Cancer is the second leading cause of death worldwide, with about 1 in 6 deaths attributable to the disease (World Health Organization, 2018). After diagnosis, many people with cancer experience physical and psychological symptoms, as well as a financial burden on themselves and their families and a decrease in quality of life (QOL) (Astrup, Rustøen, Hofso, Gran, & Bjordal, 2017; Große, Treml, & Kersting, 2018).

Cancer prehabilitation programs have been reported as effective ways to improve functional recovery, including functional walking capacity, reduced hospital stay after surgery, and lower morbidity and mortality rates from the primary treatment of cancer (Dunne et al., 2016; Gillis et al., 2014; Valkenet et al., 2011). Silver and Baima (2013) defined cancer prehabilitation as a process starting between cancer diagnosis and pretreatment, with interventions to decrease impairments and promote physical and psychological health along the cancer care continuum. Cancer prehabilitation programs have been studied in people with various forms of cancer, such as lung, colorectal, and breast, with findings showing that their use can decrease morbidity and readmissions and reduce healthcare costs in newly diagnosed patients (Mayo et al., 2011; Silver & Baima, 2013). Physical cancer prehabilitation programs typically consist of aerobic or resistance exercises, or a combination of both; such programs have been shown to improve exercise tolerance, QOL, and muscle strength (Dunne et al., 2016; Gillis et al., 2014; Silver & Baima, 2013). Physical cancer prehabilitation programs are often followed by psychological programs (Silver & Baima, 2013). Psychological cancer prehabilitation programs were shown to improve mood disturbance prior to treatment. In addition, people with cancer who participated in psychological cancer prehabilitation programs had better adaptation to daily life after discharge (Silver & Baima, 2013). Overall, patient participation in cancer prehabilitation programs can
lead to improved preoperative conditions and better recovery status after surgery. However, because the components of cancer prehabilitation programs vary, the outcomes may also be mixed (Hijazi, Gondal, & Aziz, 2017). QOL is correlated with survival in people with cancer because it includes various areas of well-being and considers the impact of the disease and its treatment (Jitender, Mahajan, Rathore, & Choudhary, 2018). People with cancer reported better QOL when they had a strong ability to cope with cancer and cancer-related treatment (Jitender et al., 2018).

A study by Silver and Baima (2013) demonstrated that prehabilitation programs have been shown to improve QOL for as many as six months after elective coronary bypass graft surgery, but similar research has yet to be conducted involving cancer prehabilitation programs among people with cancer. In addition, although Silver and Baima’s (2013) review was the first to examine cancer prehabilitation programs, the standardized steps of systematic review were not used to make conclusions, and the results were based on people with and without cancer. As a result, the connection between cancer prehabilitation programs and QOL remains unclear. The aim of this review is to provide an overview of the effect of cancer prehabilitation programs on QOL in people with cancer, with the hope that the results provide concrete recommendations to clinical care and nursing research that will enhance the quality of cancer prehabilitation. Two research questions were examined:

- What are the characteristics of cancer prehabilitation programs that lead to improved QOL in people with cancer?
- What are the effects of cancer prehabilitation programs on QOL?

Methods

This systematic review was guided by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement (Moher, Liberati, Tetzlaff, & Altman, 2009), and it was registered with PROSPERO (CRD42017070736). All included studies were randomized, controlled trials that examined the effects of cancer prehabilitation programs on QOL among people with cancer. Because few studies related to cancer prehabilitation programs have been conducted, the authors did not restrict the dates of publication during the database search process.

