Table 2: Overview of the reviewed sources

Authors and Year	Disease(s)	% White with Disease Among Disease Population	% Black with Disease Among Disease Population	% Hispanic with Disease Among Disease Population	% Asian with Disease Among Disease Population	% Other with Disease Among Disease Population	% Female with Disease Among Disease Population
Acosta, et al (2021)	Hypertension	56.67	24.02	15.96	1.75	1.60	57.9
	Hyperlipidemia	65.74	16.10	14.29	2.24	1.63	23.5
	Type II DM	46.40	26.91	22.81	2.06	1.81	57.4
	Ever Smoker	59.84	23.16	13.90	1.24	1.85	55.2
Renedo, et al (2021)	Carotid Stenosis	68.53	17.27	10.89	1.68	1.62	54.6
Clark, et al (2021)	Obesity	44.51	27.74	23.75	--	3.99	66.2
Chandler, et al (2021)	Hypertension	49.80	28.10	16.30	1.60	4.20	59.2
Leasure, et al (2021)	Lichen planus	62.01	23.09	12.27	2.64	--	76.4
Lee, et al (2022)	Openangle glaucoma	45.89	30.09	18.40	2.60	3.03	56.1
Karnes, et al (2021)	Obesity	Women = 0.36* Men = 0.33*	Women= 0.59* Men = 0.32*	Women= 0.49* Men= 0.40*	Women = 0.13* Men= 0.17*	--	--
Leasure, et al (2021)	Stroke	61.80	22.10	12.10	1.35	2.65	--
Demarais, et al (2022)	Stroke Survivors	--	Overall Health: 0.45 (0.74- 0.90)	Overall Health: 0.81 (0.51- 1.27)	Overall Health: 0.88 (0.54- 1.30)	--	--
Gong, et al (2021)	ASCVD risk	--	61.38	38.62			
McDermott IV, et al (2022)	BRVO=380 (crude cases)	212	90	70	<20*	66	204
	CRVO=311 (crude cases)	165	74	60	<20*	65	170
Alonso, et al (2021)	DM	56.28	39.04	2.23	2.44	--	--
	HF	58.61	38.21	1.76	1.43	--	--
	CHD	70.53	25.95	1.67	1.84	--	--
	Stroke	58.09	34.11	3.90	3.90	--	--
	PAF cases	83.22	14.00	1.18	1.60	--	45.1
	IAF cases	76.96	12.57	5.24	5.24	--	44.5
McDermott IV, et al (2021)	Retinal vein occlusions	46.33	25.67	24.33	3.67	--	58.7

Abbreviations: DM- Diabetes Mellitus; ASCVD- Atherosclerotic cardiovascular disease; BRVO - Branch Retinal Vein Occlusion; CRVO- Central retinal vein occlusion; HF- Heart failure; CHD- coronary artery disease; PAF- Prevalent atrial fibrillation; IAF- Incident atrial fibrillation. * = Prevalence of Obesity

participants self-identified as Black and female. Our project highlights the need for investing in precision medicine projects with focused enrollment and data collection of under-represented groups in medicine.

RURAL TELESURGERY NETWORK CHARACTERIZATION FOR FUTURE REMOTE CARDIAC CATHETER ABLATION

Harini Balasubramaniyam; Blake Hannaford; Ryan james; Wayne Monsky and Stephen P. Seslar

Background: Telesurgery involves a remote surgeon operating on a patient over distance using the internet to control a surgical robot. Telesurgery could allow rural patients more equitable access to lifesaving specialty procedures such as cardiac catheter ablation. Advances in telehealth adoption and surgical robotics are lowering the conceptual and technical hurdles for this future method of healthcare delivery. Despite this, important questions remain regarding the safe implementation of telesurgery in rural community hospitals. In particular, it is critical to understand the spatial, temporal, and content dependent variations in network performance between urban and rural hospitals. Presently, no one has meaningfully characterized internet performance for telesurgical procedures in rural areas.

Objective: The purpose of this research is to measure real-world internet performance and characterize the risk and severity of network disruptions during simulated telesurgeries between urban and rural hospitals over a long duration.

Methods: We developed a python application to generate and receive simulated telesurgery data between an urban center and small servers that are physically located in rural hospital operating rooms (Figure 1). Simulated telesurgeries were performed daily and nightly for 90min at approximately 2 packets per second.

Results: The packet latency distribution for 108 simulated surgeries (54 daytime; 54 nighttime) is shown in Figure 2. We found that 99.99% of the packets had a network latency of less than 250ms and only 10% of operations had at one or more packets delayed by 250ms or more.

