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Postoperative Quality of Life in Patients with Peritoneal Carcinomatosis

A Systematic Literature Review

Master's Degree (two years) Project in Surgical Nursing

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Abstract

Background

Today, cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) are believed to have increased survival rate in patients affected by peritoneal carcinomatosis. However, cured patients and long-term survivors have ongoing health care problem after their treatment is successfully completed.

Aim

The aim of this study was to compare quality of life (QoL) of cancer survivors treated with cytoreductive surgery (CRS) plus hyperthermic intraperitoneal chemotherapy (HIPEC) versus current oncological standard care.

Method

Fifteen QLQ-C30 (QLQ-C30, a cancer specific instrument for measurement of QoL) primary research studies that relate to the QoL in CRS-HIPEC recipients and meet pre-set eligibility criteria were selected to conduct a systematic literature review.

Results

The QoL was characterized by high scores at the baseline, a short-term decrease during1-3 month postoperatively. Thereafter, there was an increase in QoL during the subsequent 6-12 months followed by improvement in long-term survivors but there was a decrease in QoL as a result of recurrence. The QoL was similar when compared with the reference groups, but it was lower than in the general population. QoL after CRS and HIPEC can be equivalent to that of well-functioning, disease-free cancer patients.

Conclusion

QoL after CRS and HIPEC can be equivalent to that of well-functioning, disease-free cancer patients. Patients receiving CRS combined with HIPEC need continuum care assistance across hospital, home and other settings to cope with short-term and long-term effects of cancer diagnosis and therapy. Findings suggest a comprehensive approach of care that will consider delivery of adequate clinical information, individuals' preferences, perceptions, and participation in decision-making.

Keywords: *Quality of life, QLQ-C30, Cytoreductive Surgery, Hyperthermic Intraperitoneal Chemotherapy.*

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1 Introduction

Peritoneal carcinomatosis (PC) refers to the condition by which cancer cells from the secondary spread of intra-abdominal tumors such as colorectal cancer, disseminates into peritoneum. Tumor involvement in the peritoneum has previously been regarded as a terminal condition, which requires palliative surgery and chemotherapy. Advances in research has made changes in the different treatment approaches of PC from palliative to curative intent. Since cytoreductive surgery (CRS) has been combined with hyperthermic intraperitoneal chemotherapy (HIPEC), the survival period has increased ranging from six months to up to five years and even longer in selected patients (Alzahrani et al., 2016).

In view of the significant extent of surgery and chemotherapy, this treatment approach remains an extensive and high-risk procedure in which many organs are removed, and a large area of normal anatomy is altered. The surgical procedure alone takes much longer, and it is more painful than other main surgeries performed on the abdominal cavity (Schmidt, Creutzenberg, Piso, Hobbhahn & Bucher, 2008). Subsequently, CRS-HIPEC recipients have postoperative complex health care problems that impair their quality of life (Zhu, Hanna, Boutros & Alexander, 2013; Passot et al., 2014). Traditionally, health care professionals can support patients to improve the overall postoperative quality of life, but the resultant improvement of quality of life depends on the self-care ability of the individual patient (Shahsavari, Matory, Zare,Taleghani & Kaji, 2015).

To move beyond the focus of morbidity and mortality and address the question to PC survivors about their experience, so far, only few nursing studies have been conducted to investigate the perspectives of patients undergoing CRS/HIPEC treatment. These studies indicate that nurses do not always pay attention to issues of care that are required by the patients' condition. Ideally, patients need to be involved in the pathway of treatment, experience a decrease in symptoms associated with PC, and improve their ability to return to a normal level of functioning (Eriksson, Haglund, Leo Swenne & Arakelian, 2014; Leo Swenne, Jangland &Arakelian, 2017; Thaysen, Lomborg & Seibaek, 2019). However, there is a lack of comprehensive approach to understanding symptoms and their impact on recovery of patients with PC. This lack of knowledge contributes to poor symptoms management and poor quality of life (Francescutti et al., 2019).

CRS-HIPEC survivors experience treatment as a turning point stained with worries about their future mixed with hope from uncertain cure. In a long recovery process, distress regarding the return of the disease, financial difficulties, changes in family role, uncertain follow-up care, and feelings of being forgotten by healthcare system remain a major concern (Eriksson et al., 2014; Leo Swenne et al., 2017).

This research was designated to evaluate the benefits of CRS plus HIPEC in comparison to current oncological care standard in an effort to decrease burdensome symptoms and improve quality of life of cancer survivors.

2 Background

2.1 Pathophysiology of Peritoneal Carcinomatosis

The peritoneum is the largest serous membrane with a surface area of approximately 1,8 m^2 which is almost the same size as the surface of the human skin. It is located in the abdominal cavity and continues into the pelvic cavity. The role of peritoneum is to facilitate the movement of visceral organs over each other, maintain equilibrium in the abdominal cavity, and provide defense mechanisms against intra-abdominal infections (Lemoine, Sugarbaker &Van der Speeten, 2016).

Peritoneal carcinomatosis (PC) indicates tumor that spreads from internal organs to the peritoneum and structures of the abdominal cavity. It is a sign of cancer progression in advanced stage with a very poor diagnosis (Van Baal et al., 2017).

Two pathways explain the pathogenesis of PC:

1. Primary tumor of the peritoneum

Primary PC develops directly from cells lining the peritoneum or abdominal cavity. It is a form of cancer that is rare, and accounts for 10% of all peritoneal carcinoma. The most reported cases have been found in women (Coccolini et al., 2013).

2. Dissemination from the primary tumor

Tumor cells detach from the primary tumor and gain access to the peritoneal cavity. Tumor dissemination into the peritoneal cavity could be triggered by spontaneous perforation of the primary cancer or dissection of lymph or blood vessels during surgery. Once the cancer cells are seeded in the peritoneal cavity, they can spread into different anatomical regions of the abdominal cavity (Kusamura et al., 2010). Several gastrointestinal and urogenital malignancies have the potential to disseminate and grow in the peritoneal cavity but other forms of distant tumor such breast cancer can disseminate into peritoneum (Brcher et al., 2012).

Commonly, tumor nodules grow on the intestinal surface causing the progressive obstruction of the gastrointestinal function. Abdominal pain, nausea, and constipation associated with severe weight loss are more recurrent symptoms (Spratt, Edwards, Kubota et al. 1986). In some cases, bloating can be caused by a large amount of fluid accumulated in the abdomen as a result of malignant ascites. The patient may tolerate this situation until abdominal distension becomes intolerable. Death usually occurs as a result of complete bowel obstruction (Spratt, et al. 1986).

2.2 Cytoreductive Surgery (CRS) and Hyperthermic Intraperitoneal Chemotherapy (HIPEC)

The first combination of surgery and heated chemotherapy to treat patients affected with peritoneal carcinomatosis started in the1980's in USA (Spratt, Adcock, Muskovin, Sherrill, & McKeown, 1980). It became popular in the late eighties. Today, patients receiving cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) may live three to five years even longer (Alzahrani et al., 2016).

The combination of CRS+HIPEC consists of first removing any visible cancer cells and then delivering heated chemotherapy directly into the abdominal cavity. The combination of heat and chemotherapy is believed to penetrate more deeply in cancer cells than the standard chemotherapy (Baker, Morzorati & Ellett, 2005). Depending on the extent of disease, the procedure may take more than 10 hours to be completed (Brcher et al., 2012). Traditionally, patients remain in the hospital longer than the median length of hospital stay after post-abdominal surgery (Dranichnikov, Graf & Cashin, 2020).

Following the CRS+HIPEC treatment, the recovery time is associated with an increased risk of various complications and death (Martin et al., 2016). Within 30 days of the procedure, more than fifteen percent of patients may require readmission associated with digestive complications and postoperative infections though the incidence of readmission decreases over the time (Paredes, 2019). The Foster et al. (2019) study was the first comparative analysis to reveal that CRS+HIPEC treatment is safe compared with similar high-risk oncologic procedures.

2.3 Postoperative Recovery and Quality of Life

The World Health Organization (WHO, 1948) defined health as “A state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity”. This definition was the first to establish the dimensions of health in connection with illness and disease. However, health connection to the Quality of Life (QoL) concept was introduced later in medical literature. The first instrument designed as (QoL) measure was introduced as Spitzer’s QL-index (Spitzer et al., 1981). The concept reflected the subjective patient-reported effect of illness and treatment on physical, psychological and social aspects of life that appear to be influenced by human experience, spiritual, cultural and environmental dimensions (Fayers & Machin, 2016, p 4).

Postoperative assessment of quality of life has grown as a standard tool in clinical studies, anywhere therapeutic benefits need to be evaluated. QoL indicates the set of outcomes that contribute to a patient’s well-being or recovery, in which case the effects of illness and treatment on a patient’s recovery profile are evaluated. It is important to realize that preoperative QoL partially predicts how well the recovery process may improve, and positive changes in QoL scores during treatment have prognostic values making it believable of its curative effect (Fayers & Machin, 2016, p. 16).

Postoperative recovery is a process of returning to normal activities, which were impaired after the operation, by regaining control over physical, emotional, social and habitual functions. The goal is to return to the preoperative baseline level of independence in activities of daily living. Three phases have been identified in the postoperative recovery: early, intermediate and late recovery. The early phase begins after discontinuation of anesthesia with a return to consciousness and recovery of vital reflexes mainly airway and motor activity. The stabilization of vital functions occurs in the intermediate phase until readiness to be discharged from care. The late phase is a return to preoperative health standards after discharge from the hospital (Allvin, Berg, Idvall & Nilsson, 2007).

Similar to postoperative recovery, QoL has multiple dimensions of which some are found to overlap with others. In fact, recovery from illness provides better quality of life scores (Berg, Kjellgren, Unosson & Arestedt, 2012). Neville et al. (2014) identified three fundamental dimensions namely *physiological*, *symptomatic* and *functional dimension*. The physiological dimension refers to a return to control over body function and regain of physical strength. The symptomatic dimension indicates a decrease or an increase in symptomatology such as from pain, fatigue, nausea/vomiting, and anxiety/depression while the functional dimension covers mobilization and ability to perform activity of daily living.

In general, postoperative assessment of QoL contains seven dimensions or domains: physical, role, emotional (including anxiety and depression), cognitive, social, symptoms and global health (Fayers & Machin, 2016). Pain, muscle weakness, fatigue, infections, anxiety and postoperative complications have been all reported as predictors of postoperative recovery that affect the QoL of CRS-HIPEC recipients (Martin et al., 2016).

A large number of instruments are being used to assess QoL. Some instruments are intended for general use irrespective of the illness or condition of the patient. These are non-disease-specific instruments that may even be applicable to healthy people hence used in population surveys. The SF-36 is an example of an instrument of general use. Other instruments are condition- or disease-specific such as in research and treatment of cancer (Fayers & Machin, 2016). Only the cancer-specific instrument will be considered in this study. Considering homogeneity of data collected for the purpose of this review, the range of instruments has been reduced to only a QLQ-C30 (Quality of Life Questionnaire-Core 30) cancer specific instrument.

