Chronic Pain after Colon Cancer Surgery

Translation and Validation of a Scoring System

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28 November – 1 December 2022, St.Gallen, Switzerland

Monday, 28 November 2022

09.50
Opening and welcome
Jochen Lange, St.Gallen, CH

10.00
It is leaking! Approaches to salvaging an anastomosis
Willem Bemelman, Amsterdam, NL

10.30
Predictive and diagnostic markers of anastomotic leak
Andre D'Hoore, Leuven, BE

11.00
SATELLITE SYMPOSIUM
ETHICON

11.45
Of microbes and men – the unspoken story of anastomotic leakage
James Kinross, London, UK

12.15
LUNCH

13.45
Operative techniques to reduce anastomotic recurrence in Crohn's disease
Laura Hancock, Manchester, UK

14.15
Innovative approaches in the treatment of complex Crohn Diseases perianal fistula
Christianne Buskens, Amsterdam, NL

14.45
To divert or not to divert in Crohn surgery – technical aspects and patient factors
Pär Myrelid, Linköping, SE

15.15
COFFEE BREAK

15.45
Appendiceal neoplasia – when to opt for a minimal approach, when and how to go for a maximal treatment
Tom Cecil, Basingstoke, Hampshire, UK

16.15
SATELLITE SYMPOSIUM
Medtronic
Further,Together

17.00
Outcomes of modern induction therapies and Wait and Watch strategies, Hope or Hype
Antonino Spinelli, Milano, IT

17.30
EAES Presidential Lecture - Use of ICG in colorectal surgery: beyond bowel perfusion
Salvador Morales-Conde, Sevilla, ES

18.00
Get-Together with your colleagues
Industrial Exhibition

Tuesday, 29 November 2022

9.00
CONSULTANT'S CORNER
Michel Adamina, Winterthur, CH

10.30
COFFEE BREAK

11.00
SATELLITE SYMPOSIUM
INTUITIVE

11.45
Trends in colorectal oncology and clinical insights for the near future
Rob Glynne-Jones, London, UK

12.15
LUNCH

13.45
VIDEO SESSION

14.15
SATELLITE SYMPOSIUM
BD

15.00
COFFEE BREAK

15.30
The unsolved issue of TME: open, robotic, transanal, or laparoscopic – shining light on evidence and practice
Des Winter, Dublin, IE
Jim Khan, London, UK
Brendan Moran, Basingstoke, UK

16.30
SATELLITE SYMPOSIUM
Takeda

17.15
Lars Pahlman lecture
Søren Laurberg, Aarhus, DK

Thursday, 1 December 2022
Masterclass in Colorectal Surgery
Proctology Day

Wednesday, 30 November 2022

9.00
Advanced risk stratification in colorectal cancer – choosing wisely surgery and adjuvant therapy
Philip Quirke, Leeds, UK

09.30
Predictors for Postoperative Complications and Mortality
Ronan O'Connell, Dublin, IE

10.00
Segmental colectomy versus extended colectomy for complex cancer
Quentin Denost, Bordeaux, FR

10.30
COFFEE BREAK

11.00
Incidental cancer in polyp - completion surgery or endoscopy treatment alone?
Laura Beyer-Berjot, Marseille, FR

11.30
SATELLITE SYMPOSIUM

12.00
Less is more – pushing the boundaries of full-thickness rectal resection
Xavier Serra-Aracil, Barcelona, ES

12.30
LUNCH

14.00
Management of intestinal neuroendocrine neoplasia
Frédéric Ris, Geneva, CH

14.30
Poster Presentation & Best Poster Award
Michel Adamina, Winterthur, CH

15.00
SATELLITE SYMPOSIUM
OLYMPUS

15.45
COFFEE BREAK

16.15
Reoperative pelvic floor surgery – dealing with perineal hernia, reoperations, and complex reconstructions
Guillaume Meurette, Nantes, FR

16.45
Salvage strategies for rectal neoplasia
Roel Hompes, Amsterdam, NL

17.15
Beyond TME – technique and results of pelvic exenteration and sacrectomy
Paris Tekkis, London, UK

19.30
FESTIVE EVENING

Information & Registration www.colorectalsurgery.eu

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Chronic Pain after Colon Cancer Surgery: Translation and Validation of a Scoring System

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Requests for reprints should be addressed to the corresponding author

Description of the type of study:

- Original Article
- Population-based study including a large number of colon cancer patients (7,127)
- Number of text pages of the manuscript: 11
- Number of figures and tables: 5 figures and 2 tables

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Ethical Compliance: According to Danish legislation, questionnaire-based studies do not require ethical approval. All patients included in the study gave informed consent and the study was registered in the Central Denmark Region's register of research projects (no. 1-16-02-364-15).