Conclusion: Our preliminary assessment of network performance in urban-rural simulated telesurgery show acceptable latencies, though rare significant delays occur. We have recently expanded the network to include 3 additional rural hospitals (Figure 1). These ongoing studies will inform future telesurgical system design for safe and effective remote operations.
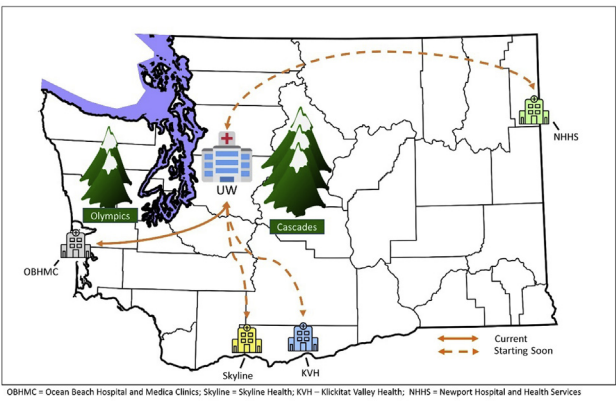

OBHMC = Ocean Beach Hospital and Medica Clinics; Skyline = Skyline Health; KVH – Klickitat Valley Health; NHHS = Newport Hospital and Health Services

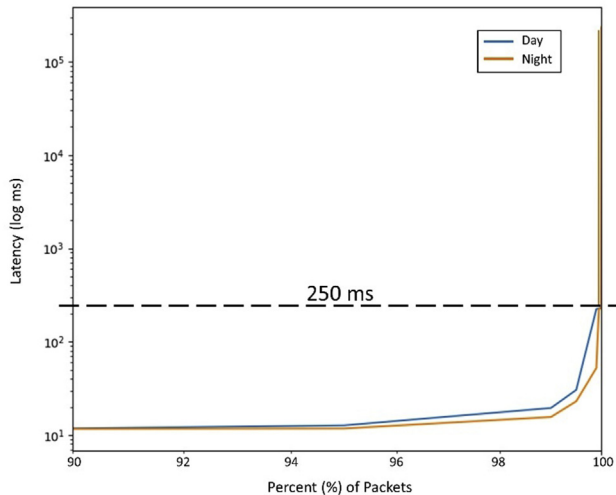Figure 1. Evolving telesurgery research network in Washington State

Figure 2. Network latency vs. percent of packets for all simulated telesurgeries

HEALTH DATA: ACQUISITION AND MANAGEMENT

SATURDAY, SEPTEMBER 10
FROM 10:30 AM-12:00 PM

A CHEST-MOUNTED ACCELEROMETER FOR ESTIMATION OF CARDIORESPIRATORY FITNESS

Samuel E.M. Schmidt; Mikkel T. Hansen; Kasper Sørensen; Tue Rømer; Lasse Gliemann; Dan S. Karbing; Mathias K. Poulsen; Jørn W. Helge and Peter Søgaard

Background: Maximal oxygen consumption (VO2max) is a measure of Cardiorespiratory fitness (CRF) and a strong predictor of cardiovascular health. Quantifying CRF by cardiopulmonary exercise (CPX) is complex and unsuitable in most clinical settings. The Seismofit® System (VentriJect ApS, DK) is a novel sensor, for non-exercise estimation of VO2max using seismocardiography (SCG). SCG is the measurement of precordial vibrations using an accelerometer.

Methods: The Seismofit® System includes an ultra-sensitive accelerometer sensor that is adhered to the lower sternum to record the SCG signal, an app for user control and data transmission, and a cloud-based machine learning algorithm for estimation of VO2max. The sensor records 40 seconds of SCG,

while the subject is resting. The machine learning algorithm estimates VO2max from SCG morphology and demographic data (Age, Height, Weight and Sex). The algorithm was developed and validated in 549 recordings from 398 subjects without known cardiac conditions undergoing ergometer CPX testing. 300 subjects were included in the training set and 98 in the test-set. Reproducibility was estimated in 20 subjects with repeated measurements across several days within 2 weeks. The total time of data transmission and processing is approximately 30 seconds depending on the internet connection.

Results: The Seismofit® System estimates VO2max in resting subjects, in approximately 70 seconds. In 98 test-set subjects, the SCG VO2max algorithm had a correlation to CPX VO2max at r=0.87 and a mean average percentage error (MAPE) at 9.1%. Day-to-day variation measured as the within-subjects-standard-deviation was 1.4 ml/min/kg for SCG-VO2max corresponding to a coefficient of variation at 3.1%.