The QLQ-C30 questionnaire was designed for assessing health related quality of life of cancer patients. It is the product of more than a decade of research run by the European Organization for Research and Treatment of Cancer (EORTC). The QLQ-C30 contains 30 -items questionnaire and incorporates five functional scales (physical, role, cognitive, emotional and social), three symptom scales (fatigue, pain, and nausea/vomiting), additional six single items common for cancer patients (dyspnea, loss of appetite, insomnia, constipation, diarrhea and perceived financial difficulties associated with disease), and one overall quality of life scale (Aaronson et al., 1993).

This disease-specific instrument has been used in a wide range of cancer patients since 1993 (see Appendix E) as it has been easily proved to detect differences between patients, treatment effects and changes over time (Fayers &Machin, 2016, p 24).

2.4 Nursing Theory Relevant to Enhance Quality of Life

This section introduces the Orem's Self-Care Deficit Theory. It will include functional scales, and symptoms experienced by CRS-HIPEC patients as components of self-care that influence quality of life.

The concept of *Self-Care* was first introduced and later Self-Care Deficit by Dorothea Orem. The primary source of Orem's ideas was her clinical experience in nursing and reflection on nursing situations. The self-care theory is a combination of three theories*: theory of self-care, theory of self-care deficit and theory of nursing system* (Masters, 2015, p.156). This theory highlights the importance of nurse's support to patients in taking joint responsibility for their health (Alligood, 2014, p.244)

The literature outlines a range of factors to be taken into account in order to enhance self-care activities in cancer survivors. These factors include patient experience, patient-centered care, patient independence, and symptom detection or monitoring.

Patient's experience may reveal self-care needs that should be addressed by healthcare team to provide appropriate comprehensive care (Francescutti et al., 2019). The CRS-HIPEC treatment pathway can be perceived as great-test of stamina or a matter of personal preference to allow patients being fully involved. Since patients perceive this treatment as the only way to survive, they feel under emotional and cognitive pressure while monitoring their symptoms continuously (Dong et al., 2016; Thaysen, Lomborg & Seibaek, 2019).

In the context of cancer survivors, patient-centered care depicts a shift from paternalistic, provider-driven, disease-focused approaches in an effort to support patients to make choices allowing them to manage their self-care needs. A patient-centered care approach is relevant to make a healthcare plan in partnership with patient, family members and a healthcare team. Research evidence supported person-centered web-based intervention to facilitate self-care in patients with cancer undergoing chemotherapy, particularly in symptom monitoring via mobile phones (Young et al., 2020).

The patients' awareness of terminal illness stressed at the time of the initial diagnosis or fear of the return of illness, is the beginning of the most physical and emotional difficulties. The use of symptom diary has improved patient self-care management and enabled discussion around treatment-related symptoms with healthcare team. A qualitative survey assessed patients' use of the diary during chemotherapy treatment. Symptom diary was perceived as a tool for symptom detection, symptom relief as well as symptom management. Diary reports improved communication and discussion between patients and healthcare professionals (Coolbrandt et al., 2017).

Quality of life is not only an important concern for individual cancer patients, but also a matter of importance for nursing care in which QoL assessment is imperative in terms of signposting the need for self-care (Bahrami & Arbon, 2011).

Nausea and vomiting are the most common side effects induced by chemotherapy in cancer patients subsequently, appetite loss, muscle weakness and fatigue may be increased (Richardson, 1991). Beside nausea and vomiting, other symptoms reputed to be disruptive particularly in the first three-month period after CRS-HIPEC treatments include insomnia, pain, diarrhea and constipation. Reduced symptoms can be attained between three-six months after treatment (Piso et al., 2009).

It is important to realize that the above-mentioned symptoms have been recognized since decades to interfere with self-care activities. Subsequently, self-care may be viewed in relation to dependence and interdependence care whereby lay people function on their own behalf to reduce postoperative symptoms with the assistance of the health care system. The blueprint of nursing care is to help patients meeting their therapeutic self-care demands (Richardson, 1991).

In Sweden, the first national comprehensive readmission study for adverse events within the field of CRS and HIPEC, reported 25% of patients requiring intervention within 6 months (Dranichnikov et al, 2020). Evidence that there are limitations in the patient's ability to perform self-care leads to the diagnosis of the self-care deficit. In fact, the notion of self-care deficit specifies when nursing care is required for the patient to meet self-care requisites. In this situation, the patient is more dependent on the nursing care system for current or future demands (Alligood, 2014, p.244).

Deficits in self-care may result from lack of knowledge about the situation, incompetence in performing self-care activities, or malfunctioning of the person in a physical, role, emotional or social aspect due to illness (Alligood, 2014, p.244). Little is known about what self-care actions to cope with the side effects of cancer treatment. Few reports on self-care behavior of cancer patients undergoing chemotherapy have shown that cancer patients lack necessary information promoting self-care (Thaysen et al., 2019).

Being diagnosed with PC and undergoing CRS-HIPEC treatment is a highly personalized experience known with potential risk to disrupt physical, emotional, psychological, spiritual, and social wellbeing of individuals and families (Francescutti et al., 2019). The nursing literature reports that loss of control in cancer survivors over their lives indicates a shift from independence to dependence on family, friends, or healthcare professionals for physical, emotional, or financial support. As the future turns unpredictable, self-care performance may become compromised (Kenten et al., 2019). To improve self-care, patients' experience can assist nurses to determine what kind of care should be addressed in a given situation, but the end point is helping individuals maintain their autonomy (Francescutti et al., 2019). Orem's self-care deficit theory reaffirms maintaining independence over one's own self-care is the best way to promote recovery (Banfield, 2011).

3 Research Problem

Today, cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) may increase survival rate in patients affected by peritoneal carcinomatosis. Combined CRS-HIPEC treatment is associated with good quality of life though it remains in long-term survivors lower than in the general population. Both cured patients and long-term survivors have ongoing health care problem after their treatment is completed (Glockzin, Schlitt & Piso, 2009; Piso et al., 2009). Concerns about CRS and HIPEC benefits remain (Gurusamy et al., 2020).

The CRS-HIPEC treatment option has been perceived as a unique and complex pathway from diagnosis, treatment and discharge to local hospital, rehabilitation or home. Patients and relatives experienced challenges in term of their involvement in decision making as well as expressing their preferences (Thaysen et al., 2019). In few studies, survivors expressed uncertainties deriving from insufficient information with respect to symptom burden over time, lack of follow-up, and blurred rehabilitation plan (Leo Swenne, Cederholm, Gustafsson &Arakelian, 2015; Thaysen et al., 2019). Francescutti et al. (2019). It is imperative to notice the knowledge gap about the severity of side the treatment side effects in most candidates who made informed decisions about pursuing the CRS-HIPEC procedure.

Symptom management is the core of nursing work in improving quality of life of individuals undergoing cancer treatment. Nursing care encompasses strategies to prevent, delay, eradicate or minimize the symptom experience (Mathew, Doorenbos & Vincent, 2020). Although CRS-HIPEC intervention has been performed for decades, the symptom line experienced that disrupt physical, mental, social, and spiritual functioning over time is less known (Research Agenda of the Oncology Nursing Society, 2019). Lack of knowledge on the QoL direction over time of patients who had undergone CRS-HIPEC treatment contributes further to poor symptom management and poor quality of life (Francescutti et al., 2019).

Previous literature reviews addressing the quality of life in CRS-HIPEC patients have collected data from mixed instruments some of which intended for general use (Zhu, Hanna, Boutros & Alexander, 2013; Shan et al., 2014). However, there is no preliminary review based on a cancer-specific tool to date. Nevertheless, little is known from primary sources about what quality of life dimension better improves or worsens postoperatively after CRS-HIPEC intervention. To get insight of QoL pattern, it was quite reasonable to compare CRS-HIPEC treatment with other oncological standard care for the awareness of human response to care delivered. QLQ-C30, a cancer specific instrument was used over the time to collect data from CRS-HIPEC subjects, and compare them with groups of cancer survivors, and the general population.

4 Aim and Research Question

The aim of the present review was to compare quality of life (QoL) of cancer survivors treated with cytoreductive surgery (CRS) plus hyperthermic intraperitoneal chemotherapy (HIPEC) versus current oncological standard care

The use of the acronym PICO (Population, Intervention, Comparison, Outcome) developed for by Bettany-Saltkov& McShery (2016) to investigate the aim of this review led to the following question:

In cancer survivors (P), does the use of HIPEC with CRS (I) versus current oncological standard care (C), provide better QoL outcome (measured by QLQ-C30 scale) (O)?

Current oncological standard care includes any of the following treatments or combinations: surgery, systemic chemotherapy, or radiotherapy.

5 Methods of the Review

5.1 Study Design

This study is a systematic review of primary studies. All available original clinical studies with or without a comparator group, that fit the pre-specified inclusion criteria, were identified, evaluated and interpreted (Snyder, 2019).

5.2 Data Collection

An electronic search was conducted using studies indexed in CINAHL, PubMed, Web of Science and Google scholar databases. CINAHL is the leading database for nurses and allied literature. While PubMed is wider than CINAHL comprising literature from medicine, nursing and other health professions, Web of Science is a multidisciplinary database covering medicine and sciences which are not directly connected to nursing or medicine (Cullum, Ciliska, Haynes & Marks, 2008). Original studies were more valuable to increase the quality of evidence than the secondary sources which were used to provide insights into the gap in the previous studies (Bettany-Saltikov & Mcsherry, 2016). The search involved four key phrases generated from the research question: *Quality of life, QLQ-C30, Cytoreductive Surgery, Hyperthermic Intraperitoneal Chemotherapy.*

Boolean operator AND was used to combine search terms into a search statement to include all terms in each record retrieved. Abstracts were checked if they were directly based on QoL after CRS and HIPEC. Finally, 15 articles were selected after being assessed for their quality according to Caldwell et al. (2011). In the primary search seven articles were selected, two additional articles were found on a secondary search and six in free text search (see Appendix A).

5.3 Inclusion/Exclusion Criteria

Participants in the included surveys were individuals who received CRS-HIPEC treatment and cancer survivors who underwent treatment with standard care regardless of their disease site in both adult males and females. The author of this study used a QLQ-C30 tool irrespective of their primary cancer site (see Appendix C). There was no limitation regarding the year of publication. English and French languages were considered.

Fifteen original articles published between 2005 and 2018 with their abstracts were selected of which one written in French and fourteen in English (fig.1). Peer reviews were verified by Ulrichweb tool, searched online articles from Gothenburg University library and checked for their authors' credentials and affiliation to higher education (Willman, Stoltz & Bahtsevani, 2011). The level of evidence below 25 scores indicating low quality was an exclusion factor (Caldwell et al., 2011) as well as QoL assessed by external QLQ-C30 tools, since the latter are not specific for cancer.

