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ORIGINAL ARTICLE

# Physical Activity, Quality of Life, and Nursing Workload in Colorectal Surgery

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## Abstract

Postoperative recovery depends on a complex interplay of patient-related factors of which mobility is an essential part. The aim of this study is to evaluate correlations between perioperative physical activity, quality of life, and postoperative nursing workload in colorectal surgery. A prospective study was used to assess footsteps, quality of life, and nursing workload. Number of footsteps was recorded from preoperative day 5 to postoperative day 3. Patients with reduced and good mobilization were compared, and the cut-off defined by the median daily preoperative footsteps. Quality of life was assessed by the Cleveland Global Quality of Life (CGQL). Nursing workload was calculated using the Project Research in Nursing (PRN) score. Statistical correlation was measured by use of the Pearson coefficient. Fifty patients were included. Mean age was 59 years, mean body mass index was 25 kg/m$^2$, and 68% of them were males. Demographics, surgical details, and clinical outcomes were comparable between the group of patients with poor mobilization compared to those with good mobilization. No correlation was found between pre- or post-operative footsteps and CGQL ($r = -0.072$, $p = 0.640$ and $r = -0.127$, $p = 0.407$), as well as between the number of pre- or post-operative footsteps and PRN ($r = 0.060$, $p = 0.687$ and $r = -0.095$, $p = 0531$). In conclusion, no correlation was found between the number of perioperative footsteps, quality of life, and nursing workload after colorectal surgery.

**Keywords** Physical activity · Quality of life · Nursing workload · Colorectal surgery

## Introduction

Health systems have to cope with a growing number of patients to be treated and therefore a constant increase in hospital activity. Thus, nurses are increasingly under pressure to do more with same resources. This workload adversely impacts patient outcomes, such as patient's experience, healthcare-acquired infections, postoperative complications, and mortality [1]. Nurse workload is defined as the level of effort required to complete a task in relation to the resources available to expend on that task [2]. When demands exceed available resources, an individual's performance deteriorates [1]. Furthermore, higher provider workloads have been found to pose a risk to patient safety in both medical and surgical settings [3].

Postoperative recovery depends on a complex interplay of factors related to the surgery, perioperative care, and the patient, such as psychological fitness, which is otherwise often neglected. Enhanced recovery after surgery pathways (ERAS) emphasized particularly on early postoperative mobilization, as it affects the ability to perform activities of daily living, return to work, and it helps to prevent complications. Furthermore, increasing adherence to enhanced recovery pathways including fostered mobilization was found to correlate with decreasing nursing time per patient and per day [4]. To better understand recovery after surgery, quality of life (QoL) has also become an important outcome measurement. Moreover, life satisfaction was shown to significantly impact the recovery process in a heterogeneous

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sample of patients [5]. Physical activity appears thus to be correlated with decreasing nursing workload and better QoL but it was not demonstrated yet.

The aim of this study was to examine the associations between perioperative physical activity, QoL, and postoperative nursing workload in colorectal surgery.

## Material and Methods

### Patients and Footsteps

This study assessed secondary outcomes of a prospective study which included a cohort of elective colorectal patients operated from June 2016 to September 2018 [6]. All patients were treated according to the ERAS protocol including routine control at 30 days after surgery [7]. Patients were paired with a connected wrist bracelets from preoperative day 5 to postoperative day 3. Patients with reduced and good mobilization were compared in terms of demographics, surgical details, and clinical outcomes. The cut-off to determine the type of mobilization was defined by the median daily preoperative footsteps.

### Quality of Life

QoL was assessed by the Cleveland Global Quality of Life (CGQL) at patient hospital discharge. The CGQL is a simple, valid, and reliable measure of QoL after surgery [8]. Patients were asked to rate three items (current QoL, current quality of health, and current energy level), each on a scale of 0 to 10 (0: worst; 10: best). The scores were added and the final CGQL utility score was obtained by dividing this result by 30.

