Multi-domain quantitative recovery following Radical Cystectomy for patients within the iROC (Robot Assisted Radical Cystectomy with intracorporeal urinary diversion versus Open Radical Cystectomy) Randomised Controlled Trial: The first 30 patients

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Conflicts of Interest

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Take Home Message

We analysed recovery after radical cystectomy using multiple domains reflecting mobilisation (steps per day), exercise capacity (chair to stand), disability, HRQOL and health economics. We found most patients recovered most of their physical capacity by 12 weeks of surgery.

Tweet

Activity trackers help measure recovery after major surgery

Letter

Many patients develop complications after Radical cystectomy (RC) [1]. Reductions in morbidity have occurred through centralization, technical improvements [2] and perhaps through Robot-assisted RC (RARC). Whilst RARC is gaining popularity, there are concerns about oncological safety [3], extra-corporeal reconstruction [4] and RCTs find little difference [5]. We are conducting a prospective RCT comparing open RC and RARC with mandated intra-corporeal reconstruction (iROC [6]). Within this trial we quantify recovery using multiple domains: personal activity trackers, the 30 second Chair Stand Test (CST30), and qualitative questionnaires of disability (WHODAS 2.0), HRQOL (EORTC QLQ-C30 and QLQ-BLM30 [6]) and health economics (EQ-5D-5L).

Given that little is known of these tools in this setting, we included an internal analysis when the first 30 patients reached the primary outcome (90 days after RC). This was reached 209 days after the first recruitment and included 28/30 who underwent their allocated RC (supplementary figures, supplementary table 1). The average time to discharge was 11.0 days (st dev. ± 5.7), and following discharge 20/28 (71%) patients visited their GP or A&E, and 5/28 (18%) were readmitted to hospital. Within 90 days of surgery, the average duration out of healthcare was 76.6 ± 6.7 days. Post-operative complications were seen in 15/28 patients, including; Clavien-Dindo Grade 1 in 5/28, Grade 2 in 7/28 and grade 3a/3b in 3/28 (11%, supplementary tables). Baseline compliance varied from 22/28 (79%) for activity trackers,

24/28 (86%) for CST30, 27/28 (96%) for WHODAS 2.0, 27/28 (96%) for QLQ-C30, to 28/28 (100%) for EQ-5D-5L. The observed values (figure 1) matched the general population (e.g. average WHODAS 2.0 score (15%) was within 78% of general population, CTS30 (average 13) was similar to that for >65 year old males and >60 year old females [7]) or were slightly lower (age matched Canadian men and women walked 7,869 and 6,970/steps per day, respectively [8]). Compliance with activity trackers and CTS30 improved during recruitment as the trial staff became experienced with collection during the perioperative period.

Each measure deteriorated after surgery (figure 2). At day 5 (POD5) the average number of daily steps was 1840 ± 1348 (32±22% baseline) and CTS30 was 8.3±5.3 (62.0±38% baseline). Activities levels improved such that by week 5 walking reached 74±32% of the baseline (4294±2370 steps/day) and CTS30 reached 96±35% baseline (12±4.3/30 seconds). By week 12 many patients had returned to their baseline level of activity (average steps/day 6375±3246, 99±47% baseline and CTS30 13±5, 108±33%). Patient reported qualitative disability scores contrasted activity levels. At week 5, WHODAS 2.0 disability reached 26±22% (which was 2.9±3.3 fold higher than at baseline), before returning to pre-operative levels in most patients by week 12 (0.9±1.1 fold baseline). Changes in EQ-5D-5L scores rating 'health today'(Q6) and QLQ-C30 (Q29: overall health and Q30: QOL in past week) questionnaires mirrored activity levels with lower scores in week 5 (EQ-5D-5L 84±17%, QLQ-C30(Q29) 80±22% and QLQ-C30(Q30) 78±23% of baseline) that recovered to baseline by week 12 (93±17%, 98±16% and 93±16%, respectively). Patients seeking medical review after discharge (GP, A&E or hospital admission) averaged fewer daily steps at week 5 (medical review: 4069±2526 vs. no review: 4743±2132) and week 12 (5535±1786 vs. 6724±3703), and had lower absolute CTS30 numbers at the same times (week 5: 11.2±4.3 vs. 13.0±4.4 and week 12: 13.2±5.5 vs. 13.5±3.1), although the low sample size precluded meaningful statistical comparison. We hypothesised that multiple domains are needed to robustly measure recovery after RC and that accurate measurement will allow a meaningful comparison between open RC and RARC. Correlation of baseline data revealed no significant associations between measures of activity, qualitative disability or QOL data (Pearson correlation all $p>0.08$). Average daily steps was not correlated to CTS30 ($r=-0.08$, $p=0.7$ in 20 patients) and was closest to the QLQ-C30 domain reflecting QOL ($r=0.41$, $p=0.08$). In this small sample size,