Data Access Statement: Due to Danish legislation, supporting data cannot be made openly available.

Conflicts of Interests: The authors declare no conflicts of interest.

Funding: TJ was supported by the Danish Cancer Society (Grant no. R192-A11536).

Short running head: Translation and Validation of a Scoring System: Colon cancer

MINI ABSTRACT

The chronic pain score was translated and validated in a cohort of 7,127 Danish patients with colon cancer. High convergent and discriminative validity and high sensitivity and specificity were found. This score could be a valid tool for measuring chronic pain after colon cancer surgery.

STRUCTURED ABSTRACT

Objective: This study aims to translate and validate the chronic pain score (CP score) in a cohort of colon cancer patients.

Background: Chronic pain following colon cancer surgery is still poorly understood. Especially, the lack of a validated tool for measuring chronic pain is a major issue, as such an instrument is critical for evaluating the incidence and risk factors. The CP score was created using data from Danish rectal cancer patients.

Methods: Danish colorectal cancer survivors diagnosed between 2001 and 2014 completed the CP score and two quality of life (QoL) measures. Clinical data were obtained from a national database. Convergent validity was investigated by testing the association of the CP score with a single *ad hoc* QoL item and the EORTC QLQ-C30, and discriminative validity was tested as the score's ability to differentiate between gender and age groups. Sensitivity and specificity were evaluated by determining the ability of the score to identify patients with a major impact of pain on QoL.

Results: Responses from 7,127 colon cancer were included. Convergent validity was confirmed, as the score was associated with both QoL measures ($p < 0.001$). Moreover, the score could differentiate between males/females and older/younger patients ($p < 0.001$, respectively), reflecting high discriminative validity. Finally, the score was able to identify patients with a major impact on QoL, with a sensitivity of 87% and specificity of 82%.

Conclusion: The CP score is a valid tool for measuring chronic pain after colon cancer surgery and should be used to homogenize outcomes in future studies.

Keywords: colon cancer, chronic pain, validation, late sequelae, quality of life

1. INTRODUCTION

Owing to advances in colorectal cancer (CRC) treatment, mortality rates have declined, and the number of long-term survivors has increased in recent decades (1). This improvement is seen not only in the Western world but also in other geographical areas where high-quality care is available (2). A growing number of CRC survivors suffer from a broad spectrum of late sequelae, including bowel, urinary, sexual dysfunction, fatigue, psychological distress, insomnia, and pain, all of which may severely affect the quality of life (QoL) (3–9). Severe persistent postsurgical pain is a well-known complication that can occur after surgical procedures, with a prevalence of about 5–10% (10). The prevalence of chronic pain (CP) after the surgical treatment of cancer varies substantially depending on the type of cancer, treatment modality, age, genetic variations, and mental elements (11). In a recent study of working-age cancer survivors in the US, nearly 17% experienced CP and scored significantly worse on the QoL assessment (12). Moreover, a Danish study of symptoms and QoL in patients with rectal cancer showed that 31% suffered from CP in the pelvic area or lower extremities (13). The literature on CP after colon cancer is scarce, and the occurrence of CP in colon cancer survivors remains unknown. Furthermore, the lack of validated tools for measuring CP in this specific group of patients with cancer is a major issue, as such instruments are required to increase knowledge about the incidence, prevalence, and risk factors. Furthermore, a valid tool for measuring CP after colon cancer can be useful in identifying patients needing further diagnosis and treatment of CP and monitoring the treatment effects.