Search Strategy and Study Selection

Various electronic databases (PubMed, MEDLINE®, Cochrane Library, EMBASE, CINAHL®, Scopus®) were searched. Cancer prehabilitation has been described in a variety of ways (Silver & Baima, 2013); therefore, the following keywords related to cancer prehabilitation were used for the current study: prehabilitation, prehab, prophylactic rehabilitation, pretreatment rehabilitation, perioperative rehabilitation, preoperative exercise, preoperative rehabilitation, preoperative program, and perioperative program. Cancer and QOL, along with their synonyms, including neoplasms, carcinoma, tumor, and health-related QOL, were also used. All keywords were connected by Boolean operators without the limitation of year of publication. EndNote software was used as a reference management tool to screen duplicate publications. All studies were selected by the first and second authors. The titles and abstracts of the articles were reviewed, and the full-text articles were then reviewed to ensure that they met the inclusion criteria (see Figure 1). Any disagreements between the first and the second authors related to abstracted data were referred to the third author to reach consensus.

Quality Assessment and Data Extraction

The Physiotherapy Evidence Database (PEDro) scale (Yamato, Maher, Koes, & Moseley, 2017) was used to assess the quality of studies. The following items were examined for each study:

- Inclusion criteria and source of participants
- Random allocation of participants
- Concealment of allocation
- Baseline comparability
- Blinding of participants
- Blinding of those who administered the interventions
- Blinding of assessors
- Participant follow-up of more than 85%
- Intention-to-treat analysis (all patients who were randomized are included in the data analysis and are analyzed in the groups to which they were randomized)
- Between-group comparison
- Point measures and measures of variability for outcomes

Inclusion criteria and source were not used for calculation of the total PEDro score; this item relates more to external validity. Consequently, total PEDro scores ranged from 0–10 points, with higher scores indicating higher study quality. The current authors contacted the authors of each of the studies to obtain additional information. A unified form was used to extract data from 12 studies. The collected…
Inclusion and Exclusion Criteria
Randomized, controlled trials in people with cancer aged at least 18 years and with people with cancer who participated in prehabilitation programs in the intervention groups were selected for inclusion. Articles in which QOL was not the primary or secondary outcome and which were not written in English were not eligible for this review.

Results
The search strategy initially found 2,320 articles across six databases; these had been published from 1968 to January 2018. Of these, 1,458 articles were identified as duplicates and removed. The titles, abstracts, and full texts of the remaining articles were reviewed in two phases, with 862 and 73 articles, respectively, excluded. Finally, 12 studies were selected for quality appraisal and systematic review.

Study Characteristics
Study characteristics are provided in Table 1. Most studies were conducted in a single center. More than half of the studies were published during a five-year period and were conducted in Western countries (the United States, Italy, the Netherlands, Canada, the United Kingdom, and Spain). In addition, most of the studies had recruited people with prostate cancer (n = 4) or colorectal cancer (n = 3). The total sample size was 839 people with cancer (426 people participating in cancer prehabilitation programs and 413 people in the control groups). Mean age in the 12 studies ranged from 52–71 years.

Total scores of study quality, determined using the PEDro scale, ranged from 4–8, with most studies scoring 7 or 8; this implies that these studies were of fairly high quality. The weakest items were related to allocation of concealment and blinding.

A total of seven QOL instruments were used in the 12 studies, with the SF-36® or the European Organisation for Research and Treatment of Cancer QOL Questionnaire–Core 30 (EORTC QLQ-C30) used in nine studies. (Instruments also used were the International Continence Society male short form questionnaire, International Prostate Symptom Score quality of life, Atkinson Life Happiness Rating Scale, Prostate Cancer Index, and EuroQol-5D.) The timing of the QOL outcome assessments varied, ranging from the day before surgery to 12 months after surgery.
### TABLE 1. Characteristics of Studies Included in Systematic Review