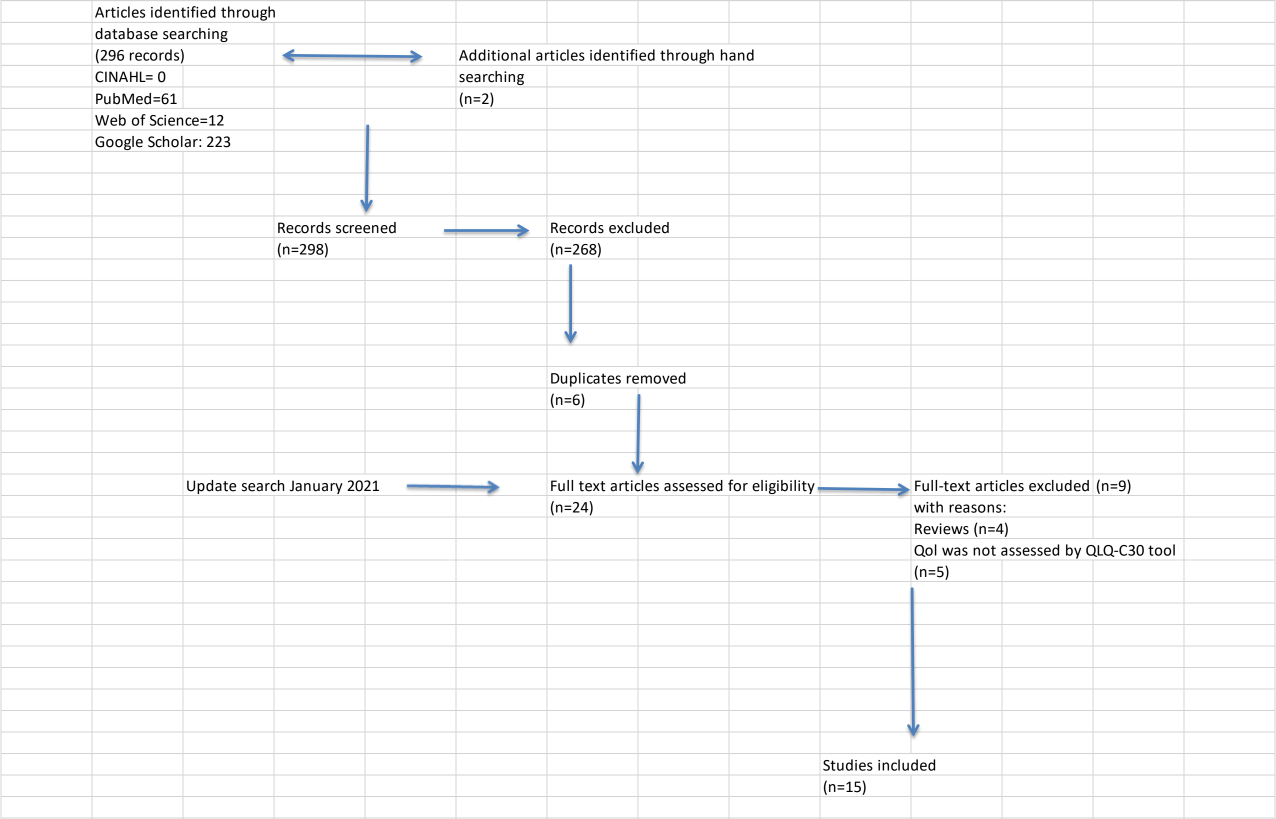


Fig.1: Flowchart of the review

5.4 Quality Assessment of QLQ-C30 Research Articles

The quality assessment of evidence was based on Caldwell et al. (2011) framework. The assessment focused on research design, sampling process, research method, analysis and result (Appendix B). The assessment deals with 18 questions where each question can be answered to provide a holistic assessment with the highest score set to 36. The lowest score of none was given to the question that was not answered at all while a partly or answered question was scoring respectively 1 or 2. In this study, the limit score to exclude a study was set to be lower than 60% (scores lower than 22/36) of the total scores. All studies within the scores between 30 and 34 which was the highest possible value were selected (see Appendix C).

5.5 Data Analysis

According to Bettany-Saltikov and Mcsherry (2016) model, three steps of analysis were considered:

1. Articles were selected based first on their titles and abstracts which was followed by reading full papers several times and summarized to be familiar with its content,
2. Quality assessment of selected papers was carried out by using a specific framework designed by Caldwell et al. (2011)
3. Extracting data from selected articles. The comparison of combined data enabled the author to construct QoL in CRS-HIPEC recipients.

The method involved grouping all items together into two separate groups namely a *Baseline group*, and a *Control /general population group.* Of the 15 reviewed articles, each paper was analyzed, and items extracted, and scores compared according to QLQ-C30 manual (Aaronson et al., 1993). The score is basically linearly transformed into 0-100 points. A higher functioning scale and global health status score represent better function and a better good health status. The higher the symptom scale and specific item score, the more severe are symptoms or problems (Fayers &Machin, 2016). The mean or median scores from the items of interest were compared before and after CRS-HIPEC treatment.

6 Ethical Considerations

All articles were checked for the ethics board approval prior to publication (Stryhn, 2007). In compliance with ethical standards for nursing research, data fabrication; falsification or data misrepresentation in reporting findings from quality assessment of articles were avoided (Houser, 2008). To achieve good quality of evidence, the results are presented objectively regardless of whether they were negative or positive (Polit & Beck, 2018).

CRS+HIPEC treatment has been reported to improve the survival and quality of life in patients with peritoneal carcinomatosis but concerns about its safety remain. Currently, the question under investigation is whether CRS plus HIPEC intervention can provide better outcomes than current standard oncologic management (Gurusamy et al., 2020; Auer et al., 2020).

CRS+HIPEC therapy represents a terminal treatment where patients have not many other choices since definitive cure is unlikely (Nacoti et al., 2014). However, individuals affected with peritoneal metastasis do not have the same chance in terms of accessing treatment because of the high cost of the procedure. People who can afford to cater for the cost, economical support will be anyhow required during a recovery period in which return to work may be difficult (Gurusamy et al., 2020).

It is worth noting that patients undergoing CRS-HIPEC therapy are faced with ethical and social issues. According to World Medical Association (2018), privacy and confidentiality, social vulnerability, health insurance discrimination, and employment discrimination may occur.

Confidentiality deals with the disclosure of information obtained during the course of patient care. In essence, such information shouldn’t be disclosed without the permission of the individual concerned (World Medical Association, 2018).

Before the procedure, patients should be informed not only about its benefits but also the gravity of the risks involved, including postoperative quality of life (Nacoti, et al., 2017). However, this is not always the case. Since patients perceive this treatment as the only way to survive, concerns have been raised about treatment decisions that were taken solely by professionals based on physical state and the spread of the disease (Thaysen et al., 2019).

7 Results

7.1 Study Characteristics

After a careful systematic selection, 15 studies with a total of 678 patients were included for review (Appendix D). Eight studies were meant to compare the QoL of patients after CRS-HIPEC treatment with the control or reference groups: the general population (Schmidt, Dahlke, Klempnauer, Schlitt & Piso, 2005), disease free cancer patients who were not on active treatment (Tan et al., 2013), postoperative complication after CRS-HIPEC (Hamilton, Taylor, Cannell, McCart & Govindarajan, 2016), secondary CRS-HIPEC treatment (Zeng et al., 2017), and cancer survivors received standard care (Zenasni et al., 2009; Chia et al., 2014; Liu et al., 2016; Düzgün, Sarıcı & Gökçay, 2018). The comparison covers a 6-48 months’ period.

The QoL of the seven remaining studies was assessed before and after CRS-HIPEC treatment on different periods of time. The follow-up period spanned from 1to 48 months. The key element in these studies was to compare the QoL at the baseline with a recovery or a recurrent period.

The results of this systematic review are presented in two categories that emerged from the analysis: *baseline group* and *control/general population group*. The QoL scores of each group are arranged in three subcategories: *functional scale, symptoms and global health status.*

7.2 The QLQ-C30 in the Baseline Group

The baseline group was characterized by a high functional scale, a high global health scale, and a lower symptom scale in all studies. Financial difficulties were not mentioned as a problem before operation. However, emotional scores were lower meaning difficulties in emotional functioning (Jess, Iversen, Nielsen, Hansen, Laurberg & Rasmussen, 2008; Alves, Mohamed, Yadegarfar, Youssef & Moran, 2010; Stearns et al., 2018). Symptoms of nausea-vomiting, pain, insomnia, appetite loss, and constipation were mentioned in six studies though less recurring before treatment

(Jess et al., 2008; Alves et al.,2010; Tsilimparis et al., 2013; Albertsmeier, Hauer, Niess, Werner, Graeb & Angele, 2014; Chia, Tan, Lim, Soo & Teo, 2016; Stearns et al., 2018). (Table.1).

Except the emotional function, the functional scale was impaired in all baseline group studies in a period 1-3 months postoperatively but later improved to the baseline level after 6- 24 months. Five studies underscored physical and cognitive impairment in the first six-month functional recovery period (Jess et al., 2008; Lim et al., 2010; Alves et al., 2010 Tsilimparis et al., 2013). The improvement of functional scores has been observed in long-term survivors who lived more than 7 years later after treatment (Stearns et al., 2018).

The emotional function was the unique variable which improved above the baseline as early as three months postoperatively (Jess et al., 2008; Alves et al., 2010; Tsilimparis et al., 2013). However, a slow recovery was indicated in cognitive functioning that did not return to baseline until 24 months or later after treatment (Jess et al., 2008; Tsilimparis et al., 2013; Stearns et al., 2018). Only one study reported a lack of significant alteration in cognition (Albertsmeier et al., 2014).