one could hypothesise that daily steps reflect actual activity whilst CTS30 is a measure of lower limb strength and exercise capacity (which may not be used).

In conclusion, we report multi-domain measurements of recovery after RC. Our measures appear well tolerated by patients, are applicable to routine practice, are likely to be useful within our RCT and in the RC pathway.

Figure legends

Figure 1. Distribution of multi-domain measurements at recruitment (baseline).

Figure 2. Multi-domain measurements of RC recovery over the first 26 weeks after RC.

Supplementary figure 1. Recruitment within iROC. a). Consort diagram of iROC feasibility phase recruitment and b). histogram of length of stay and primary outcome measure (days alive out of hospital/healthcare).

Supplementary figure 2. Recruitment within iROC.

Supplementary Table 1. Patients and tumours within the iROC feasibility phase.

Supplementary table 2. Complications seen after surgery.

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Supplementary table 1. Patient features within the iROC feasibility phase.

	n	%
Sex		
Male	23	76.7%
Female	7	23.3%
Age		
Average ± st. dev.	67.9	± 11.7
>75	10	33.3%
ASA		
1	5	16.7%
2	12	40.0%
3	4	13.3%
Missing	9	30.0%
Reconstruction		
Ileal conduit	22	73.3%
Neobladder	5	16.7%
Missing	1	3.3%
BMI		
Average ± st. dev.	27.01	± 3.4

Supplementary table 2. Complications seen after surgery.

Patient	Grade of complication	Detail
2	Grade II	Systemic sepsis, ileus, blocked catheter
3	Grade II	Infection of unknown origin
6	Grade I	Wound - Hernia
7	Grade I	Gastrointestinal - ileus and emesis
8	Grade IIIb	Surgical - Incisional hernia. Small bowel obstruction
10	Grade II	Wound - Wound infection
11	Grade II	Genitourinary - Urosepsis and renal failure
13	Grade I	Gastrointestinal - Diarrhoea
19	Grade II	Cardiac - Arrhythmia
20	Grade I	Scrotal swelling. Anaemia not requiring transfusion
21	Grade IIIb	Obstructed common Bile Duct. Urinary infection.
26	Grade I	Gastrointestinal - Constipation
27	Grade IIIb	Cardiac - Myocardial infarction
31	Grade II	Ileus. TPN line.
34	Grade II	Oral Thrush