<table>
<thead>
<tr>
<th>Source and Quality</th>
<th>Sample and Setting</th>
<th>Intervention</th>
<th>Timing of Intervention</th>
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</thead>
<tbody>
<tr>
<td><strong>Physical cancer prehabilitation programs</strong></td>
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<tr>
<td>Burgio et al., 2006 (United States) 8</td>
<td>112 patients with prostate cancer with mean ages of 60.7 years and 61.1 years in the intervention and control groups, respectively; single center</td>
<td>Pelvic floor muscle training with 1 preoperative session (45 minutes) of biofeedback-assisted behavioral training and daily home exercise consisting of 3 sessions of 15 repetitions (contraction of the sphincter muscles for 2–10 seconds, relaxation for 2–10 seconds)</td>
<td>Took place at least 1 week before surgery; 45-minute single session; evaluated with SF-36® at 6 weeks, 3 months, and 6 months postsurgery</td>
</tr>
<tr>
<td>Centemero et al., 2010 (Italy) 7</td>
<td>118 patients with prostate cancer (stage cT1-cT2 a/b) with mean ages of 60.5 years and 57.5 years in the intervention and control groups, respectively; single center</td>
<td>Pelvic floor muscle training (30 minutes daily at home)</td>
<td>Took place 30 days before surgery; occurred twice per week for 8 weeks; evaluated with International Continence Society male short form questionnaire at 1 and 3 months postsurgery</td>
</tr>
<tr>
<td>Dronkers et al., 2010 (Netherlands) 8</td>
<td>42 patients with colorectal cancer with mean ages of 71.1 years and 68.8 years in the intervention and control groups, respectively; single center</td>
<td>Warm-up, resistance training of the lower limb extensors, inspiration muscle training (15 minutes), aerobic training (20–30 minutes), and cooldown; when not training in the outpatient department, walking or cycling (30 minutes per day) was completed at home.</td>
<td>Took place 2–4 weeks before surgery; 60 minutes per session; occurred twice per week for 2–4 weeks; moderate intensity; evaluated with EORTC QLQ-C30 before and after surgery</td>
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<tr>
<td>Dunne et al., 2016 (United Kingdom) 8</td>
<td>37 patients with stage IV colorectal cancer with liver metastasis with mean ages of 61 years and 62 years in the intervention and control groups, respectively; single center</td>
<td>Warm-up, cardiopulmonary exercise testing with ergometer (30 minutes), and cooldown</td>
<td>Took place 4 weeks before surgery; 30 minutes per session; occurred 3 times per week for 4 weeks; moderate to vigorous intensity; evaluated with SF-36 pre- and postsurgery</td>
</tr>
<tr>
<td>Lai et al., 2017 (China) 8</td>
<td>101 patients with primary non-small cell lung cancer with mean ages of 63.8 years and 64.6 years in the intervention and control groups, respectively; single center</td>
<td>High-intensity pulmonary preoperative rehabilitation program: (a) deep breathing exercises 3 times per day, with 20 breaths per session, (b) 15–30 minutes of abdominal breathing exercises twice per day, and (c) aerobic endurance training for 30 minutes per day</td>
<td>Took place 7 days before surgery; 70 minutes daily for 1 week; evaluated with EORTC QLQ-C30 pre- and postsurgery</td>
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<tr>
<td>Sebio Garcia et al., 2017 (Spain) 6</td>
<td>40 patients with non-small cell lung cancer with mean ages of 70.9 years and 69.4 years in the intervention and control groups, respectively; single center</td>
<td>Endurance training (calibrated cycle ergometer for 30 minutes), resistance training (elastic band), and breathing exercise (twice daily at home)</td>
<td>Took place an average of 54.5 days before surgery; 60 minutes per session; 3–5 times per week; 8–25 sessions, with mean of 16 sessions; intensity depended on patients’ tolerance; evaluated with SF-36 before surgery, after hospital discharge, and 3 months postsurgery</td>
</tr>
<tr>
<td>Tienforti et al., 2012 (Italy) 5</td>
<td>32 patients with prostate cancer (stage cT1–cT2 a/b) with mean ages of 64 years and 67 years in the intervention and control groups, respectively; single center</td>
<td>Pelvic floor muscle training (each 10-minute session consists of contracting the sphincter muscles for 5 seconds and relaxing for 5 seconds; 3 sets are completed daily at home) and biofeedback</td>
<td>Took place 1 day before surgery; 30 minutes per session; single session; evaluated with International Prostate Symptom Score quality of life at 1 month, 3 months, and 6 months postsurgery</td>
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Continued on the next page
### TABLE 1. Characteristics of Studies Included in Systematic Review (Continued)