In 2019, a study described the development and validation of a scoring system for assessing CP after rectal cancer treatment based on data from a large cohort of Danish rectal cancer patients (14). The chronic pain score (CP score) showed high sensitivity and specificity for identifying patients with chronic pain, which significantly impacts QoL after treatment for rectal cancer. A uniform standard tool for measuring CP after surgical treatment for colon cancer is needed to conduct valid measurements of CP in colon cancer survivors and facilitate comparisons of results across studies. Thus, the CP score might be a valuable tool for this purpose; however, as its development was based on data from patients with rectal cancer only, it should not be used for measuring CP in patients with colon cancer until the psychometric properties have been investigated in this specific group of patients.

The CP score was initially developed in Danish and published in English in 2018; however, it did not undergo a formal, structured translation at that time. We hypothesized that the psychometric properties of the CP score in patients with colon cancer would be similar to those of patients with rectal cancer (14). Therefore, the aims of this study were as follows: 1) to formally translate the CP score from Danish to English; 2) to investigate the validity of the CP score in a cohort of colon cancer patients; 3) to determine the sensitivity and specificity of the score in identifying the major impact on QoL.

2. METHODS

2.1. Chronic Pain Score Development in Patients with Rectal Cancer

From November 2015 to February 2016, a survey aimed at assessing long-term functional outcomes and QoL after treatment for CRC was distributed to all Danish CRC survivors diagnosed between May 2001 and December 2014. Eligible patients were identified via the Danish CRC Group (DCCG) database, which contains highly valid data and covers 96% of all new colorectal cases registered in Denmark since 2001 (15).

Data was cross-linked with the Danish Civil Registry for exclusion of all patients who had died or emigrated since treatment or who had "research protection" (patients registered in the Danish Civil Registry with "do not want to be contacted for research purposes") (16). Further exclusion criteria were disseminated/recurrent disease, nonresectional treatment (such as polypectomy and endoscopic submucosal dissection), or complex procedures (such as total colectomy or pelvic exenteration).

Eligible patients with CRC received a comprehensive collection of patient-reported outcome measures (PROMs) on pain, bladder, sexual, and bowel function, as well as QoL.

The development of the CP score was based on survey data merely from patients with rectal cancer in this dataset, and the process was described in detail in the original article published by Mortensen et al. in 2019 (14). Briefly, Mortensen's study included 1928 Danish patients with rectal cancer. After cancer treatment, patients who indicated any CP in the abdomen, pelvis, or lower extremities completed a 13-item pain questionnaire. The 13 items addressed pain localization, intensity during daily routines and physical exertion, character, duration, functional aggravation, disturbance of night sleep, and activities abandoned due to pain. The association of each item with QoL was determined through regression analyses using an "anchoring term" as follows: "Overall, to what extent does your pain impact your QoL?" Options included not at all, a little, some, and a lot. Items with the strongest association with QoL were included in the final version of the CP score. The final CP score consisted of seven items and based on each item's association with impact on QoL, a weighted scoring system was constructed. The total score ranges from 0 to 45, and patients can be categorized into three groups: no significant pain, including those with no pain at all (0–7), minor pain syndrome (8–17), and major pain syndrome (18–45) (Figure 1).

1. Do you experience pain in your stomach, lower abdomen, pelvic region or in your legs that has developed in connection with or following your treatment for intestinal cancer?	□ No, never (please skip the following questions) □ Yes	0 0

2. How often do you experience pain in your stomach, lower abdomen, pelvic region or in your legs?	□ Less than once per week □ One to six times per week □ Every day	0 4 6
3. How severe is your pain on a daily basis?	□ No pain/slight pain □ Moderate pain □ Severe pain	0 5 12
4. How severe is your pain when it is at its worst?	□ No pain/slight pain □ Moderate pain □ Severe pain	0 3 6
5. How would you describe the duration of your pain?	□ Brief (no longer than one minute) □ Periodic (longer than one minute, but not constant) □ Constant (always or nearly always present)	0 5 7
6. Does the pain disturb your sleep at night?	□ Not at all □ A little □ Some/much	0 2 6
7. Are there any activities you have had to give up due to pain after your treatment for cancer?	□ No □ Yes	0 8
Total score 0-45 Pain score categories: 0-7: No significant pain 8-17: Minor pain syndrome		

≥ 18: Major pain syndrome

Figure 1. The chronic pain score, English version

In the present study, the original Danish version of the CP score was tested; that is, no modifications or adaptations to the original CP score items or scoring were made. The score was computed following the guidelines in the initial study outlining the development of the score. (14).