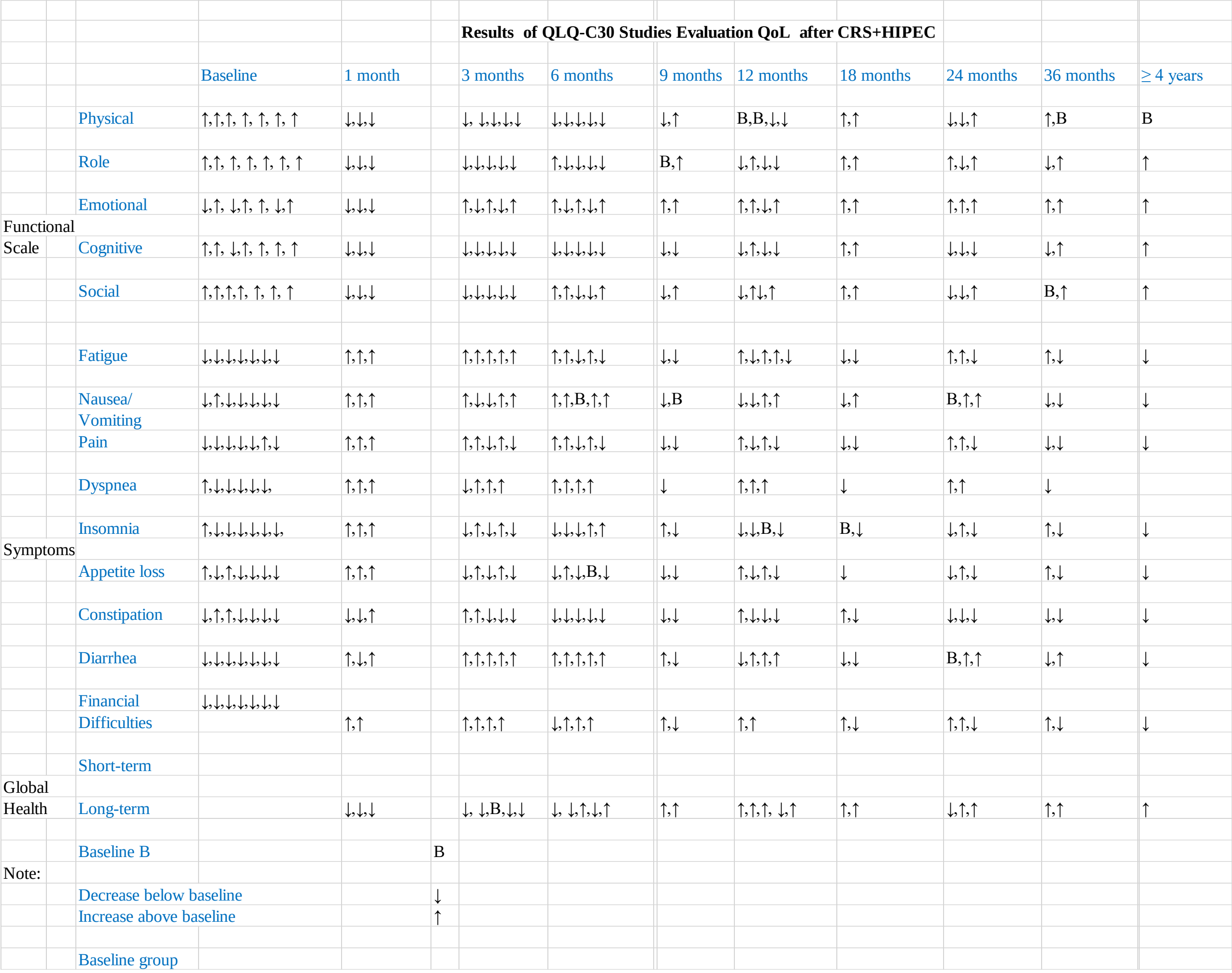
High levels of symptoms representing worsening or problems were not reported in all baseline groups before CRS+HIPEC treatment. However, symptoms increased for a period of one to three months after surgery. Improvement started to appear at 6-12 months. Appetite loss, constipation, and insomnia returned to baseline between 12-24 months after surgery (Jess et al., 2008; Alves et al., 2010; Tan, Lim, Soo & Teo, 2016). On the contrary, pain, fatigue, dyspnea, and diarrhea did not return to preoperative values within the same period (Jess et al., 2008; Lim et al., 2010; Tsilimparis et al., 2013).

Financial difficulties increased during the first 12 months after surgery (Jess et al., 2008; Lim et al., 2010; Albertsmeier et al., 2014). They improved thereafter, but increased again after 2 years (Jess et al., 2008; Tsilimparis et al., 2013)

The global health status returned to baseline after 12- 24 months after surgery (Jess et al., 2008; Alves et al., 2010; Tsilimparis et al., 2013; Albertsmeier et al., 2014). Only one study showed a return of global health status above the baseline i.e., improvement (Albertsmeier et al., 2014). Short-term global health status was impaired in all baseline studies. Nevertheless, the global health status was improved in long-term survivors (Jess et al., 2008; Lim et al., 2010; Alves et al., 2010; Tsilimparis et al., 2013; Albertsmeier et al., 2014).

The table below deals with studies in which QoL was assessed both before and after CRS+HIPEC treatment. Data collected before treatment was used as baseline to follow recovery improvement with a different period of time.

Table 1. *QLQ-C30 Baseline Studies*



					Results of QLQ-C30 Studies Evaluation QoL after CRS+HIPEC							
		Baseline	1 month		3 months	6 months	9 months	12 months	18 months	24 months	36 months	≥ 4 years
	Physical	↑,↑,↑, ↑, ↑, ↑, ↑	↓,↓,↓		↓, ↓,↓,↓,↓	↓,↓,↓,↓,↓	↓,↑	B,B,↓,↓	↑,↑	↓,↓,↑	↑,B	B
	Role	↑,↑, ↑, ↑, ↑, ↑, ↑	↓,↓,↓		↓,↓,↓,↓,↓	↑,↓,↓,↓,↓	B,↑	↓,↑,↓,↓	↑,↑	↑,↓,↑	↓,↑	↑
	Emotional	↓,↑, ↓,↑, ↑, ↓,↑	↓,↓,↓		↑,↓,↑,↓,↑	↑,↓,↑,↓,↑	↑,↑	↑,↑,↓,↑	↑,↑	↑,↑,↑	↑,↑	↑
Functional Scale	Cognitive	↑,↑, ↓,↑, ↑, ↑, ↑	↓,↓,↓		↓,↓,↓,↓,↓	↓,↓,↓,↓,↓	↓,↓	↓,↑,↓,↓	↑,↑	↓,↓,↓	↓,↑	↑
	Social	↑,↑,↑,↑, ↑, ↑, ↑	↓,↓,↓		↓,↓,↓,↓,↓	↑,↑,↓,↓,↑	↓,↑	↓,↑↓,↑	↑,↑	↓,↓,↑	B,↑	↑
	Fatigue	↓,↓,↓,↓,↓,↓,↓	↑,↑,↑		↑,↑,↑,↑,↑	↑,↑,↓,↑,↓	↓,↓	↑,↓,↑,↑,↓	↓,↓	↑,↑,↓	↑,↓	↓
	Nausea/ Vomiting	↓,↑,↓,↓,↓,↓,↓	↑,↑,↑		↑,↓,↓,↑,↑	↑,↑,B,↑,↑	↓,B	↓,↓,↑,↑	↓,↑	B,↑,↑	↓,↓	↓
	Pain	↓,↓,↓,↓,↓,↑,↓	↑,↑,↑		↑,↑,↓,↑,↓	↑,↑,↓,↑,↓	↓,↓	↑,↓,↑,↓	↓,↓	↑,↑,↓	↓,↓	↓
	Dyspnea	↑,↓,↓,↓,↓,↓,	↑,↑,↑		↓,↑,↑,↑	↑,↑,↑,↑	↓	↑,↑,↑	↓	↑,↑	↓	
	Insomnia	↑,↓,↓,↓,↓,↓,↓,	↑,↑,↑		↓,↑,↓,↑,↓	↓,↓,↓,↑,↑	↑,↓	↓,↓,B,↓	B,↓	↓,↑,↓	↑,↓	↓
Symptoms												
	Appetite loss	↑,↓,↑,↓,↓,↓,↓	↑,↑,↑		↓,↑,↓,↑,↓	↓,↑,↓,B,↓	↓,↓	↑,↓,↑,↓	↓	↓,↑,↓	↑,↓	↓
	Constipation	↓,↑,↑,↓,↓,↓,↓	↓,↓,↑		↑,↑,↓,↓,↓	↓,↓,↓,↓,↓	↓,↓	↑,↓,↓,↓	↑,↓	↓,↓,↓	↓,↓	↓
	Diarrhea	↓,↓,↓,↓,↓,↓,↓	↑,↓,↑		↑,↑,↑,↑,↑	↑,↑,↑,↑,↑	↑,↓	↓,↑,↑,↑	↓,↓	B,↑,↑	↓,↑	↓
	Financial Difficulties	↓,↓,↓,↓,↓,↓,↓	↑,↑		↑,↑,↑,↑	↓,↑,↑,↑	↑,↓	↑,↑	↑,↓	↑,↑,↓	↑,↓	↓
	Short-term											
Global Health	Long-term		↓,↓,↓		↓, ↓,B,↓,↓	↓, ↓,↑,↓,↑	↑,↑	↑,↑,↑, ↓,↑	↑,↑	↓,↑,↑	↑,↑	↑
	Baseline B			B								
Note:												
	Decrease below baseline			↓								
	Increase above baseline			↑								
	Baseline group											

(Jess et al., 2008 ; Lim et al., 2010 ; Alves et al., 2010 ; Tsilimparis et al., 2013 ; Albertsmeier et al., 2014 ; Chia et al., 2016 ; Stearns et al., 2018).

7.3 The QLQ-C30 in Control/General Population Group

At 6-12 months' follow-up, the score of functional scale was similar between patients receiving CRS-HIPEC treatment and oncology patients who received standard care (Zenasni et al., 2009; Tan et al., 2013; Chia et al., 2014; Liu et al., 2016; Düzgün et al., 2018). Functional scores improved in patient who received a second CRS-HIPEC treatment (Zeng et al., 2017).

Three studies reported similarities in symptom scores in CRS-HIPEC groups compared to the control groups (Zenasni et al., 2009; Tan et al., 2013; Chia et al., 2014) though fatigue, nausea/vomiting, insomnia, pain, and diarrhea have all been reported to be more recurrent in CRS-HIPEC patients in a period of 6-48 months but without significant differences (Schmidt, Dahlke, Klempnauer, Schlitt & Piso, 2005; Hamilton, Taylor, Cannell, McCart & Govindarajan, 2016; Liu et al., 2016). All symptom scores were high before the second CRS-HIPEC intervention. They decreased significantly after intervention thereby showing the effect of the secondary CRS-HIPEC to improve quality of life (Zeng et al., 2017).

In the reference groups (Zenasni et al., 2009; Tan et al., 2013; Chia et al., 2014; Hamilton et al., 2016; Liu et al., 2016; Düzgün, Sarıcı & Gökçay, 2018) more than 70 % of patients did not report financial difficulties but they had more financial problems compared with the reference population norms in a period of 6-60 months (Stearns et al., 2018).

The global health status improved significantly in patients who underwent the second CRS-HIPEC treatment (Zeng et al., 2017). It was low in long-term survivors compared to the general population norms (Schmidt et al., 2005) though it was without a significant difference between CRS-HIPEC recipients and patients undergoing classic surgical intervention, disease-free cancer patients or patients operated without HIPEC. Six months after surgery, the QLQ-C30 instrument could not detect any difference concerning the QoL between patients undergoing CRS-HIPEC treatment and patients undergoing classical surgery (Zenasni et al., 2009; Tan et al., 2013; Liu et al., 2016; Düzgün, Sarıcı & Gökçay, 2018). In addition, the QoL scores were similar after six months between patients who had undergone CRS-HIPEC treatment with and without complications (Hamilton et al., 2016).

