appearance and sleep apnea patients. Farre, Navajlas et al. AJRCCM Sep, 2017


Sleep telemedicine: An Emerging Field's Latest Frontier. Zia & Fields, Chest, 149#6, 2016

TELEMEDCINE Literature
College of Physicians and Surgeons of British Columbia

Professional Standards and Guidelines

Telemedicine

Preamble
This document is a standard of the Board of the College of Physicians and Surgeons of British Columbia.

According to the Federation of Medical Regulatory Authorities of Canada:

"Telemedicine is the provision of medical expertise for the purpose of diagnosis and patient care by means of telecommunications and information technology where the patient and the provider are separated by distance. Telemedicine may include, but is not limited to, the provision of pathology, medical imaging and patient consultative services."

College’s Position
The role of the College is to regulate physicians, not technology, and to remind physicians that the use of technology does not alter the ethical, professional and legal requirements around the provision of appropriate medical care.
Safety of care

Improving patient safety and reducing risks

Telemedicine — Opportunities, challenges, and obligations

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P1303-5-E

The digital revolution is profoundly changing how doctors and patients interact and the ways in which healthcare is delivered. Telemedicine has moved beyond the telephone and email, videoconferencing and web portals, and now includes a myriad of mobile apps for smartphones and tablets.

While telemedicine offers benefits for individual patients and is viewed by some governments as a way to improve access to care and control healthcare system costs, licensure and regulatory challenges continue to be perceived as barriers to achieving its full potential. Meanwhile, jurisdictional issues may complicate medico-legal matters for physicians.

Benefits and limitations

Telemedicine has been shown to help patients be more engaged in their health and enable better management of chronic diseases, resulting in fewer and shorter hospital stays, fewer emergency room visits, less severe illness, and fewer deaths.¹

Telemedicine services are widely available in most Canadian provinces and territories. In Ontario, for example, the Telhomecare program provides remote monitoring and health coaching of patients with congestive heart failure and chronic obstructive pulmonary disease (COPD). Other examples include accepting cardiograms sent by patients to doctors via smartphone,² and smartphones being used to capture and transmit blood pressure and lung function readings.
1. There is a significant shortage of trained sleep physicians in British Columbia. We only have 6 full-time sleep specialists for a population of 4 million people.
2. Allows for specialist care in rural and other geographically disadvantaged communities
3. Minimizes travel for patients and physicians
4. Expands clinic outreach programs
5. Improves patient care coordination from outpatient to inpatient to home health
6. Theoretical potential for community improvement
## Sleep Labs in BC – Apr 2018

<table>
<thead>
<tr>
<th>Sleep Clinic</th>
<th>BEDS</th>
<th>Health Region</th>
<th>Medical Director</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Abbotsford Regional Hospital and Cancer Centre</td>
<td>H 8</td>
<td>Fraser Health</td>
<td>Dr. Richard Feige</td>
</tr>
<tr>
<td>2 Surrey Sleep Clinic</td>
<td>P 6</td>
<td>Fraser Health</td>
<td>Dr. John Fleetham</td>
</tr>
<tr>
<td>3 Kelowna General Hospital</td>
<td>H 2</td>
<td>Interior Health</td>
<td>Dr. Wayne Lai</td>
</tr>
<tr>
<td>4 Kelowna Sleep Clinic</td>
<td>P 6</td>
<td>Interior Health</td>
<td>Dr. Ron Cridland</td>
</tr>
<tr>
<td>5 Kootenay Sleep Center</td>
<td>P 3</td>
<td>Interior Health</td>
<td>Dr. Wayne Lai</td>
</tr>
<tr>
<td>6 Royal Inland Hospital</td>
<td>H 4</td>
<td>Interior Health</td>
<td>Dr. Catherine Jill Calder</td>
</tr>
<tr>
<td>7 MedSleep Nelson</td>
<td>P UC - 3</td>
<td>Interior Health</td>
<td>Dr. Alan Hoffman</td>
</tr>
<tr>
<td>8 MedSleep Penticton</td>
<td>P 3</td>
<td>Interior Health</td>
<td>Dr. Alan Hoffman</td>
</tr>
<tr>
<td>9 Vernon Sleep Clinic</td>
<td>P 6</td>
<td>Interior Health</td>
<td>Dr. Ron Cridland</td>
</tr>
<tr>
<td>10 Leon Judah Blackmore Center (UBC Hospital)</td>
<td>H 9</td>
<td>Vancouver Coastal</td>
<td>Dr. John Fleetham &amp; Maureen Ceresney</td>
</tr>
<tr>
<td>11 BC Children’s Hospital</td>
<td>H 2</td>
<td>Vancouver Coastal</td>
<td>Dr. David Wensley</td>
</tr>
<tr>
<td>12 Richmond Hospital</td>
<td>H 6</td>
<td>Vancouver Coastal</td>
<td>Dr. John Fleetham</td>
</tr>
<tr>
<td>13 Royal Jubilee Hospital</td>
<td>H 4</td>
<td>Vancouver Island</td>
<td>Dr. John Reid</td>
</tr>
<tr>
<td>14 Nanaimo Sleep Clinic [MedSleep]</td>
<td>P 8</td>
<td>Vancouver Island</td>
<td>Dr. Laura McLean</td>
</tr>
<tr>
<td>15 MedSleep Campbell River</td>
<td>P UC - 3</td>
<td>Vancouver Island</td>
<td>Dr. Laura McLean</td>
</tr>
<tr>
<td>16 MedSleep Prince George</td>
<td>P 3</td>
<td>Northern Health</td>
<td>Dr. Alan Hoffman</td>
</tr>
<tr>
<td>17 Northern BC Sleep Center (Terrace)</td>
<td>P 3</td>
<td>Northern Health</td>
<td>Dr. Wayne Lai</td>
</tr>
<tr>
<td>18 Dawson Creek Sleep Clinic</td>
<td>P 3</td>
<td>Northern Health</td>
<td>Dr. Wayne Lai</td>
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</tbody>
</table>