### Nursing Workload

The nursing workload was calculated prospectively and in clinical routine using the Project Research in Nursing (PRN) score [9]. It is based on actions of care (factors) and the addition of the points of every factor determines the time of care required by each patient over 24 h; 1 point represents 5 min of nursing time. This instrument has been validated and used routinely to determine nursing care requirements [4].

### Statistical Analysis

Continuous variables were presented as mean (standard deviation, SD) or median (interquartile range, IQR) and compared with Student's $t$ or Mann–Whitney $U$ test as appropriate. Categorial variables were presented as frequencies (percentage) and compared with the Pearson's chi-square or Fisher's exact test as appropriate. Statistical correlation between footsteps, QoL, and nursing workload was measured by use of the Pearson correlation coefficient. Analysis was performed using SPSS 22.0 software (SPSS Inc., Chicago, IL).

## Results

A total of 50 colorectal patients were included. Mean age was 59 years (SD 18), mean body mass index was 25 kg/m$^2$ (SD 4), and 68% of them were males (Table 1). In terms of comorbidities, ASA scores I and II were present in 86% of patients and 56% had malignancy. The interventions were colectomies in 74% of cases and rectal resections in 14% of cases. The patients were operated in 88% of cases by laparoscopy.

Quality of life (CGQL) was not impacted by the mobilization (0.67 vs 0.64, $p=0.503$). There was also no difference between the 2 groups in terms of nursing workload (PRN 68 vs 62, $p=0.629$). The clinical outcomes were comparable between the group of patients with poor mobilization compared to those with good mobilization (Table 1).

Correlation between pre- and post-operative footsteps and CGQL was not significant ($r=-0.072$, $p=0.640$ and $r=-0.127$, $p=0.407$, respectively). No correlation was found either between the number of pre- or post-operative footsteps and PRN ($r=0.060$, $p=0.687$ and $r=-0.095$, $p=0531$, respectively, Figs. 1 and 2).

## Discussion

This prospective cohort study using connected bracelets allowed to quantify physical activity in the perioperative course of colorectal patients. In addition, postoperative quality of life and nursing workload were recorded. There were no differences between patients with low or good mobilization in terms of demographics, surgical details, and clinical outcomes. No significant correlation was found between the number of perioperative footsteps, quality of life, and nursing workload.

Correlations between health-related quality of life, preoperative physical activity, and postoperative recovery have been reported. Onerup et al. concluded that a higher self-reported preoperative physical activity level was associated with faster recovery after oncological colorectal surgery [10]. Thereby, assessment of preoperative physical activity may provide prognostic clinical information. In the present study, however, no correlation between preoperative physical activity and QoL was found. One hypothesis of these results is that physical activity was measured objectively using footsteps, while others used the self-reported level of preoperative physical activity,

**Table 1** Patient demographics, surgical details, and outcomes according to mobilization

| | Overall ($n=50$) | Low mobilization ($n=25$) | Good mobilization ($n=25$) | $p$ value |
|---|---|---|---|---|
| Age (years) (mean, SD) | 59 (18) | 62 (21) | 55 (15) | 0.197 |
| BMI (kg/m$^2$) (mean, SD) | 25 (4) | 25 (5) | 26 (4) | 0.464 |
| Gender (M:F) | 34:16 | 18:7 | 16:9 | 0.762 |
| ASA score (I–II: III–IV) | 43:7 | 21:4 | 22:3 | 1.000 |
| Surgical procedure ($n$ (%)) | | | | 0.217 |
| Colon | 37 (74) | 20 (80) | 17 (68) | |
| Rectum | 7 (14) | 4 (16) | 3 (12) | |
| Other | 6 (12) | 1 (4) | 5 (20) | |
| Laparoscopy ($n$ (%)) | 44 (88) | 22 (88) | 22 (88) | 1.000 |
| Malignancy ($n$ (%)) | 28 (56) | 17 (68) | 11 (44) | 0.154 |
| PRN score | 65 (43) | 68 (46) | 62 (40) | 0.629 |
| CGQL score | 0.66 (0.15) | 0.67 (0.15) | 0.64 (0.14) | 0.503 |
| Clinical outcomes | | | | |
| Length of stay (days) (mean, SD) | 6 (4) | 6 (3) | 6 (5) | 0.826 |
| In-hospital complications ($n$ (%)) | 18 (36) | 9 (36) | 9 (36) | 1.000 |
| Minor (I–IIIa) | 17 (34) | 8 (32) | 9 (36) | |
| Major (IIIb–IVb) | 1 (2) | 1 (4) | 0 (-) | |
| Death (V) | 0 (-) | 0 (-) | 0 (-) | |
| CCI (mean, SD) | 8 (13) | 8 (12) | 9 (13) | 0.893 |