8 Discussion

8.1 Methodological Considerations

This paper is a review of primary scientific articles that includes 15 articles. The use of several databases was recommended to get the research question answered. The author identified a research problem within a topic of nursing interest regarding postoperative quality of life. To date, this is the first study to review QLQ-C30 studies linking data generated from baseline and from control groups or the general population after CRS+HIPEC.

The purpose of the research was to make contribution in finding a solution to the problem by generating relevant evidence. The research aim was used as a guide to set a limit to the type of data to collect and determine patient' characteristics. Given various phases of recovery experienced by cancer survivors, evaluation of QoL was best investigated in longer follow-up period studies, and it proved an invaluable tool to identify more gaps from individuals' experience of their ability to function.

Only primary sources were considered to increase evidence-based materials. One article written in French was ordered via the library as it only had the abstract available online. Of the total sample, 80 % of selected articles were not older than 10 years. Nine studies were undertaken in Europe, five in Asia and one in Canada. Studies covering other continents were not available. At the moment, there is limited data describing the QoL after CRS-HIPEC assessed by the QLQ-C30 instrument. Only 15 articles were found with unplanned exclusion of evidence-based nursing material, as they were not available at the time of data collection. Of the 15 articles that were selected, none was found in CINAHL database (Appendix A).

The primary approach was to use as much as data from a prospectively designed study in which a pre-surgery assessment of QoL was assessed as the baseline, followed by postoperative assessments at different periods of time trends and compared to baseline scores (Zhu et al., 2013). However, the advantage of using control studies could not be neglected in terms of stipulating external factors that may affect the QoL after CRS-HIPEC treatment. A diversity of included studies from different geographic areas may be the main limitation of this literature review.

Patients experience CRS+HIPEC treatment as a turning point generating uncertainties as well as barriers to meeting self-care requisites (Eriksson, Haglund, Leo Swenne &Arakelian, 2014). The oncology nursing practice is driven by a number of theories and conceptual models that provide frameworks essential for a holistic care where a collaboration with the patient and her /his family is necessary in all aspects of care (Payne, 2012, p.48). The underlying theory guiding this work displayed self-care as a tool to improve quality of life not only in the immediate postoperative recovery after discharge from the hospital but also throughout a long-term follow-up.

The credibility of this study relies on the compatibility of the findings with both in the baseline group and the control or reference group besides the compliance with ethical standards implemented by evaluating the quality of articles relevant to the aim before selection (Polit & Beck 2018). To ensure validity, the author collaborated with peer debriefs through discussions (P.B., J.H., B.L., and B.S) re-analysis of raw materials and verification of the link between the purpose of this study and its results (DePoy & Gitlin, 1999). The selection of the scientific articles was not limited geographically, or any particular primary diagnosis related to the peritoneal carcinomatosis, hence excluding potential sources of bias and overviewing the results in a broad way. To minimize the risk of bias, all primary research papers have been included in this study (Bettany-Saltikov & Mcsherry, 2016).

The main limitation of this study was inclusion of QLQ-C 30 studies with small sample sizes comparing data generated from the baseline group and reference groups or the general population. In addition, the amount of data published was collected at different time ranges making it difficult to generalize our findings. A meta-analysis was not feasible given the heterogeneity across selected articles.

8.2 Discussion of the Results

The aim of this study was to compare quality of life (QoL) of cancer survivors treated with cytoreductive surgery (CRS) plus hyperthermic intraperitoneal chemotherapy (HIPEC) versus current oncological standard care.

This section will discuss the nursing strategy appropriate to improve quality of life after cytoreductive surgery combined with hypothermic intraperitoneal chemotherapy. In this review, nursing care strategies were developed from the self-care theory following the CRS-HIPEC experience outlined in the QLQ-C30 literature with a phenomenological approach that brings evidence to improve care delivery from baseline through long-term follow-up.

Living with illness such as cancer and receiving chemotherapy certainly impede meeting self-care requisites. This is indicated by the increased readmission after discharge. Understanding patients' perspectives from preoperative decision making to postoperative recovery process, is relevant in addressing gaps with regard to the delivery of healthcare, and improvement of patient outcomes (Francescutti et al., 2019).The oncology nurse has key roles in the entire care pathway to inform, coordinate, support, and follow-up and facilitate the patients' interaction with healthcare team (Hasanpour-Dehkordi, 2016), and participation in decision-making (Thaysen et al., 2019).

The diagnosis label of self-care deficit indicates an impaired ability to perform or complete certain activity of daily living (Chang, Uman & Hirsch, 1998). Patients experience CRS+HIPEC treatment as a turning point generating uncertainties (Eriksson et al., 2014). They often complain about getting inadequate discharge information for patients to manage and self-monitor their symptoms once at home (Kang, Gillespie, Tobiano &Chaboyer, 2020). Failure to provide adequate information about the treatment pathway to people with peritoneal metastases was a factor to increased feeling of worries about the disease recurrence in cancer survivors (Leo Swenne et al., 2017).

Following treatment, patients with peritoneal metastases experience difficulties to return to work within a period of time varying from three months to several months. Dealing with rapid changes along with financial constraints may be not easy to cope with. Initially, individuals struggle coping with the consequences of illness on their own. However, it is not clear to know to what extent healthcare systems will support patients once readmitted due to postoperative complications (Leo Swenne et al., 2017).

All studies in the baseline group showed a high QoL before surgery except patients requiring the secondary CRS-HIPEC treatment (Zeng et al., 2017). Findings portraying a decrease in QoL scores three-six months after surgery and a return to baseline during 12-24 months after surgery are consistent with other studies performed with different QoL measurement tools (Hinkle et al., 2017; Glockzin, Schlitt & Piso, 2009; Dodson, 2016; Passot, 2014). In clinical practice, QoL may be a predictor of treatment effect signifying that the baseline assessment of the QoL before treatment may have a prognostic value (Fayers & Machin, 2016, p 16). In order to improve survival, the baseline assessment per se can probably help to select appropriate candidates for CRS+HIPEC treatment.

In CRS-HIPEC survivors, pain, fatigue, insomnia, nausea/vomiting and diarrhea are more prevalent and may improve below the baseline level in a period of 48 months after surgery (Schmidt et al., 2005; Hamilton et al., 2016; Liu et al., 2016). However, patients have to live with long-term symptoms on a daily basis (Schmidt et al., 2005). The effectiveness of symptom management depends on attempts to understand the interdependent relationships between symptom experience, symptom management, and symptom outcomes from the patient's perspective (Larson et al., 1994).

Symptoms commonly experienced by CRS-HIPEC recipients are not dissimilar from symptoms recognized to be associated with the cancer disease process. Two groups of symptoms cluster believed to affect the QoL were: *a psycho-neurological cluster* (pain, fatigue, insomnia and cognitive disturbance) and *gastrointestinal cluster* (nausea, vomiting and diarrhea, constipation) (Barsevick, 2016). However, the resultant of poor QoL is not necessarily related to a number of symptom clusters, only one serious symptom such as pain may be enough to reduce the overall QoL (Fayers & Machin, 2016).

Self-care has been used as a tool to control symptoms in cancer survivors. Various symptoms experienced by patients undergoing chemotherapy persisted particularly nausea, vomiting, tiredness and weakness (Rhodes, Watson & Hanson, 1988). Supportive care is invaluable, but the resultant symptom management often weighs on the responsibility of the individual patients (Dodd, Janson, Facione & Faucett, 2001). A nurse-led self-care education has been tested successfully to improve QoL in females with breast cancer (Shahsavari, Matory, Zare, Taleghani & Kaji, 2015).

Traditionally, functional factors, symptoms and global health constitute the main elements of the QoL that are evaluated prior to and after CRS-HIPEC treatment. However, some clinical factors such as the presence of stoma, length of surgery and disease recurrence have been reported to affect the QoL of selected patients (Passot, Bakrin, Roux, Vaudoyer, Gilly, Glehen & Cotte, 2014). These factors should be considered as part of QoL assessment after CRS-HIPEC. Further studies may be recommended to assess more factors associated with QoL after CRS-HIPEC treatment. The persistence of diarrhea and constipation 6-36 months (Schmidt et al., 2005; Lim et al., 2010; Alves et al., 2010; Tsilimparis et al., 2013; Albertsmeier et al., 2014; Chia et al., 2016; Stearns et al., 2018) may be explained by either side effect of chemotherapy or that they are opioid -induced. The incidence of post-treatment constipation and diarrhea among cancer survivors had been estimated to persist up to 10 years after the cessation of treatment with great impact on their QoL (Mcquade, Stojanovska, Abalo, Bornstein & Nurgali, 2016; Bloechl-Daum, Deuson, Mavros, Hansen & Herrstedt, 2006).

The holistic aspect of self-care experience that has been raised in one study among cancer survivors includes physical, social and psychological aspects where a patient-nurse partnership is needed (Lindquist, Enblom & Bergmark, 2015). Hanucharurnkui, & Vinya-Nguag (1991) showed that patients who participate in self-care, experience less pain and fewer postoperative complications than avoiding self-care. In general, self-care behavior improves all aspects of the QoL and the mental component of health in particular (Weng, Dai, Huang & Chiang, 2010).

Current estimate indicates three- and five-years disease-free survival at 50 % and 25 % respectively following the initial diagnosis in patients who underwent complete cytoreductive surgery combined with HIPEC (Burnett et al., 2019). However, gaps in delivery of cancer care services occur between different phases of treatment including palliative care. Every phase requires support and assistance to overcome healthcare system barriers. Oncology nurse navigators provide information about what to do when treatment ends, coping strategies, and specific practical information. A way to ease patient feeling abandoned and vulnerable at the end of active treatment is to facilitate linkage to health care resources (Pedersen & Hack, 2011).

Following CRS+HIPEC treatment, cancer recurrence is a risk factor associated with poor QoL in selected patients. Recurrence was detected early in a period of 6-12 months in 30-70% of which 24 % of patients underwent surgery with a curative intent (Braam, Van Oudheusden, De Hingh, Nienhuijs, Boerma, Wiezer & Van Ramshorst, 2014; Hinkle, Botta, Sharpe, Dickson, Deneve & Munene, 2017). A recent study shows that over the course of the year, 38% of CRS+HIPEC patients were referred to palliative care to improve their QoL (Morris, Gani, Hammad, Peltier, Gamblin, Turaga, & Johnston, 2017). However, the QoL becomes redefined in palliative care with possible improvement at a new level of meaning through symptom control and psychological support as the continuum of care (Ferris et al., 2009).

The emotional functioning, which was lower at the baseline rapidly improved at three months postoperatively, remained above the baseline during recovery (Dodson, 2016). Improvement on emotional well-being can be explained according to Hinkle et al. (2017) by preoperative desperation of the diagnosis followed by postoperative hope after a successful operation. Recovery was slower in cognitive and gastrointestinal functions with persistent fatigue and insomnia. A return to the baseline level could take more than 24 months (Jess et al., 2008; Tsilimparis et al., 2013; Stearns et al., 2018). Better scores than the baseline values were reported after 12 months in the social and functional role (Alves et al., 2010). Cognitive impairment was reported in both baseline groups (Jess et al., 2008; Lim et al., 2010; Alves et al., 2010; Tsilimparis et al., 2013; Stearns et al., 2018) and in the general population group (Schmidt et al., 2005) while it was similar in the different reference groups (Zenasni et al., 2009; Hamilton et al., 2016; Liu et al., 2016; Düzgün et al., 2018). A significant cognitive impairment may persist longer than seven years after surgery (Stearns et al., 2018).