2.2. Translation of the Chronic Pain Score

Since only 5.5 MIO people speak Danish, it would not be reasonable or useful to base future translations into other languages on the original, Danish-developed version of the CP score. Therefore, we thoroughly translated the original Danish version into English, following the method described below. This rigorous translation process aimed to ensure semantic equivalence between the original Danish and English versions of the CP score.

We followed the forward-backward translation procedure proposed by the European Organization for Research and Treatment of Cancer (EORTC) (17). First, two native speakers of English fluent in Danish independently translated the scores from Danish to English. Based on these two forward translations, a single provisional English version of the CP score was constructed. Next, the provisional English version was translated back into Danish by two native Danish-speaking translators with excellent English skills. Finally, the original Danish version was compared with the back translations to reveal any discrepancies, and the final English version of the score was established.

2.3. Patients' Selection

The patients with colon cancer included in this study originated from the same large dataset used by Mortensen et al. to develop the original CP score in patients with rectal cancer.

For the present study, only relevant clinical information and PROMs related to chronic pain and QoL following colon cancer treatment were extracted from the main dataset.

2.4. Construct Validity Assessment

Two subtypes of construct validity were investigated: convergent and discriminant validity.

Convergent validity was investigated by testing the association between the CP score and QoL. For this purpose, the single QoL item "Overall, to what extent does pain influence your QoL?" with the response options "not at all," "a little," "some," and "a lot" was extracted from the main dataset. In addition, the EORTC QLQ-C30 v3.0 was extracted from the main dataset, and the subscales were calculated according to the official EORTC scoring manual (18,19). The questionnaire consists of 30 items, which are

aggregated into a global health status/QoL scale, five functional subscales, three symptom scales, and six single items. Subscale scores ranged from 0 to 100. Only the functional scales (physical, role, emotional, cognitive, and social functioning) and the global scale were analyzed in this study, as they were hypothesized to be associated with the CP score. In the functional subscales, a higher score represents better functioning and QoL.

Discriminant validity was tested using the CP score's ability to differentiate between groups known to differ in pain level. Based on previous studies, we hypothesized that the CP score would be able to distinguish between men and women and between patients younger and older than the median age of the study population (13,14).

2.5. Sensitivity and Specificity

The CP score's sensitivity and specificity for identifying patients with or without no major impact of pain on QoL were investigated using the single item "Overall, to what extent does pain influence your QoL?"

2.6. Statistical Analysis

In order to assess the psychometric properties of the CP score when applied to patients with colon cancer, we used the same methodology as Mortensen et al. used to validate the CP score in patients with rectal cancer (14). Continuous variables are presented as mean (SD) or median (IQR) according to their distribution, whereas categorical variables are shown as numbers (%). The student's *t*-test, Mann–Whitney *U* test, or Kruskal–Wallis test was used for analyses of continuous data, and the $\chi 2$ test for categorical data.

2.6.1 Convergent Validity

For the purpose of investigating the association between the CP score and the impact of pain on QoL, the four response options of the single QoL item's "Overall, to what extent does your pain impact your QoL?" were grouped into three categories: "not at all" (no impact), "a little" (minor impact), and "some/a lot" (major impact). Patients reporting no pain in the first item of the CP score were instructed to skip the remaining CP score items, including the single QoL item, so these patients were excluded from this analysis.

Differences in CP scores between the three QoL groups were visualized using box plots and tested using the Kruskal–Wallis test. Using a 3 × 3 table, the association between the three CP score categories and the three categories of a single QoL item was investigated. The proportions of patients with a "perfect fit," "moderate fit," and "no fit" between the CP score and QoL categories were calculated. We considered it a "perfect fit," if the patients were categorized as having no pain/no impact on QoL, minor pain/minor

impact on QoL, or major pain/major impact on QoL. A difference by one category was considered a "moderate fit," while differences between the two categories were considered as "no fit" between the QoL and CP score groups. Bar graphs showing the global and functional subscales of the EORTC QLQ-30 per CP group were generated, and differences were tested using the Kruskal–Wallis test.