<table>
<thead>
<tr>
<th>Source and Quality</th>
<th>Sample and Setting</th>
<th>Intervention</th>
<th>Timing of Intervention</th>
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<tr>
<td><strong>Psychological cancer prehabilitation programs</strong></td>
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<tr>
<td>Garssen et al., 2013 (Netherlands) 4</td>
<td>70 patients with stage I–III breast cancer with mean ages of 52 years and 54 years in the intervention and control groups, respectively; single center</td>
<td>Stress management training: relaxation, guided imagery techniques, active coping, alert relaxation, and a positive attitude toward change</td>
<td>Took place 5 days and 1 day before surgery and 2 days and 30 days after surgery; 45–60 minutes for each session; 4 sessions during 5-week period; evaluated with EORTC QLQ-C30 (6 days and 1 day presurgery and 2, 5, 30, and 90 days postsurgery)</td>
</tr>
<tr>
<td>Katz et al., 2004 (Canada) 7</td>
<td>20 patients with oral cancer (T1–T4) with mean ages of 53.4 years and 60 years in the intervention and control groups, respectively; single center</td>
<td>A 2-part booklet was used: preoperative (oral cancer, the healthcare team, the surgery, improving health before surgery, coping with anxiety, talking with the healthcare team, and meeting family and friends in the hospital) and predischarge (staying healthy after surgery, swallowing and speaking after surgery, dealing with social situations, coping with emotional stress, personal growth after oral cancer, and additional resources).</td>
<td>Took place prior to actual admission to hospital; 60–90 minutes; 2 sessions (preoperative and predischarge) during 1-week period; evaluated with Atkinson Life Happiness Rating Scale and EORTC QLQ-C30 (presurgery, predischarge, and 3 months postsurgery)</td>
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<tr>
<td>Parker et al., 2009 (United States) 7</td>
<td>105 patients with stage I–III prostate cancer with mean ages of 59.8 years and 60.9 years in the intervention and control groups, respectively; 3 centers</td>
<td>Stress management training: relaxation, coping skills, information about prostate cancer, and management of adverse effects</td>
<td>Took place 1–2 weeks before surgery; session 1 was 60–90 minutes; session 2 was 10–15 minutes; 2 sessions during period of 1–2 weeks; evaluated with SF-36 and Prostate Cancer Index (baseline and 6 weeks, 6 months, and 12 months postsurgery)</td>
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<tr>
<td><strong>Multimodal cancer prehabilitation programs</strong></td>
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<tr>
<td>Gillis et al., 2014 (Canada) 8</td>
<td>76 patients with stage I–III colorectal cancer with mean ages of 65.7 years and 66 years in the intervention and control groups, respectively; single center</td>
<td>Trimodal: exercise (aerobic exercise and resistance bands), nutrition (whey protein supplement), and coping strategy to reduce anxiety (relaxation exercises based on imagery and visualization, used with breathing exercises)</td>
<td>Took place 4 weeks before surgery; exercise was 50 minutes at home at least 3 days per week; nutrition was daily supplement (1.2 g of protein per kg of body weight); coping strategy to reduce anxiety was a single 60-minute session with a trained psychologist and practice with disc at home 2–3 times per week; 12-week period; evaluated with SF-36 (baselines, presurgery, and 4 and 8 weeks postsurgery)</td>
</tr>
<tr>
<td>He et al., 2015 (China) 7</td>
<td>86 patients with stage IV colorectal cancer with liver metastasis with mean ages of 56.3 years and 60.4 years in the intervention and control groups, respectively; single center</td>
<td>Enhanced recovery after surgery program: presurgery education, preoperative preparation, and postoperative rehabilitation</td>
<td>Evaluated with EuroQol-5D at 2, 4, 6, 8, 10, 20, 30, and 40 days postsurgery</td>
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</table>