The global QoL scores after CRS-HIPEC was lower than the QoL of the general population (Schmidt et al., 2005; Stearns et al., 2018). However, the QoL of CRS-HIPEC recipients was similar to the QoL of cancer patients undergoing classic surgical intervention with or without major complication (Zenasni et al., 2009 Tan et al., 2013**;** Hamilton et al., 2016; Liu et al., 2016; Düzgün et al., 2018). Similar results have been found in patients who underwent curative resection of colorectal primary tumor at 12 months after surgery (Zhu, Hanna, Boutros & Alexander, 2013).

Postoperative complications which require reoperation and cancer recurrence are facets associated with readmission after discharge and delaying recovery after CRS/HIPEC (Martin et al., 2016;

Hinkle et al., 2017; Chia, Tan, Lim, Soo & Teo, 2016). The way these factors affected the QoL of the CRS-HIPEC recipients as reported in QLQ-C30 studies was not fully understood (Chia et al., 2016; Hamilton et al., 2016).

Postoperative self-care activities may be performed by an individual to promote quality of life and well-being for a return to functional activities impaired after surgery. Although relative increase in QoL to better functioning activity level has been observed after 3-month CRS-HIPEC treatment (Piso et al., 2009), the QoL in long-term survivors remained significantly below the baseline level (Huo, Richards, Liauw & Morris, 2015). It is important to realize that the individual recovery state, life experience, socio-cultural factors and available resources may affect these activities (Masters, 2015, p.156).

The CRS+HIPEC is an expensive procedure since patients have to pay a special fee for this treatment. Recipients have reported financial instabilities both short-term and long-term in comparison with the reference population (Schmidt et al; 2005; Stearns et al., 2018). Despite being around for decades, the cost of CRS-HIPEC treatment cannot be paid by all candidates. For example, the hospital costs for this treatment in 2013 were estimated at 37000 US dollars excluding drug and expenses for an average hospital stay of 21 days in Sweden (Ludwigs, 2013). This amount which differs in areas without state-funded medical care (Stearns et al., 2018) may be difficult to refund during a recovery time. The financial impact on selection criteria to be qualified for CRS+HIPEC treatment may be raised as an ethical issue.

Cultural variations or differences weigh on how patients receive, assimilate, and deal with health-related issues. Cancer patient’s experience can demonstrate such similarities and differences from the predominant culture in which the health care facility is located (Payne, 2012, p.36). This leads to the important goal of delivering a culturally competent nursing care as described through Madeleine Leininger’s (2002) theory of transcultural nursing.

Cancer survivors need a continuum care that spans an entire lifetime to ensure continuity of care across the hospital, home and other settings (Shulman et al., 2009). There is growing evidence showing that nurses help patients to cope with short-and long-term effects of cancer diagnosis and therapy along with management of comorbid conditions. Partnership with the patient and the family caregiver while encouraging behaviors that lead to health promotion is essential in all aspects of care to reduce the continuum deficit (Morgan, 2009).

This is the first study to review QLQ-C30 studies linking data generated from baseline and from control groups or the general population after CRS+HIPEC. The QoL which was lower than in the general population though similar as compared with reference groups suggests that the CRS-HIPEC treatment does not affect the QoL of recipients differently from other major cancer treatment procedures. The return to the pre-diagnosis QoL may be not reached in a period less than 3-4 years after treatment. This should be related to the 30 % risk of recurrence within 12 months and impairment of cognitive function (Hinkle et al., 2017).

Conclusion

Recipients of CRS-HIPEC commonly experience symptoms independently reported to predict changes in short-term and long-term QoL. Except the emotional dimension which recovers rapidly above the baseline, the overall short-term QoL is characterized by impairment of all dimensions and an increase in symptom scores in the first three months after CRS-HIPEC treatment. The long-term QoL may return to the baseline or reference group level 12 months after CRS-HIPEC treatment. However, fatigue, pain, insomnia, and diarrhea symptoms may persist along with cognitive impairment. The QoL trend for patients undergoing CRS-HIPEC is characterized by high scores at baseline, a short-term decrease in 1-3 months postoperatively, an increase 6-12 months followed by improvement in long-term survivors or a decrease as a result of recurrence. The CRS-HIPEC recipients need a continuum of care across the hospital, home and community to ensure that patients not only live longer but also have a better QoL. Cancer survivors require ongoing health care that supports the patient and family's self-care in order to deal with the progressive symptoms and cancer recurrence.

Although CRS-HIPEC treatment has been there for more than two decades, quality of life of survivors is still affected by lack of information about the treatment pathway pertaining to the procedure itself, discharge, rehabilitation, and complications. To improve quality of life, findings suggest a comprehensive approach of care that will consider delivery of adequate information, individuals' preferences, perceptions, and participation in decision-making. The oncology nurse has a myriad of roles to play in the entire care pathway, mostly informative, coordinating, supportive, and follow-up functions to promote the patient's interaction with the healthcare team.

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Appendices

Appendix A

Overview of Literature Search

Date covered (2000-2021)

Overview of Literature Search

Database	Search Topic	Date Covered	Update Searching	Hits	Full Record/Titles and Abstracts	Selected for Quality Assessment	Selected for the Results
CINAHL	((quality of life) AND (cytoreductive surgery) AND (hyperthermic intraperitoneal chemotherapy))	2000-2021	31/01/2021	0	0	0	0
PubMed	((quality of life) AND (QLQ-C30) AND (cytoreductive surgery) AND (hyperthermic intraperitoneal chemotherapy))	2000-2021	31/01/2021	12	12	10	7
Secondary Search		2000-2021	31/01/2021		2	2	2
Free Text in Google Scholar	((quality of life) AND (cytoreductive surgery) AND (hyperthermic intraperitoneal chemotherapy))	2000-2021	31/01/2021	223	35	12	6

Databases: CINAHL, PubMed, Web of Science and free search in Google Scholar

Authors	CINAHL 0	PubMed 61	Web of Science 12	Google Scholar 223	Second Search
Schmidt et al. (2005)		x	x	x	
Jess et al. (2008)				x	
Zenasni et al. (2009				x	
Lim et al. (2010)				x	
Alves et al. (2010)					x
Tan et al. (2013)		x	x	x	
Tsilimparis et al. (2013)		x		x	
Chia et al. (2014)		x	x	x	
Albertsmeier et al. (2014)		x	x	x	
Chia et al. (2016)		x	x	x	
Hamilton et al. (2016)				x	
Liu et al. (2016)			x		
Zeng et al. (2017)					x
Duzgun et al. (2018)			x	x	
Stearns et al. (2018)		x		x	

Appendix B

Assessment Tool of Study Quality with Caldwell et al. (2011) Framework

Does the title reflect the content?

Are the authors credible?

Does the abstract summarize the key components?

Is the rational for undertaking the research clearly outlined?

Is the literature review comprehensive and up-to-date?

Is the aim of the research clearly stated?

Are all ethical issues identified and addressed?

Is the methodology identified and justified?

Quantitative

Is the study design clearly identified, and is the rationale for choice of design evident?

Is there an experimental hypothesis clearly stated? Are the key variables clearly defined?

Is the population identified?

Is the sample adequately described and reflective of the population?

Is the method of data collection valid and reliable?

Is the method of data analysis valid and reliable?

Qualitative

Are the philosophical background and study design identified and the rationale for choice of design evident?

Are the major concepts identified?

Is the context of the study outined?

Is the selection of participants described and the sampling method identified?

Is the method of data collection auditable?

Is the method of data analysis credible and confirmable?

Are the results presented in a way that is appropriate and clear?

Are the results generalizable?

Is the discussion comprehensive?

Are the results transferable?

Is the conclusion comprehensive?

Framework by Caldwell et al. (2011).

(Bettany-Saltikov, & Mcsherry, 2016, p. 132).

Appendix C

Quality Assessment of QLQ-C30 Research Articles Using Caldwell et al. (2011) Framework

		Quality Assessment of Selected Articles		
Author (year)	Aim/Research Problem	Methods/Design	Main Outcomes	Assessment Scores
1. Schmidt et al. (2005)	To analyze postoperative morbidity and mortality. To assess QoL	Analyse patient data compiled into a database QLQ-C30 questionnaire n=20	The global health status was lower than the reference population. Leading symptoms were fatigue, insomnia and pain	30
2. Jess et al. (2008)	To assess the QoL	QLQ-C30 questionnaire n=23	After 24 months, physical function, fatigue and pain remained under the baseline level. Cognitive function declined.	32
3. Zenasni et al. (2009)	To evaluate impact of HIPEC on the QoL	QLQ-C30 questionnaire n=68, all recurrence excluded	QoL is good in 65.4% of participants Functional scale was satisfactory.	32
4. Lim et al. (2010).	To assess QoL at least 12 months after HIPEC	QLQ-C30 questionnaire n=32	QoL scores decreased in 60 % of patients in the early postoperative assessment(1 month) Return to baseline at 3 months in 53.3%. Overall QoL recoved in 73 % at 12 months after HIPEC	34
5. Alves et al. (2010)	To assess health related QoL after CRS-HIPEC	QLQ-C30 questionnaire n=49	Significant improvement in emotional well-being, appetite and global QoL after 1 year following surgery	30
6. Tan et al. (2013)	To assess QoL outcomes after CRS-HIPEC in an Asian cancer center	QLQ-C30 questionnaire n=27 Reference group: Disease-free cancer patients	Global health status, functional scale and symptom scores were largery similar between patients after CRS-HIPEC and the control group. Cognitive functioning and fatigue scores were better in the CRS-HIPEC group.	34
7.Tsilimparis et al. (2013)	To investigate health-related QoL over time in after CRS-HIPEC treatment	QLQ-C30 questionnaire n=90	Physical and role function improved at 6 month and were close to baseline at 24-month assessment. Emotional function recovered to baseline by month 12. Cognitive and social function had slow recovery. Fatigue , diarrhea , dyspnea and sleep disturbance persisted at 6-month assessment but improved later.	32
8. Chia et al. (2014)	QoL after CRS-HIPEC Factors to improve QoL	QLQ-C30 questionnaire n=63	Better scores at 6 months after CRS-HIPEC followed by a decline period and an improvment period after 2 years. CRS-HIPEC patients scored better than a control group recurrent/metastatic cancer patients	34