P = Private/Community (MSP funded)      H = Hospital

TOTAL FUNCTIONING POLY BEDS = 41 Hospital + 37 Private = 78 beds/4 million = 1 bed/51,280 people
# CENTER to CENTER vs CENTER to HOME

<table>
<thead>
<tr>
<th>Telemedicine Model</th>
<th>Center to Home</th>
<th>Center to Center</th>
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<tbody>
<tr>
<td><strong>Advantages</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Implementation costs lower</td>
<td>• More similar to live office visit</td>
<td></td>
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<tr>
<td>• Ease of patient Access</td>
<td>• Utilization of personnel and the diagnostic tools</td>
<td></td>
</tr>
<tr>
<td>• Patients familiar with phone technology (sometimes)</td>
<td>• Reliable and higher quality technology</td>
<td></td>
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<tr>
<td><strong>Disadvantages</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Privacy more difficult to control</td>
<td>• Remote site agreement required</td>
<td></td>
</tr>
<tr>
<td>• No tools or personnel available</td>
<td>• Higher equipment and personnel costs</td>
<td></td>
</tr>
<tr>
<td>• Variable signal quality/reliability</td>
<td>• Less convenient to patients</td>
<td></td>
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</table>
1. INCREASING DEMAND
   • Patient driven
   • IN US, payer driven

2. QUALITY
   • What can /should be done this way?

3. THIS IS NOT NEW
   • Military, Psychiatry, Radiology, Dermatology
SOME KEY TERMINOLOGY *

* Kholsa et al, Sleep Medicine Trends, 2017 Arizona

- **TELEHEALTH** – exchange of medical information to improve the patient’s health status
- **TELECONFERENCING** – information from central location to multiple remote sites
- **TELECONSULTATION** – Telephone or video interaction between clinicians
- **TELEMONITORING** – remote collection and transmission of data
- **TELEMEDICINE** - legal patient/clinician encounter using electronic communication
WHERE DOES ONE START???

TYPE of APPOINTMENS in OUR SLEEP MEDICINE PRACTICE:

• Consultations
• PSG-Dx Follow ups
• PSG-Tx Follow ups
• CPAP/BiPAP Follow ups
• Insomnia/RLS/Narcolepsy Follow Ups
• CONSULT2’s – annual visits
WHERE DOES ONE START???

1. Start Simple

2. Know the regulations

3. Center to Center – with full control all Technical and Administrative aspects of both hands.

4. With Follow – Up Appointments

5. Goal to mirror a “live” visit as much as possible
WHERE DOES ONE END ???

1. Telemedicine every day, all day

2. Different Clinic/City for a different day

3. Center to Center, Center to CPAP Provider and Center to Home

4. Ability in each different clinic – to do TM with each different clinic/city – with full interactive communication with staff
TELEMEDICINE MEDSLEEP BC

PHYSICIANS: 8 (4 live in BC, 3 in Ontario, 1 in Phoenix)

Sleep Respirologists 3 – 2 of 3 do telemedicine, 1 uses a physician extender
Sleep Psychiatrists 3 – all 3 do telemedicine, 1 uses a physician extender
Sleep Internists 1 - does telemedicine and uses 2 physician extenders simultaneously
Sleep Trained Family MD

PHYSICIAN EXTENDERS:

Nurses LPN x 2
RPSGT x1
Psychologist x1
Kinesiologist x1

MEDSLEEP – 17 Sleep Laboratories across Canada
60+ Sleep Physicians
> 500 Staff
CLINICAL SLEEP DISORDERS
[≈ 85]

- Insomnias (11)
- Sleep Related Breathing Disorders (14)
- Hypersomnias of Central Origin (12)
- Circadian Rhythm Sleep Disorders (9)
- Parasomnias (15)
- Sleep Related Movement Disorders (8)
- Proposed Sleep Disorders (9)

The Sleep Telemedicine Model has to Address all disorders, not just OSA and Insomnia.
TRAVEL IS AN ISSUE
For Staff & for Patients
TRAVEL IS AN ISSUE
For Staff & for Patients
TRAVEL IS AN ISSUE
For Staff & for Patients

DRIVING TIMES TO CLINICS

• PR to PG = 8 hours
• MacKenzie to PG = 4.5 hours
• Haida Gwaii to Nanaimo = full day

The Advisory Committee for Diagnostic Facilities in the Ministry of Health is now considering driving times, winter road conditions and local municipal boundaries, as opposed to Health Regions – when awarding licenses for polysomnography facilities.
CLINICAL SLEEP DISORDERS [~ 80]

- Insomnias (11)
- Sleep Related Breathing Disorders (14)
- Hypersomnias of Central Origin (12)
- Circadian Rhythm Sleep Disorders (9)
- Parasomnias (15)
- Sleep Related Movement Disorders (8)
- Proposed Sleep Disorders (9)
TELEMEDICINE SETUP

2-computer model
# Telemedicine Systems

<table>
<thead>
<tr>
<th>Professional Medical/Business</th>
<th>Consumer Grade</th>
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<tbody>
<tr>
<td><strong>VIDYO</strong></td>
<td><strong>FACETIME</strong></td>
</tr>
<tr>
<td>Powers the OTN</td>
<td></td>
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<tr>
<td><strong>MEDEO</strong></td>
<td><strong>MESSENGER</strong></td>
</tr>
<tr>
<td>QHR – excellent for Center to Home Use</td>
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<tr>
<td><strong>SLEEP TELEMEDICINE</strong></td>
<td><strong>SKYPE</strong></td>
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<tr>
<td>AASM – expanding into Canada</td>
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<tr>
<td><strong>MICROSOFT LYNC</strong></td>
<td></td>
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<tr>
<td>Used in Business &amp; Medicine – end to end encrypted</td>
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</table>
1. **LAN MESSENGER (BigANT)** – allows for instant communications with staff across the organization in all clinics

2. **MULTIPLE TELEMEDICINE ROOMS** – allows Physician extenders to present the patients in private

3. **MULTIPLE SIMULTANEOUS TELEMEDICINE STREAMS** – allows the MD to communicate with Physician Extenders in different clinics/cities.

4. **PRINT REMOTELY** – in all clinics/cities (all on VLAN)

5. **MUST HAVE A SYSTEM-WIDE VLAN NETWORK**
PATIENT ASSESSMENT

iPOD IMAGES Uploaded into EMR
PATIENT ASSESSMENT

VITAL SIGNS MEASUREMENT
PATIENT ASSESSMENT

BLUETOOTH STETHOSCOPE
CONSIDERATIONS for EQUIPMENT SELECTION

1. Be aware of connectivity differences between different locations/systems – eg community clinics & hospitals & CPAP Provider companies
2. Test equipment extensively and prepare redundancies
3. Consider Bridged Internet Systems, eg TELUS:SHAW simultaneously
4. Logitech WebCam 920e or 930 HD + Modeling Light
5. Sennheiser MB Pro 2 UC ML Premium Double-Sided Bluetooth Headset
6. Workstation quality computer system
SECTION 2

PHYSICIAN EXTENDERS
PHYSICIAN EXTENDERS

Assisting the Physician

- Interns, Residents and Fellows
- House Officers (Senior and Junior), Registrars (Senior and Junior) and specialists
- Physician assistants
- Nurse practitioners
- Registered nurses
- Licensed practical nurses
- Respiratory Therapists
- Registered Polysomnography Technicians
- Other qualified staff
1. Very detailed 12 month training program for our physician extenders, customized to their background experience and knowledge. The entire training program lasts a year—six months of detailed training, close mentoring and supervision, followed by an additional six months of close monitoring.

2. Completion of 13 AASM modules (currently underway by KL) specifically designed to train physician extender/physician assistants in all aspects of basic sleep medicine management (SM science, diagnostic and treatment).

3. After completion of the above program, the physician extender may be offered the opportunity to attend the basic & advanced Atlanta School of Sleep Medicine program for nurses and physician extenders.
1. The goal of the program is to have physician extenders comfortable with the initial intake consultation of patients with all 85 sleep disorders, and given additional training and interest, to also be involved in other aspects of clinical care such as review of polysomnograms with patients, review of CPAP downloads and review of medication efficacy.