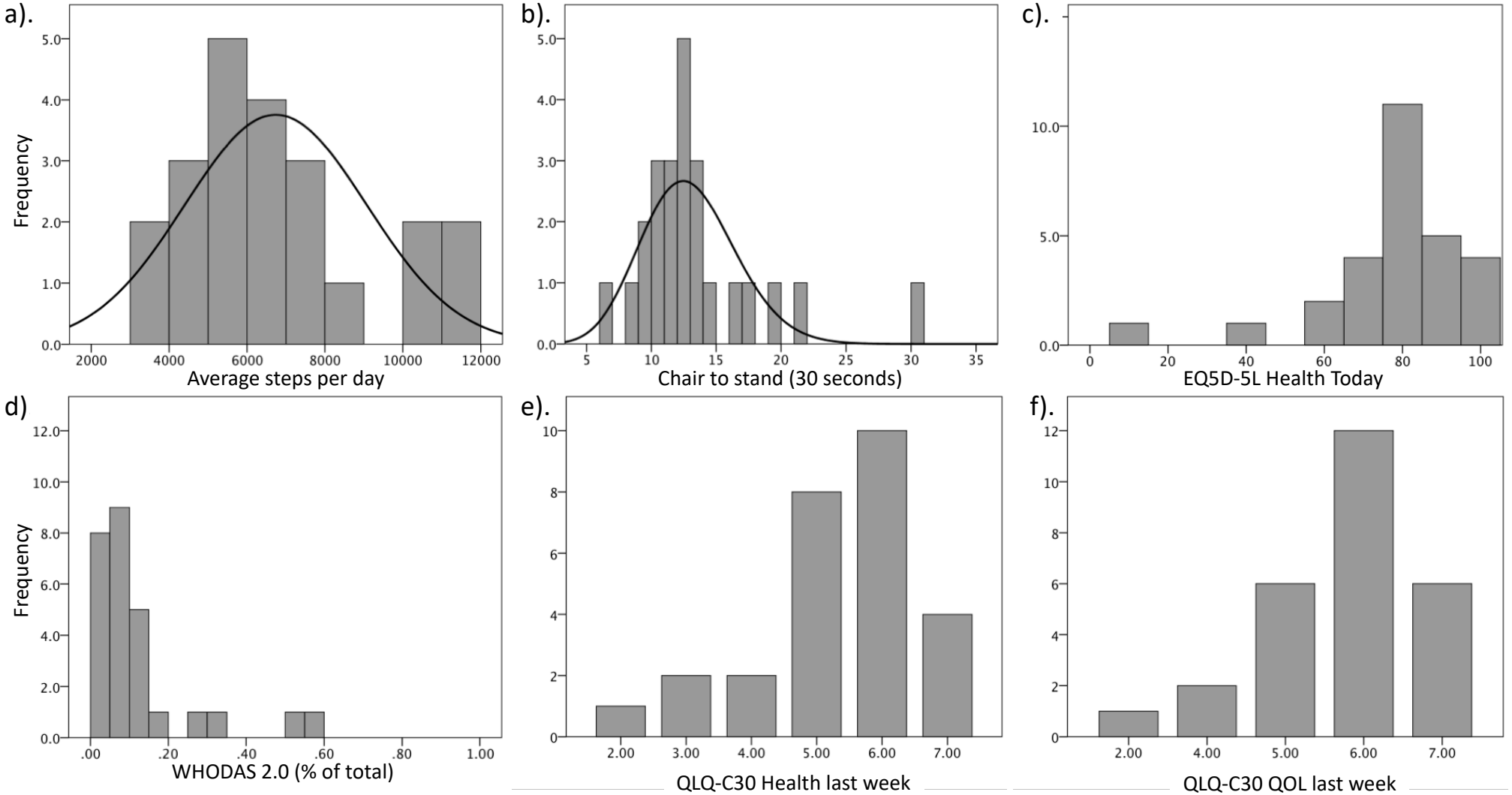


Figure 1. Baseline distribution of multimodal metrics in patients undergoing radical cystectomy.