**Note.** The 11-item Physiotherapy Evidence Database (PEDro) scale was used to rate studies. Each item received either a yes (1 point) or a no (0 points) response. One item was excluded. Total PEDro scores ranged from 0–10 points, with higher scores indicating higher study quality.
Prehabilitation Program Characteristics

Physical cancer prehabilitation programs: Seven studies involved physical cancer prehabilitation programs in people with prostate, colorectal, and lung cancers (Burgio et al., 2006; Centemero et al., 2010; Dronkers et al., 2010; Dunne et al., 2016; Lai et al., 2017; Sebio García et al., 2017; Tienforti et al., 2012). The goal of the programs was to improve patients’ cardiopulmonary function (Dronkers et al., 2010; Dunne et al., 2016; Lai et al., 2017; Sebio García et al., 2017) or pelvic floor muscle function (Burgio et al., 2006; Centemero et al., 2010; Tienforti et al., 2012) through exercise.

One of the cancer prehabilitation programs focusing on cardiopulmonary function trained people with cancer using an electromagnetically braked cycle ergometer for 30 minutes three times a week for four weeks; significantly improved QOL was noted in the intervention group, but no significant difference was found between groups (Dunne et al., 2016). Another study of a prehabilitation program aimed at improving cardiopulmonary function was comprised of endurance training, resistance training, and breathing exercises; the program was completed during 16 one-hour sessions and took place an average of 54.5 days before surgery (Sebio García et al., 2017). Overall, it showed that cancer prehabilitation programs focused on cardiopulmonary function can significantly improve the physical component summary scores of the SF-36 at three months postsurgery; this was noted in the intervention and control groups.

Regarding improvements to pelvic floor muscle function, only one study on a cancer prehabilitation program conducted 30 days before surgery showed any differences between the intervention and control groups (Centemero et al., 2010). In this study, the intervention took place during an eight-week period; the 30-minute intervention occurred twice per week.

Psychological cancer prehabilitation programs: The three studies that examined psychological cancer prehabilitation programs involved different types of cancer (breast, oral, and prostate) (Garssen et al., 2013; Katz, Irish, & Devins, 2004; Parker et al., 2009). Two of these studies were conducted using stress management techniques, including relaxation, guided imagery, and promotion of active coping and a positive attitude (Garssen et al., 2013; Parker et al., 2009). The other study used a psychoeducational program that provided information about oral cancer and its treatment, along with effective coping strategies (Katz et al., 2004). However, only the study by Garssen et al. (2013) demonstrated effectiveness of the program in improving QOL in the intervention group. This program consisted of four sessions (two prior to surgery and two after surgery) during a five-week period; each session was about 45-60 minutes in length.

Multimodal cancer prehabilitation programs: Of the two multimodal cancer prehabilitation programs, one was an enhanced recovery after surgery (ERAS) program comprising the presurgery, preoperative preparation, and postoperative rehabilitation periods (He, Lin, Xie, Huang, & Yuan, 2015), whereas the other was a trimodal program containing exercise, nutrition with whey protein supplement, and coping strategy training for anxiety reduction (Gillis et al., 2014). However, no differences were observed between the intervention and control groups in these studies.

Discussion

Unimodal and Multimodal Programs

This is the first systematic review of cancer prehabilitation programs’ effects on QOL in people with cancer. Most studies examined interventions within unimodal cancer prehabilitation programs. Cancer prehabilitation programs that focused on improving cardiopulmonary function through exercise (n = 4), improving pelvic floor muscle function (n = 3), and providing stress management training (n = 2) were most prevalent. The studies involved people with various types of cancer, but the most common cancer types were prostate and colorectal. Only four studies (two focusing on improving cardiopulmonary function, one focusing on improving pelvic floor muscle function, and one focusing on providing stress management training) showed any differences between the intervention and control groups; these studies provided the intervention at four to eight weeks prior to surgery.