*SD*, standard deviation; *BMI*, body mass index; *ASA*, American Society of Anesthesiologists; *PRN*, Project Research in Nursing; *CGQL*, Cleveland Global Quality of Life; *CCI*, Comprehensive Complication Index

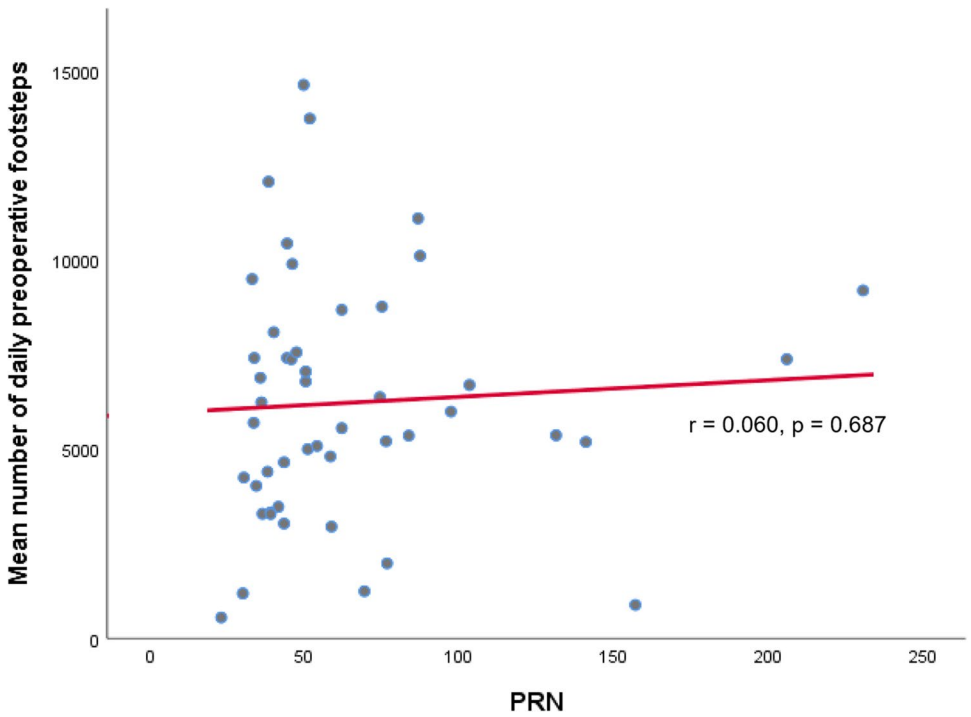


**Fig. 1** Correlation between preoperative footsteps and nursing workload (PRN)

which could lead to measurement bias and overestimation of activity.