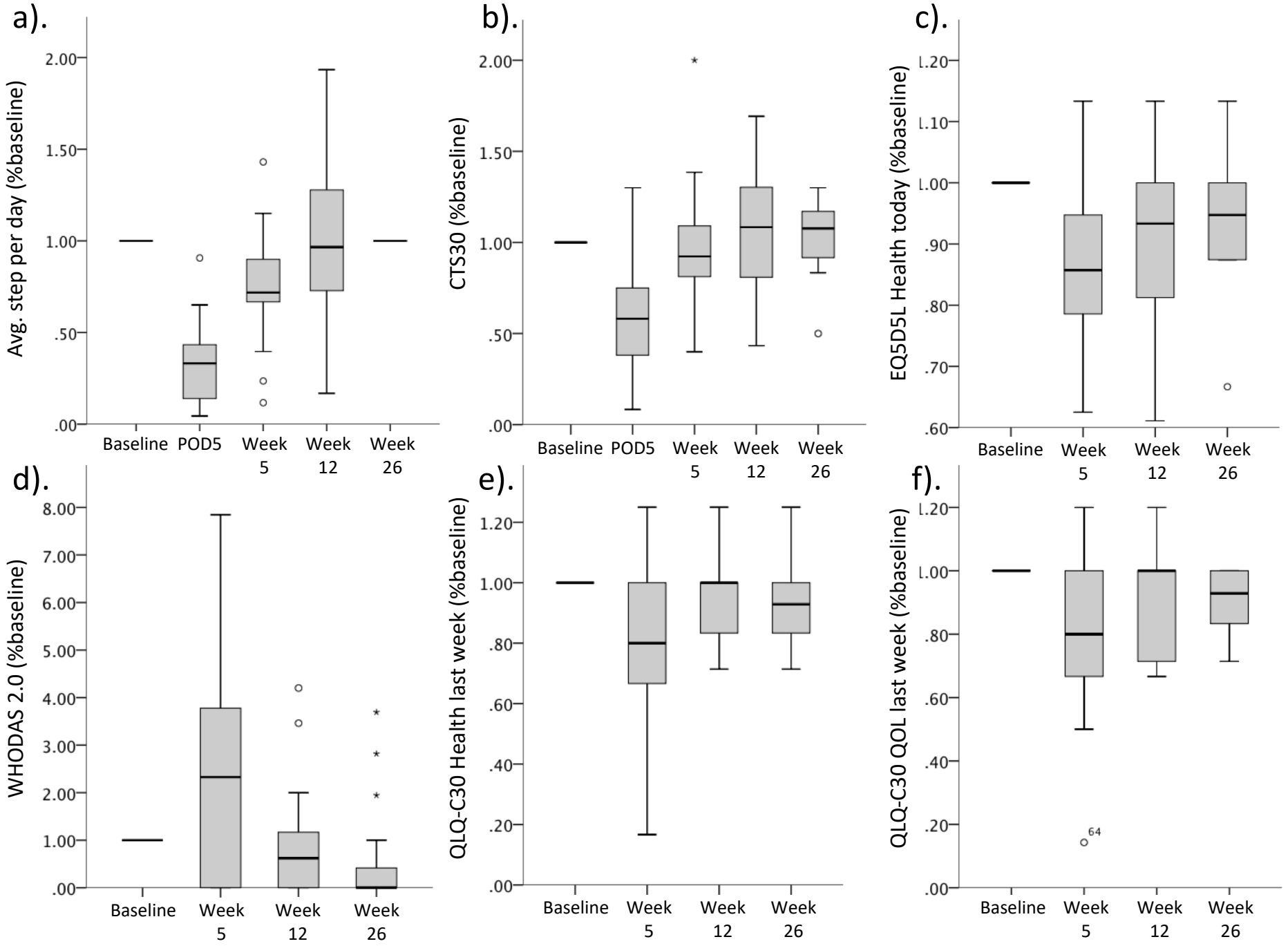
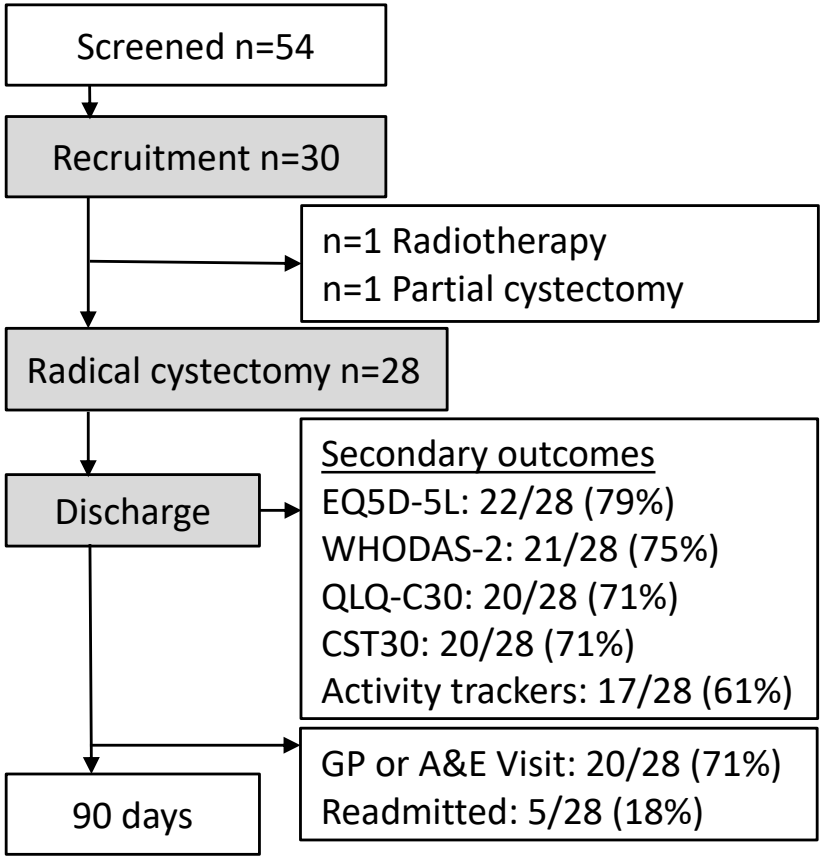