9.Albertsmeier et al. (2014)	To evaluate QoL after CRS-HIPEC prospectively	QLQ-C30 questionnaire n=33	Global health status was not impaired significantly. Functional scales deteriorated 3 months after surgery (physical, role, and social). Fatigue, pain, dyspnea, insomnia and diarrhea increased but returned to baseline within 9 months.	32
10.Chia et al.(2016)	Prospective QoL after CRS-HIPEC and attempt to identify factors affecting QoL	QLQ-C30 questionnaire n=23	Physical and role functioning scores declined at 3 months but returned to baseline at 6 months. Emotional and social functioning scores increased between 6-12 months. Improvement in all symptoms scores at 6-12 months was reported. Factors affecting QoL: High PCI score, longer duration of surgery, the presence of stoma and recurrence.	33
11. Hamilton et al.(2016)	Impact of major complications on patient's QoL after CRS-HIPEC	QLQ-C30 questionnaire n=42 Assessment after 6 months CRS-HIPEC	At 6 months, the global health score was 68.1%, while the worse-rated sypmtom scores reported were diarrhea (39.8%) and fatigue (35.4%). There were no significant differences in 6-month QoL scores between patients with and without major complications in any specific domains.	31
12.Liu et al. (2016)	Survival after CRS morbidity and mortality	QLQ-C30 questionnaire n=30 Evaluation 6 months postoperatively	Patients receiving CRS-HIPEC have similar QoL as other patients 6 months postoperatively	30
13. Zeng et al. (2017)	To evaluate the QoL before and after secondary CRS-HIPEC	QLQ-C30 questionnaire n=50	Secondary CRS-HIPEC improved QoLof patients. Symptoms were reduced .	34
14. Düzgün et al. (2018)	To investigate short-term QoL after CRS-HIPEC	QLQ-C30 questionnaire 6 months after surgery n=42	Functional scale and symptom scores were the same between CRS-HIPEC and cancer patients operated without CRS-HIPEC.	30
15. Stearns et al. (2018)	Long-Term QoL after CSR-HIPEC which was not repoted in previous studies	QLQ-C30 questionnaire n=86	Patients' physical, role and social function scores were impaired until 12 months after HIPEC. The symptom scores (fatigue, appetite loss, insomnia, and financial difficulties) worsened significantly in the first 12-months but normalized after. Cognitive function impairement persisted beyond 12 months parallell with constipation and diarrhea.	34

Appendix D

Overview of Selected Articles (n=15)

1.	Schmidt, U., Dahlke,M.H., Klempnauer,J., Schlitt, H. J., & Piso, P. (2005)		
	Germany		
		Physical	Improved
		Role	Decreased
		Emotional	Lower than the reference group
	Functional Scale		
		Cognitive	Lower than the reference group
		Social	Decreased
		Fatigue	Increased
		Nausea/vomiting	Insignificant
		Pain	Increased
		Dyspnea	24.80% reported QoL alteration
	Symptoms	Insomnia	38.1% reported QoL alteration
		Appetite loss	Insignificant
		Constipation	21.6% of the sample
		Diarrhea	26.5% of the sample
		Financial Difficulties	Little higher than the reference group
		Short-term	Not assessed
	Global Health		
		Long-term	Lower than the reference population
	Notes:	No baseline but the reference group which is the general Norwegian population, n=20	
		Assessment in long-term survivors with 4 years as the mean average age.	
		CRS-HIPEC patients scored higher QoL than patients undergoing whipple operation	

2.	Jess, P. H., Iversen, L. B., Nielsen, M. C., Hansen, F., Laurberg, S., & Rasmussen, P. (2008). Denmark		
		Physical	Lower than baseline after 12 months
		Role	Improved after 6 months
		Emotional	Above baseline already at 3 months postoperatively
	Functional Scale		
		Cognitive	Declined at 24 months
		Social	Improved after 6 months, returned to baseline after 12 months
		Fatigue	Increased at 3,6, and 24 months
		Nausea/vomiting	Return to baseline after 24 months
		Pain	Decline at 3,6 and 12 months
		Dyspnea	Increased at 24 months
	Symptoms	Insomnia	Declined a little
		Appetite loss	Under baseline scores at 12 months
		Constipation	Insignificant
		Diarrhea	Insignificant
		Financial Difficulties	Increased in comparison to baseline
		Short-term	Significant decrease in the immediate postoperative period.
	Global Health		
		Long-term	Return to baseline level after 24 months
		Baseline QoL , the patient was followed prospectively in a clinic at 3,6,12,18, and 24 months	
	Notes:	after CRS+HIPEC, n=23	
		Insignificant: less than 1 person mentioned	

3.	Zenasni,F., Botella,M., Elias,D., Dauchy,S., Boige,V., Malka,D., …Pocard, M. (2009)			
	France			
			No QoL alteration	Reported alteration
		Physical	95.7%	4.3%
		Role	89.9%	10.1%
	Functional Scale	Emotional	76.8%	23.2%
		Cognitive	85.5%	14.5%
		Social	88.4%	11.6%
		Fatigue	79.7%	20.3%
		Nausea/vomiting	94.2%	5.8%
		Pain	89.9%	10.1%
		Dyspnea	91.3%	8.7%
	Symptoms	Insomnia	71.0%	29.0%
		Appetite loss	92.7%	7.3%
		Constipation	84.1%	15.9%
		Diarrhea	81.2%	18.8%
		Financial Difficulties	92.8%	7.2%
		Short-term	Unspecified	
	Global Health			
		Long-term	66.6%	
		QoL long-term survivors(≥1 year after CRS-HIPEC without recurrence)		
	Notes:	No French baseline QoL norm studies to compare the QLQ-C30 scores.		
		HIPEC does not affect the QoL of survivors compared to classic surgical intervention		
		n=68		

4.	Lim,C., Tordjmann,D., Gornet,J.M.,			
	Nemeth,J., Valleur,P., Pocard,M. (2010)			
	France			
			Physical	Decreased significantly in the few months after CRS-HIPEC
				in 47%
			Role	
			Emotional	1/3 of patients reported emotional problems including depression
	Functional Scale			
			Cognitive	Decline after 1 month, little improvement after 3 months but did not
				reach the baseline after 1 year CRS-HIPEC treatment
			Social	Decreased in 53,4%
			Fatigue	In 1/5 of patients
			Nausea/vomiting	At baseline level after 12 months
			Pain	Increased significantly postoperatively, persisted in 26 %
				of patients after 3 months CRS-HIPEC
			Dyspnea	Reported in 15%
	Symptoms		Insomnia	26% of patients affected
			Appetite loss	1/3 of patients affected, and persisted in 15% after 3 months
			Constipation	Persistance in 21 % after 1 year of treatment
			Diarrhea	Persistance in 21 % after 1 year of treatment
			Financial	
			Difficulties	16 % affected after 1 yeat treatment
			Short-term	QoL score had decreased in 60 % of patients
	Global Health			Return to baseline in 53% of patients after 3 months
			Long-term	55% recovered their QoL at 6 months, and 73 % at 12 months
				Psychological problems, diarrhea and constipation were reported
				in 20% of survivors over the course of the first year after CRS-HIPEC
	Notes:		QoL at baseline, at 1, 3, 6, and 12 months	
			The first QoL after CRS-HIPEC study in France, n=32	
		Decline of	and ADL difficulties in 47%. QoL improved after 3 months, was restaured in 50 %	
		QoL was recovered to the preoperative level or higher after 1 year in 73%		
		21% reported either persitent diarrhea or constipation		

5.	Alves, Mohamed, Yadegarfar, Youssef, & Moran. (2010).		
	UK		
		Physical	Return to baseline after 12 months
		Role	Decline after 3 months, improved above baseline at 12 months
		Emotional	Improved after 3 months
	Functional Scale		
		Cognitive	Return to baseline after 12 months
		Social	Above baseline after 1 year
		Fatigue	Decline at 3 months, baseline at 6 months, improved at 12 months
		Nausea/vomiting	Worse at 1 month, improved at 3 and 12 months, return to baseline at 6 months.
		Pain	Improved at 3 months, deteriorated at 6 months but improved beyond baseline at 12 months.
		Dyspnea	Lower than baseline in 12 months after CRS-HIPEC
	Symptoms	Insomnia	Improved after 3 months
		Appetite loss	Improved after 3 months
		Constipation	Improved after 1 month
		Diarrhea	Increased after 3, 6 and 12 months
		Financial Difficulties	Not assessed
		Short-term	At baseline lever after 3 months
	Global Health		
		Long-term	Above baseline at 6 and 12 months
	Notes:	QLQ-C30 questionnaires prior surgery and at 1,3,6, and 12 months after surgery, n= 49	

6. Tan, W. J., Wong, J. F. S., Chia, C. S.,
Tan, G. H. C., Soo, K. C., & Teo, M. C. C. (2013).
Singapore

		No QoL alteration	Reported alteration
	Physical	85%	15%
	Role	89%	11%
	Emotional	83%	17%
Functional Scale		The scores were similar with the reference group	
	Cognitive	88%	12%
	Social	83%	17%
	Fatigue	83%	17%
	Nausea/vomiting	93%	7%
	Pain	87%	13%
	Dyspnea	92%	8%
Symptoms	Insomnia	84%	16%
	Appetite loss	93%	7%
	Constipation	88%	12%
	Diarrhea	93%	7%
	Financial Difficulties	79%	21%
	Short-term	Unspecified	
Global Health			
	Long-term	67% which was almost similar to a reference group.	
Notes:	No QoL baseline, n=27 compared to a disease-free cancer patient group.		
	Follow-up: 6-18 months		

7.	Tsilimparis, N., Bockelmann, C., Raue, W., Menenakos, C., Perez, S., Rau, B., & Hartmann, J. (2013). Germany		
		Physical	Close to baseline at 24-month measurement 36-month survivors had better physical function than at baseline
		Role	Recovery was prolonged, close to baseline at 24-month measurement
		Emotional	Lower than baseline level 12 moths after surgery
		Cognitive	Slow recovery to baseline by month 12
	Functional Scale		
		Social	Required 36 months to recover to baseline level.
		Fatigue	Persistent at 6-month follow-up, improved later at 24-36 months
		Nausea/vomiting	Improved at 6 months, but worsened again over the time
		Pain	Close to baseline at 6-month
		Dyspnea	Persistent at 6-month follow-up, improved later at 24-36 months
		Insomnia	Persistent at 6-month follow-up
	Symptoms	Appetite loss	Close to baseline at 6-month follow up, improved later.
		Constipation	Close to baseline at 6-month
		Diarrhea	Persistent at 6-month follow-up, improved later at 24-36 months
		Financial Difficulties	Unspecified
		Short-term	A significant decrease in all elements of QoL
	Global Health		
		Long-term	Close to baseline 24 months postoperatively
	Notes:	Follow up at 1, 6, 12,24, and 36 months	
		Baseline QoL	
		n=90	