The results of the multimodal cancer prehabilitation programs examined in this review are not consistent with the previous review conducted by Silver and Baima (2013). Although Silver and Baima (2013) suggested that multimodal prehabilitation programs incorporating physical and psychological interventions may be more effective than unimodal prehabilitation programs (this was proven in diverse populations of people without cancer), evidence is lacking because they did not implement the standardized steps of systematic review. In addition, most of the studies discussed by Silver and Baima (2013) involved unimodal prehabilitation programs; consequently, their conclusions need further verification. Multimodal prehabilitation programs also were developed later than unimodal programs (Silver & Baima,
Physical cancer prehabilitation programs: Two types of physical cancer prehabilitation programs were examined in this review: cardiopulmonary exercise \((n = 4)\) and pelvic floor muscle training \((n = 3)\). In addition, just three studies showed that physical cancer prehabilitation programs could improve QOL in people with cancer (Centemero et al., 2010; Dunne et al., 2016; Sebio García et al., 2017).

Of the cancer prehabilitation programs focusing on cardiopulmonary function, two demonstrated improvements in QOL. However, the results were varied. In the cancer prehabilitation program using a cycle ergometer, significant improvement in QOL was noted only in the intervention group (Dunne et al., 2016). In the cancer prehabilitation program focusing on endurance training, resistance training, and breathing exercises, significant differences were found only in the physical component summary scores of the SF-36 between the intervention and control groups (Sebio García et al., 2017).

Variance in results could be attributed to the small sample size of the studies with physical cancer prehabilitation programs, ranging from 37–118 and with small effect size \((0.04–0.27)\) (Burgio et al., 2006; Centemero et al., 2010; Dronkers et al., 2010; Dunne et al., 2016; Lai et al., 2017; Sebio García et al., 2017). Two studies in which the mean effect size was 0.11 did not show significant QOL differences within or between the intervention and control groups (Dronkers et al., 2010; Lai et al., 2017), and two studies in which the mean effect size was 0.2 showed significantly different results between the intervention and control groups (Dunne et al., 2016; Sebio García et al., 2017). Consequently, future research on physical cancer prehabilitation programs needs to feature larger sample sizes to further examine the effects of interventions.

In addition, within the physical cancer prehabilitation programs focusing on cardiopulmonary function that were examined in this review, the intensity of the training program played a significant role (Scharhag-Rosenberger et al., 2015). The American Cancer Society (2017) and the American College of Sports Medicine (Schmitz et al., 2010) recommend that people with cancer perform at least 150 minutes of moderate intensity or 75 minutes of vigorous intensity exercise per week, which can increase cardiopulmonary function. However, only two of the studies (Dronkers et al., 2010; Dunne et al., 2016) with physical cancer prehabilitation programs examined in this review indicated that the exercise intensity was at a moderate or a moderate to vigorous level.
This exercise intensity signifies a 55%–75% maximal heart rate (Dronkers et al., 2010) or less than 60% to more than 90% oxygen uptake (Dunne et al., 2016). However, these studies did not note how the intensity level was measured or whether the participants reached the intended intensity of the training program when participating in the intervention. Participants in the Dronkers et al. (2010) study were to walk or cycle 30 minutes per day at home, but the intensity of this exercise was not measured at home and compliance was not reported. Although compliance monitoring may be difficult, compliance is an important factor influencing the results of an intervention and should be carefully monitored (Gearing et al., 2011).