A qualitative study described nurses' perceptions of facilitators and barriers to hospitalized patients' physical activity participation in an acute Asian setting [11]. Facilitators included seeing physical activity engagement as a fundamental facet of nursing, drawing social contracts and motivating patients. Barriers included psychological factors

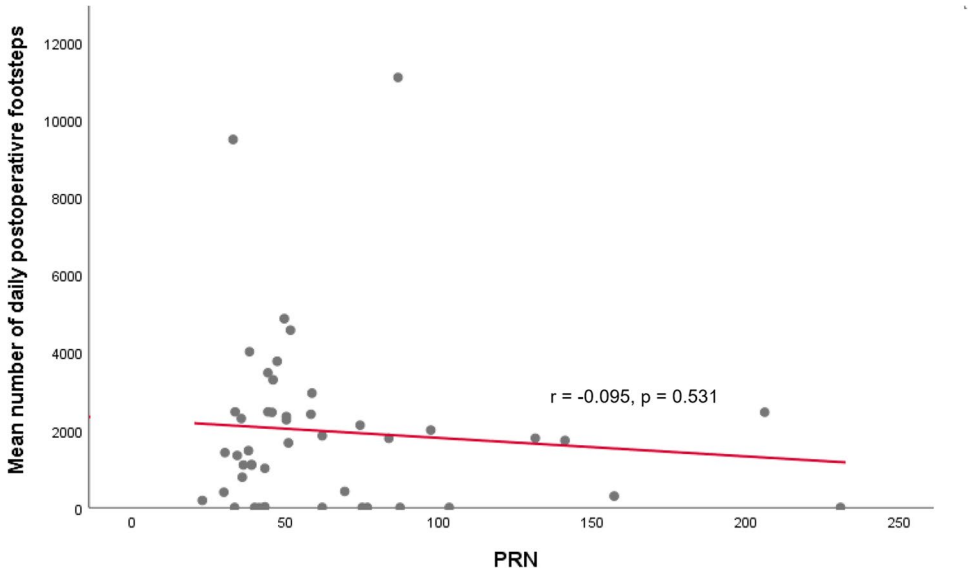


**Fig. 2** Correlation between postoperative footsteps and nursing workload (PRN)

and nurses' heavy workload. As engaging adults in physical activity is often a time-consuming activity, it has been described that this was given low priority in a busy environment [11]. Another study showed that patient factors that influenced adherence to postoperative physical therapy included presence of depressive symptoms and attitudes, such as motivation to participate in physical therapy [12]. In the present study, patients' postoperative physical activity did not decrease nursing workload. An observation study found that nurses were not focused on patients' performance of physical activity and even when they did, this was often limited to patients stand and transfer [13].

It could have been assumed that a fit patient with a high life satisfaction score will recover faster and better and would decrease the nurses' workload. It has been described that there was a direct relationship between nurses' workload and patient outcomes and nurse-reported quality of care [14]. However, in this study, no correlation was found between patient's quality of life and nursing workload. Although there is increasing evidence that physical activity participation can improve health outcomes, patients were generally seen as not motivated to engage in physical activity.

Several limitations of the present study need to be addressed. One of them was the potential systematic errors arising from selection bias, whereas more health-conscious people tend to participate in this study. Nurses' workload was measured using the PRN score. Such score consisting of self-reporting can be burdensome for care providers and thus filled out whiteout accuracy. Moreover, confounding factors of other perioperative parameters are probably related to nurses' workload that were not adjusted in the stage of analysis considering the small number of patients included. Patients' quality of life and nurses' workload are currently not directly assessed in ERAS pathway; however, these should be elements to consider in the future drafting of ERAS guidelines and the design of prospective studies.

## Conclusions

There were no differences between patients with low or good mobilization in terms of demographics, surgical details, and clinical outcomes after colorectal surgery. No significant correlation was found between the number of perioperative footsteps, quality of life, and nursing workload. Thus, patients who mobilize little preoperatively will not necessarily result in an additional workload for nurses, which could be useful in personnel management.

**Author Contribution** All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by David Martin, Valentine Guarnero, Pénélope St-Amour, Valérie Addor, Benoît Romain, and Martin Hübner. The first draft of the manuscript was written by David Martin and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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**Data Availability** The data is accessible from the corresponding author.

**Code Availability** Not applicable.

## Declarations

**Ethics Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study was approved by the local ethics committee (383/15) and registered under clinicaltrials.gov (NCT02610790).

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

**Conflict of Interest** The authors declare no competing interests.



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