8.	Chia, C. S., Tan, W. J., Wong, J. F. S., Tan, G. H. C., Lim, C., Wang, W., . . . Teo, M. C. C. (2014). Singapore			
			No QoL alteration	Reported alteration
		Physical	86.80%	13.20%
		Role	84.70%	15.3%
	Functional Scale	Emotional	87.50%	12.5%
		Cognitive	88.90%	11.1%
		Social	86.20%	13.8%
		Fatigue	81.00%	19.0%
		Nausea/vomiting	96.80%	3.2%
		Pain	86.80%	13.2%
		Dyspnea	90.50%	9.5%
		Insomnia	82.50%	17.5%
	Symptoms	Appetite loss	92.10%	7.9%
		Constipation	82.50%	17.5%
		Diarrhea	92.10%	7.9%
		Financial Difficulties	81.00%	19.0%
		Short-term	Improved in a period ≥ 6 months	
	Global Health			
		Long-term	68.80%	Decrease below baseline in a period between 6-24 months, improved later after 24 months
	Notes:	No baseline scores but a comparison group		
		QoL records in a period of 6 months to 24 months		
		n=63		

9.	Albertsmeier, M., Hauer, A., Niess, H., Werner, J., Graeb, C., & Angele, M. (2014). Germany		
	Functional Scale	Physical	Return to baseline values within 9 months
		Role	Return to baseline values within 9 months
		Emotional	Not altered significantly
		Cognitive	Not altered significantly
		Social	Return to baseline values within 9 months
	Symptoms	Fatigue	Return to baseline values within 9 months
		Nausea/vomiting	Not severe. No significant differences with baseline
		Pain	Return to baseline values within 9 months
		Dyspnea	Return to baseline values within 9 months
		Insomnia	Return to baseline values within 9 months
		Appetite loss	Lower than preoperative values after 9 months
		Constipation	Increased above baseline after 9 months
		Diarrhea	Return to baseline after 18 months
		Financial Difficulties	Not improved
	Global Health	Short-term	QoL reduced 3 months postoperatively
		Long-term	Not impaired significantly. Returned to the preoperative level around 18months. Some patients viewed their health status that recovered better than baseline.
	Notes:	Baseline QoL, follow-up at 3,9, and 18 months, n=33	

10.	Chia, C., Tan, G., Lim, C., Soo, K., & Teo, M. (2016).		
	Singapore		
		Physical	Decline at 3 months, return to baseline at 6 months
		Role	Decline at 3 months, return to baseline at 6 months
	Functional Scale	Emotional	Improvement at 6-12 months
		Cognitive	
		Social	Improvement at 6-12 months
		Fatigue	Improvement at 6-12 months
		Nausea/vomiting	Improvement at 6-12 months
		Pain	Improvement at 6-12 months
		Dyspnea	Improvement at 6-12 months
	Symptoms	Insomnia	Improvement at 6-12 months
		Appetite loss	Improvement at 6-12 months
		Constipation	Improvement at 6-12 months
		Diarrhea	Improvement at 6-12 months
		Financial Difficulties	Improvement at 6-12 months
		Short-term	Decline 3 months postoperative
	Global Health		
		Long-term	Improved 6-12 months
	Notes:	QoL baseline and at 3,6, and 12 months postoperatively	
		n=23	
		Improved in all symptom scalesat 6-12 months.	

11.	Hamilton, T., Taylor, D., Cannell, E., McCart, L., & Govindarajan, A. (2016).			
	Canada			
			No major Complication	Major Complication
		Physical	85.0%	80.0%
		Role	78.6%	71.4%
		Emotional	79.2%	75.0%
	Functional Scale	Cognitive	80.4%	76.2%
		Social	75.0%	65.5%
		Fatigue	32.9%	40.5%
		Nausea/vomiting	4.8%	12.8%
		Pain	23.8%	21.4%
		Dyspnea	9.9%	4.8%
		Insomnia	29.8%	16.7%
	Symptoms			
		Appetite loss	10.7%	21.4%
		Constipation	3.6%	9.5%
		Diarrhea	42.0%	35.7%
		Financial Difficulties	32.1%	14.3%
		Short-term	Not evaluated	
	Global Health			
		Long-term	70,80%	62,50%
	Notes:	No preoperative QoL assessment. QoL evaluation after 6 months CRS-HIPEC. The purpose was to investigate if there was significant differences between patients with and without major complications. The results showed that there were no significant differences in 6-month QoL scores between 2 groups. n=42		

12.	Liu, Y., Mizumoto, A., Ishibashi, H., Takeshita, K., Hirano,M., Ichinose,M., . . . Yonemura, Y.(2016).			
	Japan			
			Non HIPEC group	HIPEC group
		Physical	82.1%	89.5%
		Role	71.5%	84.6%
		Emotional	83.9%	83.6%
	Functional Scale	Cognitive	85.1%	85.9%
		Social	74.1%	84.6%
		Fatigue		
		Nausea/vomiting	14.9%	3.2%
		Pain		
		Dyspnea		
		Insomnia	20.8%	11.5%
	Symptoms			
		Appetite loss		
		Constipation	2.4%	14.1%
		Diarrhea	25,00%	32.1%
		Financial Difficulties		
		Short-term		
	Global Health			
		Long-term	67,90%	67,90%
	Notes:	QoL evaluation 6 monts after operation, n=30 in each group		
		QoL was similar in both groups except N/V and insomnia		
		which was more significant worse in non HIPEC group.		

13. Zeng, S., Liu, S., Feng, J., Liu, D., Gao, J., Zhang, L., ... & Guo, L. (2017). China

		Secondary Preoperative	Secondary Postoperative
Functional Scale	Physical	53.84%	76.52%
	Role	62.91%	71.65%
	Emotional	63.57%	65.52%
	Cognitive	52.21%	70.56%
	Social	59.21%	70.56%
Symptoms	Fatigue	25.17%	23.22%
	Nausea/vomiting	30.75%	25.74%
	Pain	33.45%	27.92%
	Dyspnea	15.71%	11.67%
	Insomnia	35.23%	31.55%
	Appetite loss	36.53%	27.76%
	Constipation	40.16%	33.63%
	Diarrhea	28.51%	23.35%
	Financial Difficulties	46.36%	42.65%
Global Health	Short-term		
	Long-term	41.52%	65.39%

Notes: Comparison of baseline QoL scores before and after secondary CRS-HIPEC, n=50

14. Düzgün, Ö., Sarıcı, İ. Ş., & Gökçay, S. (2018). Turkey

		CRS+HIPEC Patients (n=42)	Oncology patients operated without CRS+HIPEC (n=92)
	Physical	78%	84%
	Role	81%	85%
	Emotional	82%	84%
Functional Scale	Cognitive	82%	84%
	Social	81%	82%
	Fatigue	14%	16%
	Nausea/vomiting	8%	9%
	Pain	15%	16%
	Dyspnea	10%	9%
	Insomnia	19%	17%
Symptoms			
	Appetite loss	10%	9%
	Constipation	15%	13%
	Diarrhea	9%	8%
	Financial Difficulties	23%	24%
	Short-term		
Global Health	Long-term	65%	68%

Notes: No baseline comparison. QLQ-C30 questionnare was used after 6 months CRS-HIPEC. QoL comparison between CRS-HIPEC patients and oncology patients operated without HIPEC was perfomed. There was no significant differences between the 2 groups.

15.	Stearns, A., Malcomson, T., Punnett, L., Abudeeb, G.,		
	Aziz, H., Selvasekar, O., . . . O’Dwyer, E. (2018).		
	UK	Physical	
			Impaired 12 months postoperatively
		Role	
			Impaired 12 months postoperatively
		Emotional	
			Impaired significantly
	Functional Scale	Cognitive	Impairement persisted 12 months before return to the reference
			population norms.
		Social	
			Impaired 12 months after surgery
		Fatigue	
			Decline in the first 12 months before return to the refeence population norms.
		Nausea/vomiting	
			Not significant
		Pain	
			Not significant
		Dyspnea	
			Not significant
		Insomnia	
	Symptoms		Worsened in the first 12 months, and then normalized
		Appetite loss	
			Worsened in the first 12 months, and then normalized
		Constipation	
			Increase, normalized after 12 months
		Diarrhea	
			Pesisted to 36 months postoperatively
		Financial	
		Difficulties	Increased in the first 12 months and then normalized.
		Short-term	
			Impaired
	Global Health	Long-term	
			Did not differ from the reference population group.
		QoL at 3,6,9,12,18,24,36,48, and 60 months, n=86	
	Notes:	Baseline and a reference group were used to compare QoL	
	High functional scale scores and low syptom scores mean good QoL.		

Appendix E

EORTC QLQ-C30 (version 3) Questionnaire

We are interested in some things about you and your health. Please answer all of the questions yourself by circling the number that best applies to you. There are no “right” or “wrong” answers. The information that you provide will remain strictly confidential

Your birthdate (Day, Month, Year): …./…./…./…./…./…./…./…./…./
Today's date (Day,Month, Year): 31…./…./…./…./…./…./…./…./…./

	Not at All	A Little	Quite a Bit	Very Much
1. Do you have any trouble doing strenuous activities, like carrying a heavy shopping bag or a suitcase?	1	2	3	4
2. Do you have any trouble taking a long walk?	1	2	3	4
3. Do You have any trouble taking a short walk outside of the house ?	1	2	3	4
4. Do you need to stay in bed or a chair during the day ?	1	2	3	4
5. Do You need help with eating , dressing , washing yourself or using the toilet?	1	2	3	4

During the past week	Not at All	A Little	Quite a Bit	Very Much
6. Were you limited in doing either your work or other daily activities?	1	2	3	4
7.Were you limited in pursuing your hobbies or other leisure time activities?	1	2	3	4
8. Were you short of breath?	1	2	3	4
9. Have you had pain?	1	2	3	4
10.Did you need to rest ?	1	2	3	4
11.Have you had trouble sleeping?	1	2	3	4
12. Have you felt weak?	1	2	3	4
13. Have you lacked appetite?	1	2	3	4
14. Have you felt nauseated?	1	2	3	4
15. Have you vomited?	1	2	3	4
16. Have you been constipated?	1	2	3	4
17. Have you had diarrhea?	1	2	3	4
18. Were you tired?	1	2	3	4
19. Did pain interfere with your daily activities	1	2	3	4
20. Have you had difficulty in concentrating on things, like reading a newspaper or watching television?	1	2	3	4
21. Did you feel tense?	1	2	3	4
22. Did you worry?	1	2	3	4
23. Did you feel irritable?	1	2	3	4
24. Did you feel depressed?	1	2	3	4
25.Have you had difficulty remembering things?	1	2	3	4
26. Has your physical condition or medical treatment interfered with your **family** life?	1	2	3	4
27. Has your physical condition or medical treatment interfered with your **social** activities?	1	2	3	4
28. Has your physical condition or medical treatment caused your financial difficulties?	1	2	3	4

For the following questions please circle the number between 1 and 7 that best applieas to you

29. How would you rate your **overall health** during the past week?

1	2	3	4	5	6	7
Very poor						Excellent

30. How would you rate your overall **quality of life** during the past week?

1	2	3	4	5	6	7
Very poor						Excellent

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