Conclusion: The Seismofit® System is a novel, fast and easy-to-use method for estimation of VO2max, with clinically relevant accuracy and reproducibility. This makes SCG-VO2max a potent tool for point-of-care estimation of CRF.
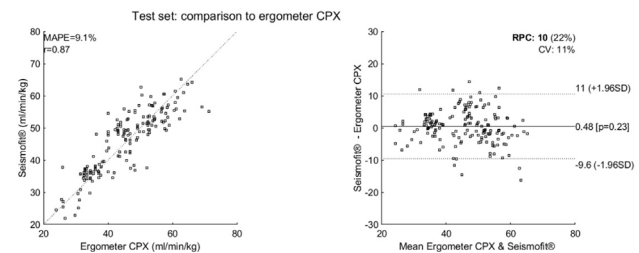
THE REALITY OF INTEGRATING VIRTUAL REALITY (VR) TO ENHANCE PATIENT'S AF ABLATION EDUCATION

Aimee Lee; Crystaljade Lau and Linda K. Ottoboni

Atrial fibrillation (AF) is an epidemic and catheter ablation (CA) is a widely used treatment modality. AF is independently associated with increased mortality, risk of stroke and HF. The risks are magnified post ablation with CA-specific risks of cardiac tamponade, PV stenosis and esophageal injury. Guideline-adherent AF therapy has been shown to improve outcomes and guidelines underscore the importance of AF education in providing comprehensive care. Patients traditionally receive their post-CA education through verbal instruction and pamphlets. These one-way communication methods may be ineffective because of poor recall, patient health literacy and time constraints. Virtual reality (VR) is a new medium for providing education using a computer-generated three-dimensional (3D) experience. Patient exposed to VR experiential learning have shown increased understanding, perception and assimilation of the information they are given. One retrospective study aimed to evaluate the effectiveness of the 3D education on the consequences of AF and stroke prevention. The study concluded that 3D is an effective tool in transferring knowledge about AF and the role of OAC in stroke prevention. We hypothesized that use of VR to provide education prior to ablation will increase patient engagement knowledge score and improved outcomes. RCT study design was proposed with consecutive patients pre-AF CA invited to participate to receive either the VR-based or usual care pre-operative education. Pre-post test scores of the Jessa Atrial Fibrillation Knowledge Questionnaire and Patient Activation Score will be used. Current options for delivering VR include single use or complex VR system. Both options require content development for digital delivery which requires substantial investment. Our plan was derailed due to costs and lack of funding resources. Future education could be optimized with the addition of VR, but cost remains a huge obstacle in its realization and implementation.

DEVELOPMENT OF AN ATRIAL FIBRILLATION DETECTION ALGORITHM FOR ECG COLLECTED WITH TEXTILE GARMENT

Arezoo Karimizadeh; Muammar Kabir; Sourav Mukhopadhyay; Bastien Moineau and Amin Mahnam

Background: Atrial fibrillation (AF) is a common arrhythmia related to increased mortality, strokes and heart failure. AF is typically diagnosed using ECG recorded with adhesive gel electrodes, which can irritate the skin in long recording. Garments with textile electrodes are a comfortable alternative for long term ECG monitoring.

Objective: To develop and evaluate an algorithm for continuous monitoring and automatic detection of AF using ECG recording garments.

Methods: The proposed AF detection from textile ECG includes 3 steps: (1) R-peak detection using a proprietary algorithm previously developed and validated for textile ECG; (2) Signal quality classification (clean/noisy ECG segments) to exclude expected noise and motion artifacts with a threshold on the ratio [maximum slope in between R-peak regions]/[maximum slope of the corresponding R-peaks]; and (3) Classification of AF and non-AF based on the Shannon Entropy of the processed RR sequence (using an optimized threshold) of the clean ECG segments (with optimized segment length). Initial development and testing of the AF detection algorithm was performed using public databases. The MIT-AFIB public database was used to optimize the segment length and entropy threshold to discriminate between AF and non-AF segments. Final testing was done with ECG recorded from Skiin Undergarment (Myant Inc, Canada) in 84 participants and labeled by a cardiologist in an REB-approved study (PACE cardiology, Canada).

Results: The optimal parameters for this AF detection method are a segment duration of 55 sec and an entropy threshold of 0.95. The sensitivity and specificity of AF detection for each database used in this study was above 91% as detailed in Table 1.

Figure1: Device providing textile ECG and structure of the proposed AF detection method