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**Technological Advances and Emerging Strategies for Treatment-
Related Symptoms During Cancer Survivorship:**

Case panel discussion and interactive presentations

Alex Chan, PharmD, MPH

Vice Chair, Neurological Complications



Case Study #1

- A.K. is a 38-year-old female who is newly diagnosed with ER+, PR- and HER2- Stage 2 breast cancer.
- After lumpectomy, she was given 4 cycles of chemotherapy, consisting of doxorubicin and cyclophosphamide. This is followed by 6 weeks of adjuvant radiation and 5 years of tamoxifen.
- A.K. lives in a rural area → can telehealth improve her survivorship care?



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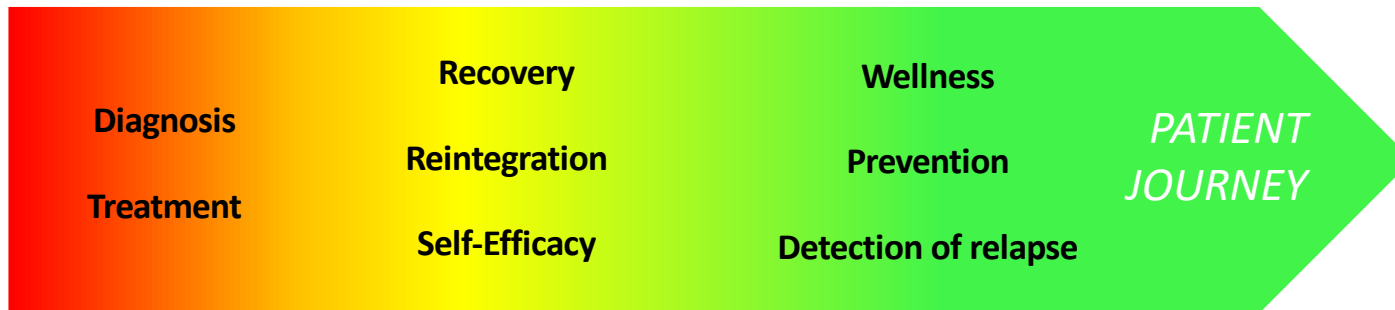
Road to Survivorship



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From acute care, to rehabilitation, to health promotion in the community



Improving access to survivorship care through Telehealth: A pilot project

Dori L. Klemanski, DNP, APRN-BC

Cancer Support Services

The Ohio State University Comprehensive Cancer Center – The James



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Collaborators:

Denise Schimming, MS, APRN-BC

Maryam Lustberg, MD, MPH

The James



Summary of Research

- Coordination of care and communication with patients and health care providers can be improved at end of acute treatment
- Use of telehealth for cancer survivorship care is an emerging concept to reduce barriers to treatment summary and survivorship care plan (TS/SCP) delivery

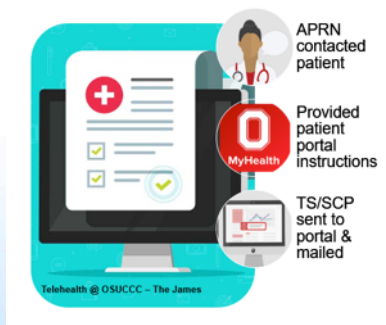
	Telehealth Visit (n=30)	Clinic Visit (n=11)	Declined (n=17)
<i>Gender</i>			
Female	9	3	4
Male	21	8	13
<i>Age (years)</i>	63	60	59
<i>Cancer diagnosis</i>			
Bladder	8	9	6
Ductal Carcinoma <i>in situ</i>	2	0	0
Prostate	10	0	1
Renal	7	0	9
Testicular	1	0	0
Thyroid	1	2	1
Urethral	1	0	0
<i>Distance traveled</i>			
Local	17	7	8
≥50 miles	13	4	9



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Significance

- Survivorship care plan delivery via telehealth is feasible
 - Improve access to care
 - Improve care coordination
 - Reduce barriers for cancer survivors



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Next Steps

- The pilot identified the need to
 - improve workflow patterns to identify appropriate patients for telehealth
 - provide access to the mobile app with the patient portal prior to telehealth visit
 - develop reimbursement strategies for TS/SCP delivery, specifically using telehealth
- Telehealth initiatives in survivorship care delivery can be an important focus area in the upcoming White Paper that we can discuss as a group



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Case Study #2

- You are an integral member of the supportive care team at your cancer center.
- The team is coming up an information leaflet together that would summarize the benefits of exercise during chemotherapy and survivorship.
- Should wearable devices be recommended to all cancer patients and survivors for monitoring their physical activity levels?



