(MP61-06) The role of wearable devices and CPET in predicting major complications after radical cystectomy

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Background & Introduction

- Fitness trackers have gained popularity for use in healthcare
- As part of the intracorporeal Robotic vs Open Cystectomy (iROC) trial, 340 patients will be prospectively recruited in various high volume centres in the UK.
- CPET is used to risk-stratify patients undergoing radical cystectomy in participating centres
- There is some evidence that daily step-counts could be a surrogate for performance status

Aims & Objectives

- The aim of this study is to assess step-count data from a wrist worn device in assessing patient fitness prior to radical cystectomy
- Objectives:
  - To compare CPET variables with step-count data to explore associations
  - To assess if CPET and step-count data can predict post-operative major complications (CD≥3)

Methods

- At baseline, patients consented for the iROC trial were approached to wear a fitness tracker (Misfit Shine 2) for 7 consecutive days and daily step counts collected
- At baseline, patients also underwent a CPET
- anaerobic threshold (AT) <11 or VE/VCO2 ≥33 were used as used as predictors for high risk of complications
- Patients were divided into two groups: Clavien-Dindo major (CD) ≥3 or minor (≤2) within 90 days.
- Spearman Rho was used to explore associations between non-parametrically distributed variables.
- Groups were compared using Mann-Whitney-U for non-parametrically distributed variables.
- A log transformation was performed prior to logistic regression analysis.

Results

Comparison with CPET variables

- 57 patients participated in the WD sub-study.
- 10 (17.5%) patients had major complications in the post-operative 90 days.
- Median step-counts of 8,626 (IQR: 6,561-12,358) were noted in patients pre-operatively.
- Step-counts at baseline correlated significantly with both AT and VE/VCO2 (p=0.002 and p=0.0005).
- Combined risk using either AT or VE/VCO2 correlated most significantly, with z= -4.01 and p=0.00006

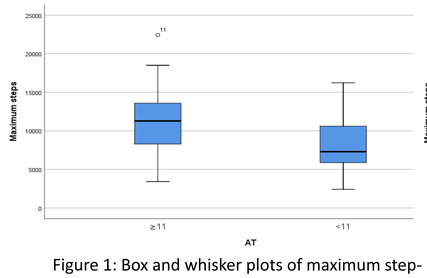

Figure 1: Box and whisker plots of maximum step-count (MSC) for patients risk-stratified by anaerobic threshold (AT) over <11 as high risk

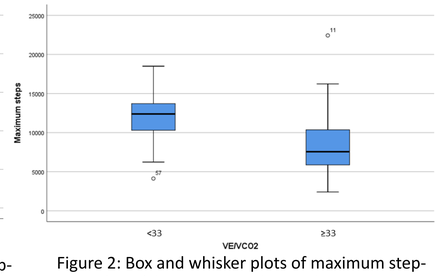

Figure 2: Box and whisker plots of maximum step-count (MSC) for patients risk-stratified by VE/VCO2≥33 as high risk

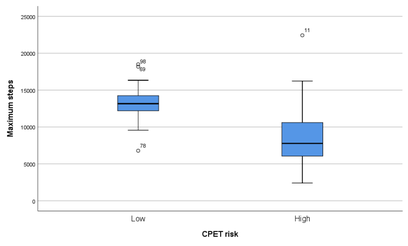

Figure 3: Box and whisker plots of maximum step-count (MSC) for patients with a combined high CPET risk (VE/VCO2≥33 or AT<11)

	AT risk	VE/VCO_2 risk	CPET combined risk
Mann-Whitney U	300	245.5	108.5
Wilcoxon W	966	1373.5	1486.5
Z	-3.09	-3.50	-4.01
Asymp. Sig. (2-tailed)	0.001996	0.000472	0.000061

Table 1: Mann-Whitney U test for maximum steps in patients considered high risk of complications by AT(<11), VE/VCO2(≥33) and CPET combined (AT<11 or VE/VCO2≥33).

Grouping by complications

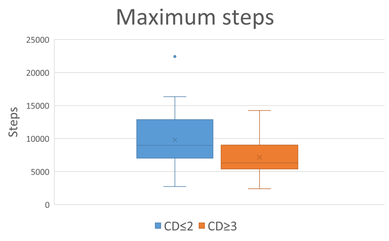

Figure 4: Baseline average step-count and maximum step-count for patients who went on to have none or minor complications (CD≤2) or major complications (CD≥3).

- From the daily step-count data, maximum steps (MS) were computed
- Baseline data for NAC status, age, BMI and ECOG were collected

Results

- Mann-Whitney U test showed that grouping patients by have none or minor complications (CD≤2) or major complications (CD≥3), maximum step counts (MSC) were significantly different in the two groups (z = 2.161, p = 0.031). Box and whisker plot shown in Figure 4.

Variable	B	S.E	p	O.R.
MSC	-3.7	1.819	0.042	0.025 (0.001-0.874)
CPET risk	0.087	0.793	0.913	1.091 (0.231-5.161)
NAC	0.388	0.699	0.579	1.474 (0.375-5.797)
Age	0.060	0.047	0.201	1.062 (0.968-1.165)
BMI	0.026	0.019	0.166	1.026 (0.989-1.065)
ECOG	0.557	0.354	0.116	1.746 (0.872-3.495)

MSC = Maximum step-count, CPET = Cardiopulmonary Exercise Testing, NAC = Neoadjuvant chemotherapy, BMI = Body Mass Index, ECOG = Eastern Cooperative Oncology Group performance status

Table 2: Binary logistic regression for baseline variables in predicting 90-day major complications (CD≥3)

- Due to the low event rate for CD≥3 complications (n=10), univariate logistic regression was performed
- Of the baseline variables, only step-counts predicted major complications (p = 0.042, OR 0.025)

Conclusions

- Wearable devices are easy to use and well-accepted by patients
- They can provide real-time snapshots of patients' health status
- While the sample size is limited, step-count data from fitness trackers correlate well with CPET variables, and outperform CPET and other baseline measures of physical fitness in predicting major complications following RC

→ The iROC trial will recruit 340 patients, and step-counts will be collected on all patients to analyse this relationship in a larger cohort

Acknowledgements

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