2.6.2 Discriminant Validity

Mann–Whitney's *U* test was applied to test differences in CP scores between men and women and between younger and older patients.

2.6.3 Sensitivity and Specificity

ROC curve analyses were used to investigate the sensitivity and specificity of the CP score to identify patients with a major impact on QoL, with a cutoff value of 18, and patients with no impact on QoL, using a cutoff value of 8. These cutoff values were adapted from the original CP score (14).

All statistical analyses were performed using STATA 14 (StataCorp LP, College Station, Texas, USA), with a threshold of significance of 5%.

3. RESULTS

3.1. Translation

No significant discrepancies were found when comparing the original Danish CP score with the backward translation of the provisional English version. This version was accepted as the final English version, as shown in Figure 1.

3.2. Patients

3.2.1 Responders vs. Nonresponders

The flowchart is shown in Figure 2. Out of the 13,169 eligible colon cancer patients, 7,127 completed the CP score, corresponding to a response rate of 54.1%. The mean (SD) age of responders was lower than that of nonresponders (66.34 (10.2) vs. 70.64 (11.0), $p < 0.0001$), and compared with nonresponders, a higher proportion of responders were males (51.65% vs. 43.23%, $p < 0.0001$).

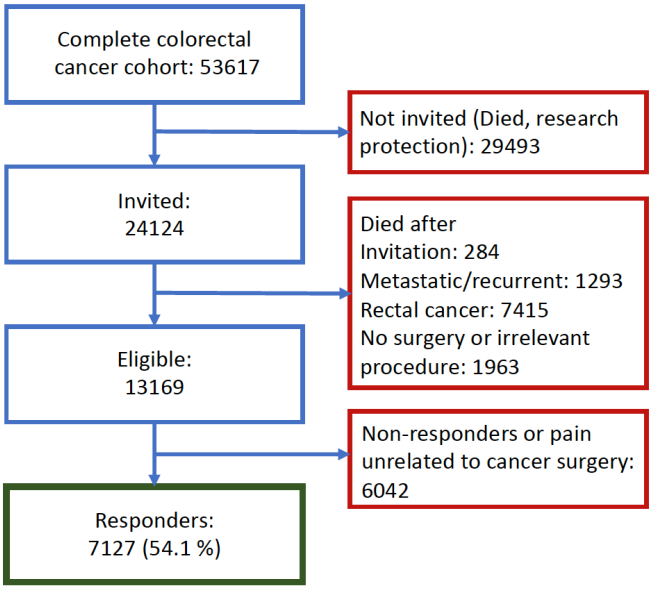

Figure 2. Flowchart of included patients.

3.2.2 Included Patients

Among the included patients, the median (IQR) time since surgery was 58 (29.50–101.06) months. A total of 4,264 (59.83 %) patients responded that they never had any pain related to their colon cancer surgery; hence, they were assigned a CP score value of 0. The included patients were categorized as follows: no significant pain (including no pain at all), 5,107 (71.66%); minor pain, 986 (13.83%); major pain, 1,034 (14.51%). Further details of the patients' clinical and demographic characteristics are provided in Table 1.

Table 1. Clinical-/demographic characteristics of the 7,127 included colon cancer patients

Age at surgery, mean (SD)	66.31 (10.19)
Sex, n (%)	
Female	3442 (48.30)
Male	3685 (51.7)
BMI, mean (SD)	25.82 (4.55)
Missing, n	881
ASA score, n (%)	
I or II	6181 (88.41)
III or IV	810 (11.59)
Missing, n	136
Smoking, n (%)	