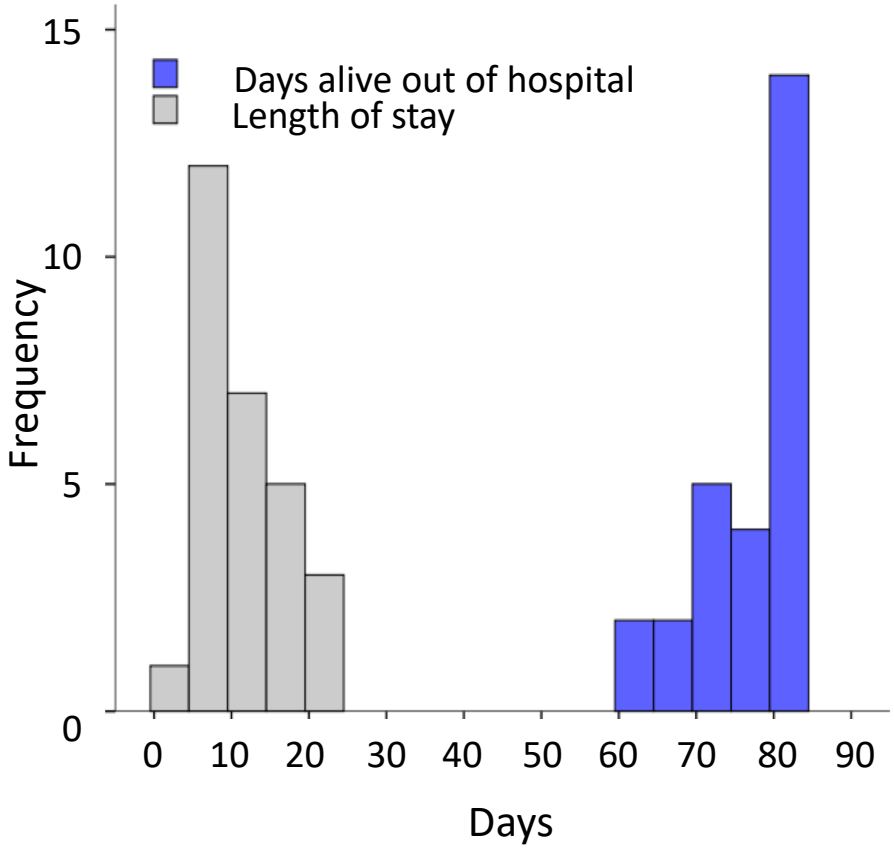