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A Comparison of Adherence to Activity Trackers and Physical Activity Levels among Adolescent and Young Adult (AYA) Cancer Patients and Healthy Controls: A Prospective, Longitudinal Study

Dr Chiu Chin Ng
Department of Pharmacy
Faculty of Science
National University of Singapore

Collaborators: Hui Lee, Angie Hui Ling Yeo, Yi Long Toh, Chia Jie Tan,
A/Prof Alexandre Chan



Summary of Research

- This is an ongoing prospective, longitudinal clinical study. (ClinicalTrials.gov Identifier: NCT03476070)
- Preliminary analysis of Fitbit® data in AYA cancer patients and healthy controls.



	Cancer Patients (n=17)	Healthy Controls (n=10)	p-value
1. Feasibility assessment	47.20%	92.60%	-
2. Physical activity assessment			
Daily Step Count			
Mean ± SD	5638 ± 3155	12831 ± 5896	0.004 *
Weekly time spent in different activity intensities (min/week)			
Light activity (mean ± SD)	747.6 ± 430.6	1404.8 ± 753.6	0.008*
Moderate activity (mean ± SD)	55.4 ± 35.6	180.8 ± 200.2	0.08
Vigorous activity (mean ± SD)	46.2 ± 39.0	163.1 ± 185.1	0.08
Daily energy expenditure (kcal/day)			
Mean ± SD	492.4 ± 190.9	958.4 ± 391.1	0.004*



Significance

- In general, cancer patients are less engaged to physical activity (PA) compared to healthy controls.
- Activity trackers can be useful tools for measuring and remotely tracking PA progress in cancer patients through treatment and survivorship.
- Increased PA has been linked to reduced risk of cancer recurrence, improved symptom management and quality of life, and prolonged overall survival.



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Next Steps

- Future studies should develop ideal exercise prescriptions for reducing cancer-related and treatment-related symptoms, and improving quality of life for survivors.
- Exercise interventions utilizing activity trackers are a feasible and cost-effective method to increase exercise engagement within the cancer population.



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Efficacy and Safety of mHealth Application and Wearable Device in Physical Performance for Patients with Hepatocellular Carcinoma

Department of PM&R, Samsung Medical Center
Sungkyunkwan University School of Medicine, Seoul, South Korea

