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# Recovery and convalescence after laparoscopic surgery for appendicitis: A longitudinal cohort study



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## ABSTRACT

**Background:** Information about predictors for the duration of convalescence and the overall general wellbeing after laparoscopic surgery for suspected appendicitis is missing in the scientific literature. We aimed to describe and identify predictors for the duration of convalescence and the quality of recovery for patients undergoing laparoscopic surgery for suspected appendicitis.

**Methods:** A prospective cohort of adult patients undergoing laparoscopic surgery for suspected appendicitis was performed between July 2014 and December 2014. Patients completed a QoR-15 questionnaire six times during the 30-d postoperative period. Time until resumption of recreational and occupational activities was recorded. Potential predictors for the duration of convalescence and the quality of recovery measured by the QoR-15 score were identified.

**Results:** A total of 108 patients were included, and 95 patients were eligible for analysis. The median duration of convalescence was 13 d. Disease, depressive mood, level of recreational activities, age, and pain at rest on the first postoperative day were significant predictors of the duration of convalescence. Gender, postoperative complications, disease, and anxiety were significant predictors of the quality of recovery during the 30-d postoperative period. A 10% increase in the QoR-15 score increased the hazard ratio of 1.24 (95% confidence interval, 1.08–1.43,  $P = 0.002$ ) for ending the period of convalescence.

**Conclusions:** Duration of convalescence after laparoscopic surgery for appendicitis seems long. Psychological factors, demographical factors, and perioperative outcomes were important predictors for the quality of recovery and the duration of convalescence. Increased quality of recovery is associated with a shorter period of convalescence.

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## Introduction

The laparoscopic approach has become the standard operative approach in many countries for patients suspected of appendicitis and has resulted in reduced pain, length of

recovery, and wound infections compared with open appendectomy.<sup>1</sup>

Increasing attention is paid to patient-related outcomes. Historically, an overall assessment of how well the patient is feeling is often neglected in clinical trials.<sup>2,3</sup> This is also the

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case in high-volume benign patient categories, such as patients with acute appendicitis. Another important outcome after benign elective surgery is how fast the patient regains normal functions.<sup>4</sup> Restoration of the patient's normal functions can be quantified as the duration of convalescence defined as the resumption of recreational and occupational activities.

To our knowledge, no previous studies have reported the general quality of recovery after laparoscopic surgery for suspected appendicitis. Quality of recovery after surgery can be measured with simple and validated questionnaires like the QoR-15. The QoR-15 consists of 15 questions on an 11-point numerical rating scale in the domains of pain, physical comfort, physical independence, psychological support, and emotional state during the previous 24 h.<sup>5</sup> The score ranges from 0 to 150, and a high score represents good recovery.<sup>5,6</sup> We aimed to describe and identify predictors for the 30-d postoperative course after laparoscopic surgery for suspected appendicitis, focusing on general quality of recovery measured by the QoR-15, the length of convalescence, and to explore the association between general quality of recovery measured by the QoR-15 and the duration of convalescence. Secondly, we aimed to describe the degree of mobilization during the first postoperative day.

## Methods

A prospective observational cohort study was completed at the Department of Surgery in a University Hospital between July 2014 and December 2014. The study was approved by the Danish Data Protection Agency. In accordance with Danish legislation, no ethical approval was necessary. Patients gave written and oral consent.

All adult patients (age  $\geq 18$  y) with an American Association of Anesthesiologist (ASA) risk class of I-III undergoing a diagnostic laparoscopy for suspected appendicitis were eligible for inclusion. Patients known to have inflammatory bowel disease, were pregnant or breastfeeding, or had presumed poor compliance with the study protocol were excluded from the study.

Junior or senior surgeons enrolled patients who fulfilled the criteria for inclusion.

### Demographics and psychological factors

Gender, age, height, weight, and ASA class were recorded via the patient's anesthesiology chart. Last C-reactive protein (CRP) within 24 h preoperative, time of admission, and time of discharge were recorded via the electronic patient charts. Anxiety, depression, and pain catastrophizing has been related to pain and quality of life.<sup>7,8</sup> Participants completed the Hospital Anxiety and Depression Scale (HADS) and the Pain Catastrophizing Scale (PCS) preoperatively. The HADS consists of two 7-item subscales designed to measure anxiety (HADS-A) and depression (HADS-D) during the last 7 d separated from somatic disorders, and the scores range from 0 to 21.<sup>9,10</sup> A high score represents a higher degree of anxiety or depressive mood. The PCS measures pain catastrophizing and

ranges from 0 to 52.<sup>11,12</sup> A high score indicates a high level of pain catastrophizing.

After the operation, the investigator contacted participants, and a short interview was performed. The participants were told how and when they were to fill out their postoperative questionnaire. The following were recorded during the short interview: Duration of abdominal pain before admission, use of sleep medication or use of psychopharmacological drugs 7 d before the operation, use of tobacco (smoker, nonsmoker or former smoker), whether the patient lived with another adult or lived alone, whether the patient had children who lived at home, children who lived elsewhere or no children, educational background, occupation, level of occupational, and recreational activities. Level of occupational activities was defined as sedentary (e.g., office work), light (e.g., no heavy lifting), moderate (e.g., a few heavy lifts during the day), or strenuous (e.g., many heavy lifts during the day). Level of recreational activities was defined as sedentary (e.g., reading, watching television), light (e.g., garden work, cycling), moderate (e.g., regular exercise), or strenuous (e.g., contact sports, extreme sports).

### Procedure and diagnosis

Standard anesthesia at our institution is total intravenous anesthesia and 20-mL 2.5-mg/mL Bupivacaine is used as local anesthetics at port sites. Standard procedure for patients suspected of appendicitis is a diagnostic laparoscopy to verify the diagnosis of appendicitis, followed by a 3-port laparoscopic appendectomy if the appendix is considered inflamed. If other pathologies were encountered, appropriate procedures were carried out in accordance with our institution standards. Diagnosis, the procedure performed, and whether a more experienced surgeon supervised the procedure were registered directly in the patient's case report form. Start and stop times for surgery and pathology reports were recorded from the electronic operation system and from the patient's electronic chart.

Patients were allowed to resume occupational and recreational activities the day after discharge.

### Postoperative outcome

Participants completed a postoperative questionnaire 10 times during the 30-d postoperative period and returned the questionnaire by mail in a prepaid envelope. The following were recorded: the quality of recovery measured by the Danish version of the QoR-15,<sup>6</sup> nausea ("none," "light," "moderate," or "severe"), episodes of vomiting ("no vomiting," "1 episode," "2 or 3 episodes," or "3 or more episodes"), pain at rest and when coughing, fatigue, and sleep quality on a 100-mm VAS, mobilization from the bed ("no help required," "little help required," "lot of help required," or "cannot get out of bed"), date of resumption of occupational activities, date of resumption of recreational activities, and reasons for not resuming occupational and recreational activities earlier. Registration was done at 2-10 h, 8-16 h, and 24-32 h postoperatively, on postoperative day (POD) 2, POD 3, POD 7, POD 14, and POD 30. The reason for the time intervals on the first

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