Among cancer prehabilitation programs focusing on pelvic floor muscle training, only one study (Centemero et al., 2010) showed significantly improved QOL in people with prostate cancer; the 30-minute intervention in this study was provided twice weekly in the eight weeks prior to surgery. In other studies with programs focusing on pelvic floor muscle training, the intervention consisted of a single session of 30–45 minutes offered seven days prior to surgery; improved QOL was not noted, which calls into question the effectiveness of a single intervention session (Burgio et al., 2006; Tienforti et al., 2012).

Studies have shown that people with prostate cancer have lower levels of anxiety, depression, and social inhibition and increased QOL with improvements in urinary continence (Zhang, Strauss, & Siminoff, 2006). Pelvic floor muscle training is considered to be the first-line treatment for urinary incontinence (Newman & Wein, 2013). In studies in which pelvic floor muscle training programs demonstrated significant improvements to urinary continence, interventions were conducted at least twice (Filocamo et al., 2005; Sweppel, Kreder, & See, 2001; Van Kampen et al., 2000). The two studies in which the results did not show improved QOL (Burgio et al., 2006; Tienforti et al., 2012) incorporated only a single session.

A significant outcome of interventions focusing on pelvic floor muscle training is whether people with cancer can correctly identify the pelvic muscles to perform the exercises. Newman and Wein (2013) suggested that researchers should check with participants to determine if the correct muscles are being used after the first training session. Accordingly, having at least two intervention sessions can help researchers verify whether the exercises are being correctly performed prior to surgery. One recommendation for physical cancer prehabilitation programs focusing on pelvic floor muscle training is to devote the first session to teaching the exercises to participants and the second and additional sessions to determining whether participants are correctly performing the exercises.

All studies centered on cancer prehabilitation programs with pelvic floor muscle training interventions asked participants to practice these exercises daily at home. However, the frequency of this practice is important to consider. Newman and Wein (2013) suggested that people with cancer should perform at least 45–60 pelvic floor muscle exercises per day.

Urinary incontinence is the most common complication after surgery in people with prostate cancer, and it may cause anxiety, depression, and social inhibition, which can affect an individual’s psychological and social QOL (Parekh et al., 2003). The severity and duration of urinary incontinence also affects QOL and should be considered in the intervention (Parekh et al., 2003). Two studies (Centemero et al., 2010; Tienforti et al., 2012) examined in this review used specific QOL instruments in people with cancer (International Continence Society male short form questionnaire in the former study, International Prostate Symptom Score quality of life in the latter study). Choosing specific instruments to assess participants’ QOL should be considered in the research design process.

**Psychological cancer prehabilitation programs:**

For this review, two studies (Garssen et al., 2013; Parker et al., 2009) were examined that looked at psychological cancer prehabilitation programs focusing on stress management training in people with early-stage breast or prostate cancer. However, just the study by Garssen et al. (2013) demonstrated improvement in overall QOL. These studies varied in terms of content and intervention dose. In the Garssen et al. (2013) study, the intervention was administered prior to surgery (5 days before and 1 day before) and after surgery (2 days after and 30 days after); the intervention was also given for a total of 180–240 minutes during five weeks, compared to 70–105 minutes in one to two weeks in the Parker et al. (2009) study.

Rehse and Pukrop (2003), who conducted a review concerning the effects of a psychosocial intervention on QOL in people with cancer, found that at least 12 weekly intervention sessions are needed to improve QOL in people with cancer; they attributed this need to the significance of the relationship between the psychologist and the person with cancer, particularly the stability and level of trust established, in psychosocial interventions. Psychological cancer
prehabilitation programs may need at least four intervention sessions, with each session lasting 45–60 minutes, to improve the effect of the intervention on QOL (Rehse & Pukrop, 2003).

Trained psychologists play an important role in guiding people with cancer in psychological cancer prehabilitation programs (Gearing et al., 2011), but two studies (Garssen et al., 2013; Parker et al., 2009) focusing on stress management training stated only that the interventions were conducted by a clinical psychologist and did not provide any details about his or her professional experience. Adequate training and management of those who administer interventions are necessary, particularly for social, psychological, and behavioral interventions (Gearing et al., 2011). The effect size of the Garssen et al. (2013) study was 0.29–0.32 among four QOL measurement time points (days 2, 5, 30, and 90 postsurgery), which is consistent with the effect size of 0.31 in the Rehse and Pukrop (2003) study.