Yoon Kim, Jin Serk Seo, So Yeon An, Dong Hyun Sinn, **Ji Hye Hwang**



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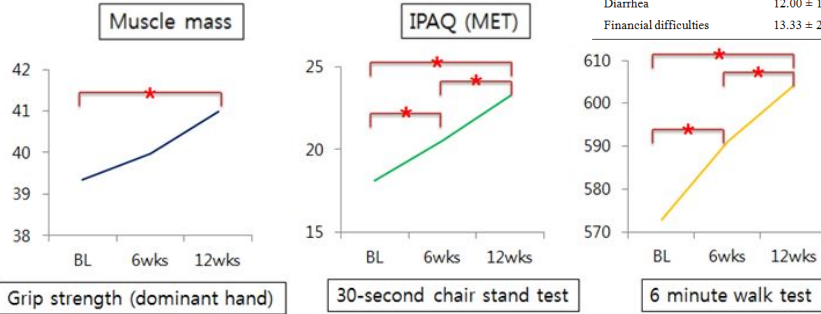
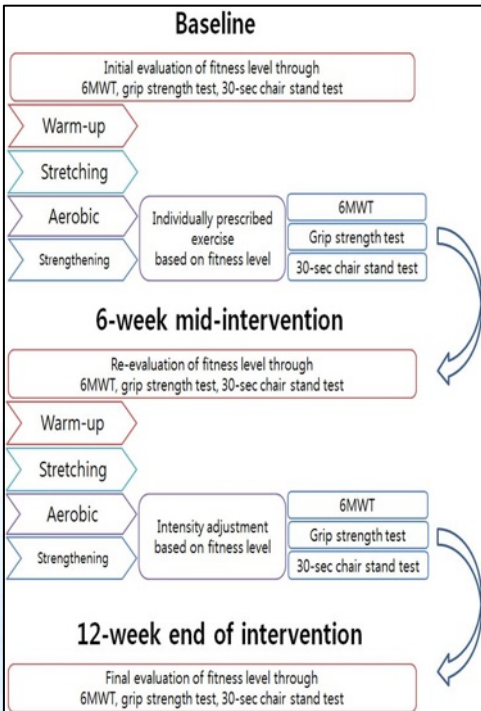
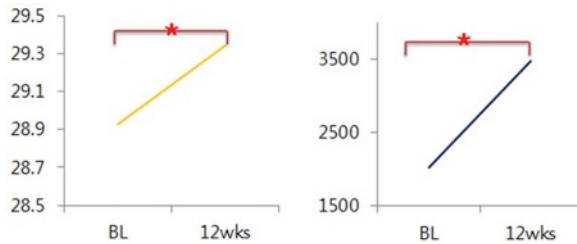
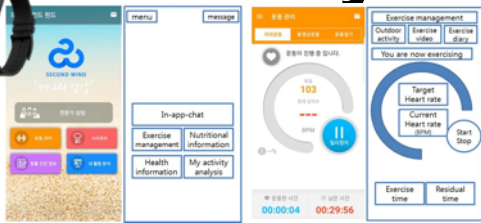
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Summary of Research



- It is **safe and effective for compensated HCC patients** who have completed anti-cancer therapy to undergo **12 weeks of individually prescribed rehabilitation exercises** using our **mHealth application and interconnected IoT wearable device**.
 - No complication or biochemical deterioration (surveillance with wearable IoT device, real-time communication chat service)
 - Significant change in the physical fitness measures (grip strength, 30-second chair stand test, 6MWT), body composition (muscle mass), self-reported amount of physical activity (IPAQ), and pain.
- **1st study** to use mHealth application & interconnected IoT device for individually prescribed rehabilitation exercises in compensated HCC patients after therapy.

EORTC-QLQ-C30*	Baseline	12 weeks	P value
Global health status / QoL[†]			
Global health status / QoL	72.50 ± 17.52	74.44 ± 17.63	.428
Functional scales[‡]			
Physical functioning	85.77 ± 10.31	87.55 ± 11.30	.433
Role functioning	87.22 ± 13.62	89.44 ± 16.65	.380
Emotional functioning	84.16 ± 18.48	87.50 ± 12.90	.277
Cognitive functioning	80.55 ± 13.19	86.11 ± 11.64	.057
Social functioning	85.55 ± 24.65	93.33 ± 12.06	.075
Symptom scales/single items[‡]			
Fatigue	25.18 ± 12.69	23.33 ± 15.25	.475
Nausea and vomiting	2.22 ± 5.76	2.17 ± 6.31	.662
Pain	10.55 ± 14.17	6.11 ± 11.14	.043
Dyspnea	22.22 ± 26.74	17.77 ± 24.34	.354
Insomnia	15.55 ± 22.71	14.44 ± 20.86	.801
Appetite loss	6.66 ± 16.14	5.55 ± 12.63	.712
Constipation	12.00 ± 17.83	11.11 ± 15.98	.801
Diarrhea	12.00 ± 17.83	11.11 ± 15.98	.712
Financial difficulties	13.33 ± 25.67	7.77 ± 16.80	.202