Figure 2. Changes in quantified activity levels, exercise capacity and patient reported disability and QOL during recovery from radical cystectomy.

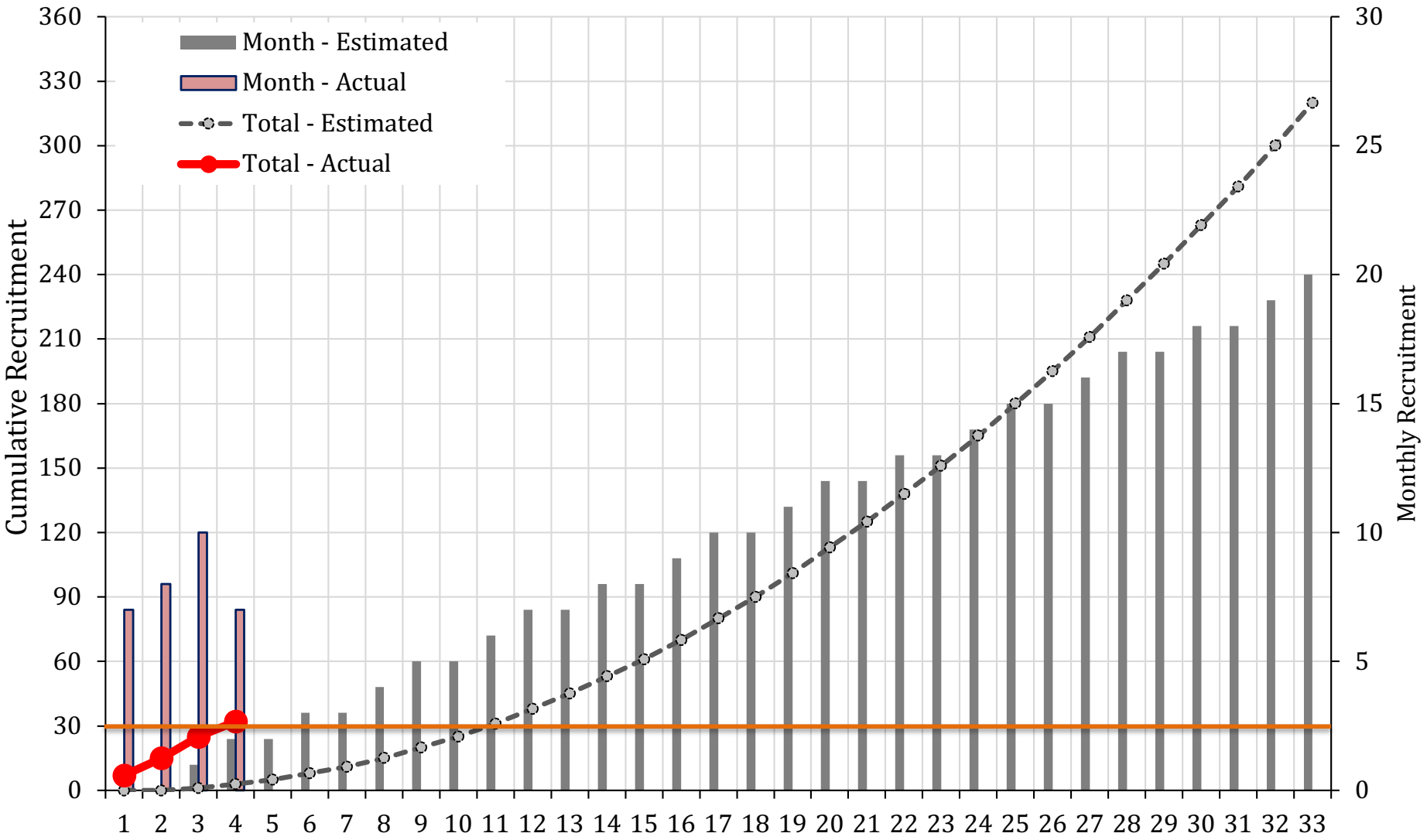
a). First 30 patients in iROC



b). Primary outcome for first 30 patients



Supplementary figure 1. a). Recruitment and collection of data within iROC. B). Primary outcome measure (Days alive and out of hospital) and Length of stay within iROC.



Supplementary figure 2. Actual (red) and estimated (grey) recruitment within iROC. The first 30 patient threshold is shown as an orange line.