2. All aspects of the physician extender care would be under the tacit direct supervision of the designated physician mentor.
Specifically developed for Advanced Practice Nurses (APRN) and Physician Assistants (PA), this series of modules will provide what you need to know to integrate into sleep medicine practices. CNE or CME credit provided upon completion of the entire series of 14 modules.

**Learning Objectives**
Upon completion of this activity, participants should be able to:
- Access and manage adult sleep disorders
- Review results of lab and home testing
- Discuss the characteristics of movement disorders
- Collaborate with the sleep medicine team to provide care for adult patients

**Target audience:** nurse practitioners and physician assistants

**Estimated time to complete:** 13 hrs.

**Release date:** 06/03/2017
**Expiration date:** 06/02/2018

- Sleep 101
- Sleep History
- Laboratory based Polysomnography, Multiple Sleep Latency Test, and Maintenance of Wakefulness Test
- Home Sleep Apnea Testing (HSAT) for Obstructive Sleep Apnea
- Adult Obstructive Sleep Apnea Background, Assessment and Diagnosis
- Adult Obstructive Sleep Apnea Treatment
- Adult Obstructive Sleep Apnea Follow Up Assessment, Chronic Management Considerations Atypical Presentations and Case Examples
- Central Sleep Apnea
- Insomnia
- Restless Legs Syndrome
- Central Disorders of Hypersomnia
- Circadian Rhythm Sleep-wake Disorder
- Parasomnias
- Interprofessional Collaboration & Care Coordination in Sleep Health
COMPLEXITY of TELEMEDICINE

Where Dr. Hoffman Sits

MedSleep Cowichan

MedSleep Vancouver

MedSleep Prince George

MedSleep Penticton
COMPLEXITY of TELEMEDICINE

Where The Physician Extenders Work

- MedSleep Vancouver
- MedSleep Prince George
- MedSleep Cowichan
- MedSleep Penticton
Wearable Sleep Tracker

- Battery good for 30+ days
- Water resistant - good for shower, bath or swimming pool
- Parent company located in Vancouver, BC
- Used in the transportation industry and the military to determine sleep and fatigue levels
- Proprietary algorithm to monitor daytime fatigue.
- $300 USD/year fee
TELE-ACTIGRAPHY
Fatigue Science ReadiBand2
Cloud Based - Level 3 Recorder
Watermark ARES 8 channel

1. Snoring Mic
2. Nasal Airflow
3. Oximetry
4. Actigraphy
5. Position (head)
6. Resp Effort
7. Single Channel EEG
8. EOG/EMG

- Ideal for Multiple Sleep Centers
- Central Portal
Cloud Based - POLYSOMNOGRAPHY

Philips Alice 6 with Alice G3 Software

- Ideal for Multiple Sleep Centers
- Allows for Distributed Scoring & Interpretation
- Fully customizable polysomnography software downloadable to multiple workstations (including at home) obtaining level one data from the cloud
OBJECTIVE: To explore the feasibility of a comprehensive telemedicine based OSA management pathway in a community based veteran cohort

METHODS: Perspective, parallel group randomized pilot study involving 60 veterans, randomized to either a traditional in-person care model or telemedicine base pathway

RESULTS: No significant difference and functional outcome changes, patient’s satisfaction, dropout rates or PAP adherence between the 2 groups after 3 months of treatment

CONCLUSIONS: Pilot study suggests telemedicine-based management of OSA patients is feasible in terms of patient functional outcomes and overall satisfaction of care
OBJECTIVE: examining the effects of telemedicine-delivered obstructive sleep apnea education and CPAP telemonitoring with automatic patient feedback messaging on CPAP adherence

METHODS: Four-arm, randomized factorial design clinical trial enrolling 1455 patients referred for suspected OSA. 956 underwent HSAT, 556 prescribed CPAP. 2 telemedicine interventions were implemented-web-based OSA education and CPAP telemonitoring with automatic patient feedback

RESULTS: primary end point was 90 day CPAP usage. Secondary endpoints were attendance to OSA evaluation and change in ESS.

CONCLUSIONS: Use of CPAP telemonitoring with automated feedback messaging improved 90 day adherence in patients with OSA. Telemedicine based education did not significantly improve CPAP adherence but did increase clinic attendance for OSA evaluation.
CONCLUSIONS

1. Presented the key components of the successful telemedicine program
2. Discussed how to Integrate physician extenders into a clinical sleep medicine practice and
3. Reveiwed the expansion of the advanced sleep medicine practice into the rural community
CONTACT INFORMATION

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