Smoker	1027 (16.92)
Ex-smoker	2578 (42.47)
Non smoker	2465 (40.61)
Missing, n	1057
Alcohol (cup/week), n (%)	
0	1229 (20.26)
1-14	3922 (64.66)
15-21	465 (7.67)
>21	450 (7.42)
Missing, n	1061
+ Chemotherapy, n (%)	2881 (40.5)
Missing	14
Stoma, n (%)	
No stoma	6128 (86.29)
Temporary	475 (6.69)
Permanent	499 (7.02)
Missing, n	25
T4 tumors, n (%)	866 (12.74)
Missing, n	330
Operative approach, n (%)	
Open	3643 (51.12)
MIS	3483 (48.88)
Missing, n	1
Months since surgery, median (IQR)	58 (29.5-101.06)
CP Score group, n (%)	
No	5107 (71.66)
Minor	986 (13.83)
Major	1034 (14.51)

BMI: Body Mass Index, ASA: American Society of Anesthesiology, MIS: Minimally Invasive Surgery.

3.3. Convergent Validity

3.3.1 Association between the CP Score and the Single QoL Item

As only patients reporting pain in the first question of the CP score were included, 2,861 patients were available for these analyses. Table 2 shows the fit between the three CP score groups and three QoL groups. We found a perfect fit in 63.23%, moderate fit in 35.79%, and no fit in 0.98%, indicating a strong

correlation between the CP score and the single QoL item ("Overall, to what extent does your pain impact your QoL?").

Table 2. Fit between CP Score group and QoL group (n=2,861).

	No significant pain	**Minor pain syndrome**	**Major pain syndrome**
No QoL impact	473 (16.5 %)	204 (7.1 %)	19 (0.7 %)
Minor QoL impact	361 (12.6 %)	691 (24.2 %)	369 (12.9 %)
Major QoL impact	9 (0.3 %)	90 (3.1 %)	645 (22.5 %)

Dark grey=Perfect fit (63.2 %), light grey=moderate fit (35.8 %), white=no fit (1.0 %)

QoL: Quality of life

In Figure 3, boxplots of the CP score vs. the three QoL groups are presented. The differences in score values between the groups were highly significant ($p < 0.001$, Kruskal–Wallis' test).

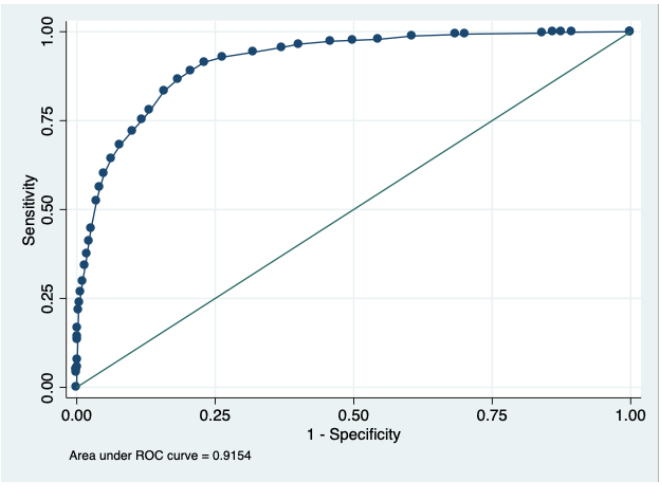

Figure 3. Boxplots of the CP Score vs. impact on quality of life (QoL) ($p < 0.001$, N = 2,861).

3.3.2 Association between the CP Score and EORTC QLQ-C30 Functional Subscales

We found significant differences between patients in the three CP score groups for all six investigated EORTC functional subscales ($p < 0.001$; Kruskal–Wallis' test, Figure 4). The greatest differences between the groups with no significant pain and major pain syndrome were in role functioning (26.47), followed by global health status (26.39) and social functioning subscales (23.05).