Limitations
This systematic review has some limitations, and the results should be interpreted with caution. For example, most of the treatment allocation was not concealed, and blinding was not performed. Although it was not possible to blind participants to the intervention, the data collectors should have been blinded for better quality assurance during data collection. In addition, although this review included a greater number of randomized, controlled trials than previous systematic reviews of cancer prehabilitation programs, the number of studies was still relatively small. Therefore, meta-analysis could not be conducted. Finally, multimodal cancer prehabilitation programs have been noted in various reviews (Looijaard, Slee-Valentijn, Otten, & Maier, 2017; Loughney & Grocott, 2016), but only two studies examining multimodal cancer prehabilitation programs were selected for this review. Consequently, the effects of multimodal cancer prehabilitation programs on QOL could not be fully studied in this review.

Implications for Nursing
In this review, the authors found that physical cancer prehabilitation programs provided four to eight weeks before surgery and psychological cancer prehabilitation programs consisting of four sessions, each lasting 45–60 minutes, during a five-week period may improve QOL. Cancer prehabilitation programs may be a useful way to promote QOL during the continuous process of cancer care. Oncology nurses could provide various interventions to patients who decide to undergo surgery. In terms of physical care, nurses could recommend that people with cancer perform cardiopulmonary exercise of a moderate to vigorous intensity (e.g., electromagnetically braked cycle ergometer, resistance training) for 30–60 minutes three to five times each week, depending on their tolerance; this exercise should begin sometime between cancer diagnosis and pretreatment. In terms of psychological care, oncology nurses could teach stress management skills (e.g., deep breathing, strategies for coping with anxiety, relaxation techniques) to help decrease patients’ stress related to cancer or its treatment.

In addition, nurse researchers should make sure that the QOL instruments used are specific and relate to the content of the cancer prehabilitation program, the cancer type, and the time points for evaluation. Having a large sample size or an effect size of 0.2 should also be considered, as should ensuring adequate duration of the intervention (i.e., at least 12 weekly sessions). The intensity, duration, and total sessions of the intervention should be reported in the corresponding study. Intervention fidelity and compliance should be considered. In addition, comparing and contrasting the effects of unimodal and multimodal cancer prehabilitation programs on QOL is needed.

Conclusion
Physical cancer prehabilitation programs provided at least four weeks before surgery may improve QOL in people with cancer, and psychological cancer prehabilitation programs focusing on stress management and consisting of at least four sessions of 45–60 minutes each has been shown to improve QOL after surgery. This review found that most studies had been conducted with unimodal physical cancer prehabilitation programs and that, overall, the studies

Knowledge Translation
- Most cancer prehabilitation programs were unimodal and had small sample sizes; fewer than half of the studies examined showed positive findings.
- Physical cancer prehabilitation programs provided four to eight weeks before surgery may improve quality of life (QOL).
- Psychological cancer prehabilitation programs may require at least four sessions, with each session lasting 45–60 minutes, to build a good relationship between the administrator of the intervention and the individual with cancer to improve QOL.
that have been done of cancer prehabilitation programs are varied in terms of study design. In the future, researchers should work to design studies that employ proper instruments, large sample size, strong relationship building between those who administer the interventions and those who take part in it, and compliance monitoring of patients. High-quality randomized, controlled trials with large sample sizes looking at multimodal cancer prehabilitation programs are required to demonstrate the benefits of cancer prehabilitation programs on QOL in people with cancer.

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Chou and Shun contributed to the conceptualization and design and provided statistical support. All authors completed the data collection, provided the analysis, and contributed to the manuscript preparation.

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