Significance

- Association of **cancer & exercise**
 - After diagnosis of some solid cancers : regular exercise resulted in more survival years & lower tumor recurrence rate
- Association of **liver disease & exercise**
 - **HCC**: Taiwanese cohort study(2012), NIH confirmation study(2013): [degree of physical activity correlated with a decline in HCC risk.](#)
- Previous studies of **exercise after diagnosed of HCC**:

	Our study	Kaibori et al.	Koya et al.
Participants	Compensated HCC patients after cancer Tx	Compensated HCC patients /c chronic hepatitis or LC, hepatectomy	Compensated HCC patients (1 day post HCC Tx-TACE, sorafenib, CTx)
Intervention period	12wks	1m preop~6m postop	median 7.5days
Ex. protocol	Stretching ex Aerobic ex Strengthening ex	Stretching ex Aerobic ex	Stretching ex Strengthening ex Balance ex (only L/Ex)
Individualized ex	Y	Y	N
Place of ex.	Outside hospital	In hospital	In hospital
monitor	Mhealth program	Ex. trainer	PT (cancer rehab certified)
Ex. adjustment	Y	Y	N (not individualized)

Kaibori M, Ishizaki M, Matsui K, Nakatake R, Yoshiuchi S, Kimura Y, et al. Perioperative exercise for chronic liver injury patients with hepatocellular carcinoma undergoing hepatectomy. Am J Surg 2013 Aug;206(2):202-9
 Koya S, Kawaguchi T, Hashida R, Goto E, Matsuse H, Saito H, et al. Effects of in-hospital exercise on liver function, physical ability, and muscle mass during treatment of hepatoma in patients with chronic liver disease. Hepatol Res 2017 Mar;47(3):E22-e34

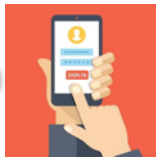
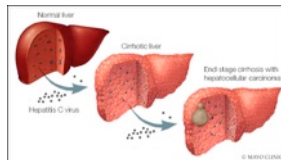


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Next Steps



Needs of HCC survivors

Our unpublished study

Low level of health-related QOL

Physical activity: minimally
active

80.7%: had need for exercise

-> 30.0% exercised regularly

-> 48.3% not exercise at all for
nonmedical reasons

m/c reason: ambiguous fear of
developing **hepatic
decompensation**

To meet the needs of HCC survivors:

1. **Technological advancement** of mhealth
 - Advanced monitoring technology
 - Advanced tailored exercise program
2. **Well-designed clinical studies** of mhealth
 - RCT
 - HCC survivors with diverse medical condition
 - Larger sample size
3. **Universal agreement** of medical professionals on efficacy of mhealth
4. **Patient education** (value of mhealth)



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National Institute on Minority Health and Health Disparities



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Collaborators

Jasmine Santoyo-Olsson, MS

Liliana Chacón, BS

Anita L. Stewart, PhD

Niharika Dixit, MD

Carmen Ortíz, PhD



Summary of Research

- 2-month feasibility study of Spanish-language mobile app+integrated Fitbit+telephone coaching program with Spanish-speaking breast cancer survivors (n=23; 57% < 6th grade); pre-post assessments
- Aim: culturally appropriate survivorship care planning/support to
 - ↓ fatigue and health distress
 - ↑ knowledge & self-efficacy for managing cancer and walking
- Results:
 - Fatigue ($P = .02$), health distress decreased ($P < .01$); knowledge of needed follow-up care/resources increased ($P = .03$)
 - Avg daily steps increased by 1,311 ($P = .02$); used app 4-6 times/wk



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Significance

- Short-term interventions combining mobile app, Fitbit, and telephone coaching could:
 - reduce fatigue & distress
 - improve knowledge of recommended follow-up care and resources
 - increase walking
- Increased reach to vulnerable populations



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Next Steps

- Need to identify who is best suited for app approach; some required intensive personal assistance to use app
- Need RCT
- HIT offers potential to address ongoing psychosocial, informational and symptom management needs even in vulnerable groups, if tailored to population



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Panel Discussion