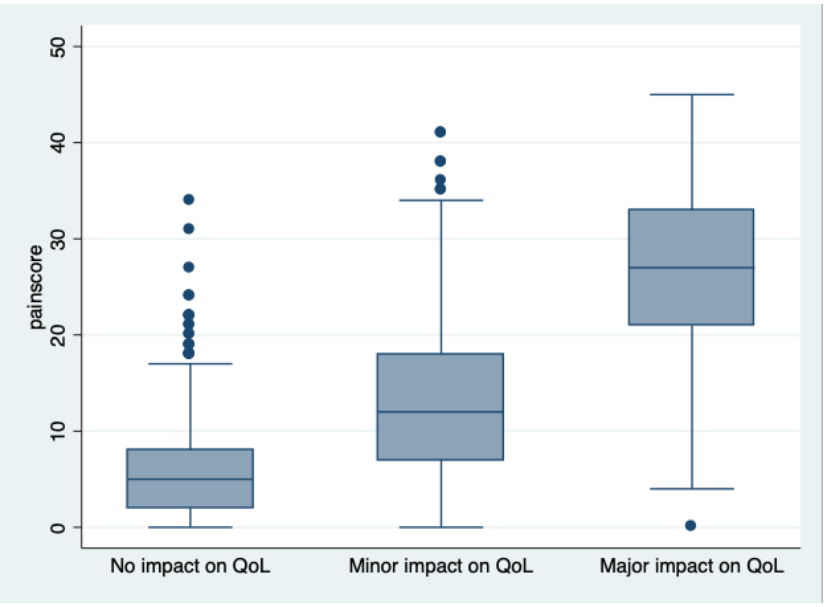

Figure 4. Functional subscales of the European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire–Core 30 (EORTC QLQ-C30) by the Chronic Pain Score group (N = 7,049–7,093). $p < 0.001$ for all subscales.

3.4. Discriminative Validity

Females had a median CP score of 0 (IQR, 0–13), which was higher than that of males, who had a median score of 0 (0–7) ($p < 0.001$). Moreover, a higher proportion of females had major pain compared with males (17.58% vs. 11.64%, $p < 0.001$).

Patients younger than the median age of the study population (67 years) had a median CP score of 0 (IQR, 0–12), which was higher than for the older patients (0; IQR, 0–7) ($p < 0.001$), and a higher proportion of younger patients had major pain compared with older patients (17.02% vs. 11.78%, $p < 0.001$).

3.5. Sensitivity and Specificity

ROC curve analyses showed that with a cutoff of 18 points, the CP score had a high sensitivity (86.69%) and specificity (81.67%) for identifying patients with a major impact of pain on QoL. The area under the curve was 0.92 (95% CI, 0.90–0.93) (Figure 5).

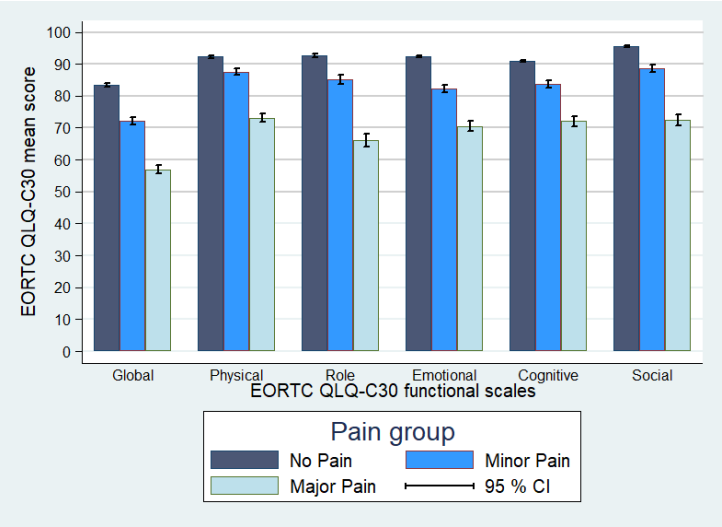

Figure 5. Receiver Operating Characteristic (ROC) curve showing the relationship between CP Score value with a cutoff at 18 points and the major impact of pain on the quality of life.

The sensitivity and specificity of the CP score's ability to identify patients with no impact of pain on QoL, with a cutoff at 8 points, were 67.96% and 82.91%, respectively, and the area under the curve was 0.86 (95% CI, 0.84–0.87).

4. DISCUSSION

Developed initially for assessing pain after rectal cancer surgery, a questionnaire was administered to patients after colon cancer surgery. A total of 7,127 patients with colon cancer completed the questionnaire and two measures of QoL at a median of 58 months after surgery. As hypothesized, the CP score demonstrated a high convergent and discriminative validity and a sensitivity and specificity of more than 80% identifying patients with a major impact of pain on QoL. We concluded that the questionnaire may be considered a valid and useful tool for measuring pain after colon cancer surgery.

4.1. Convergent Validity and Sensitivity/Specificity of the Chronic Pain Score

We found a perfect or moderate fit between CP score group and QoL group in 99% of the participating colon cancer patients, and the differences in the CP score's numerical values between QoL groups were highly significant. These results indicate high convergent validity, supported by the strong association between the CP score and all functional subscales of the EORTC QLQ-C30.

In the analyses of discriminative validity, the CP score proved to be able to discriminate between groups of patients known to differ with respect to pain, as we found highly significant differences between men and women and between younger and older patients.

In addition, we found that with a cutoff of 18 points, the CP score correctly identified 87% of patients with colon cancer with a major impact of pain on QoL, which corresponds to high sensitivity. Furthermore, with this cutoff, the CP score correctly identified 82% of patients with no or minor impact of pain on QoL, corresponding to high sensitivity.

The results obtained in this study are, in general, similar to or even better than those presented in the original development and validation of the CP score in patients with rectal cancer, indicating that it is an equally valid tool for assessing chronic pain in both patients undergoing surgery for colon cancer and those undergoing surgery for rectal cancer.

4.2. Usability of the CP Score

The combination of high colon cancer incidence and survival rates has led to a substantial number of colon cancer survivors worldwide. We found that 14.5% of the included patients with colon cancer had a CP score in the major pain category (≥18 points), which was lower than in patients with rectal cancer. However, since colon cancer is approximately twice as common as rectal cancer, the total number of colon cancer survivors experiencing chronic pain may be at least as high as that of rectal cancer survivors. Therefore, we consider it relevant to further explore pain after both colon and rectal cancers in future well-designed studies to obtain more knowledge within the field. We encourage researchers worldwide to use the CP score when measuring pain after CRC to facilitate comparisons of results across studies and conduct meta-analyses in the future. Furthermore, we encourage using the CP score to screen for chronic pain after CRC surgery in the clinical setting to effectively detect patients in need of further diagnosis and treatment. The simplicity of the CP score makes it is easy to use for both patients and healthcare providers.

In patients with rectal cancer, chronic pain has been shown to be correlated with radiotherapy and low pelvic dissection. This pain is likely caused by nerve damage either directly during surgical resection or by neurotoxicity after irradiation (13). Patients with colon cancer never receive radiotherapy, and dissection rarely occurs close to any major nerve. The causes of chronic pain in colon cancer patients remain unknown, although surgical trauma can lead to damage to soft tissue and nerves. However, studies on the risk factors for chronic pain are required to explore the potential causes. Chronic postsurgical pain has been correlated with the intensity and interference of acute postoperative pain (20), and it could be speculated that the use of minimally invasive surgery and decreasing rates of surgical complications, including anastomotic leakage, could reduce the rate of chronic pain in colon cancer patients in the future.

4.3. Future Use of the CP Score

It should be noted that the final English version presented in this article is slightly different from the version published in 2019 in the original article by Mortensen et al. (14). Since the latter did not undergo a

similar rigorous translation process, the version presented in this article must be considered the official English version of the CP score, and this version must be used for any future use of the CP score and translation to other languages. We recommend that any future translations of the score follow rigorous forward and back translations, as described by EORTC (17). To avoid the development of more than one version in each language, we encourage each new language version to be made publicly available and register it by contacting the main author of the original article (14).

4.4. Strengths and Limitations

Among the strengths of this study are the rigorous methodology, population-based design, and high number of the included patients with colon cancer. The study's limitations include a relatively low response rate of 54%, which might be explained by the rather extensive collection of PROMs included in the original survey and the extended time after surgery for a proportion of the patients that could have led to less interest in participating. Although the study could have some selection bias, the large number of included patients ensured that the complete range of the CP score was covered, which is considered necessary in validation studies. Finally, due to the study design, it was not possible to perform any tests of the CP score's reliability or sensitivity to changes in pain; hence, these properties must be established in future studies.

5. CONCLUSION

In conclusion, CP score may be considered a valid tool for measuring chronic pain after colon cancer surgery. The score is currently available free of charge in English and Danish for nonprofit clinical use and research purposes.

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