Tampere University

MATTI LAITAMÄKI

Palliative Gastrointestinal Surgery

Preoperative evaluation and postoperative outcomes

Tampere University Dissertations 1278

Tampere University Dissertations 1278

MATTI LAITAMÄKI

Palliative Gastrointestinal Surgery

Preoperative evaluation and postoperative outcomes

ACADEMIC DISSERTATION
To be presented, with the permission of
the Faculty of Medicine and Health Technology
of Tampere University,
for public discussion in the Finn-Medi 5 Auditorium
of the Finn-Medi 5, Biokatu 15, Tampere,
on 19 September 2025, at 12 o'clock.

ACADEMIC DISSERTATION
Tampere University, Faculty of Medicine and Health Technology
Finland

Responsible supervisor and Custos	Professor Johanna Laukkarinen Tampere University Finland	
Supervisor	Docent Mika Ukkonen Tampere University Finland	
Pre-examiners	Professor Tiina Saarto University of Helsinki Finland	MD PhD Matti Tolonen University of Helsinki Finland
Opponent	Professor Juha Saarnio University of Oulu Finland	

ISBN 978-952-03-4029-2 (print)
ISBN 978-952-03-4030-8 (pdf)
ISSN 2489-9860 (print)
ISSN 2490-0028 (pdf)
http://urn.fi/URN:ISBN:978-952-03-4030-8

Carbon dioxide emissions from printing Tampere University dissertations have been compensated.

PunaMusta Oy – Yliopistopaino
Joensuu 2025

ABSTRACT

Palliative care is a patient-centered care aimed at improving quality of life by alleviating symptoms and giving psychosocial support in patients suffering from incurable diseases. Palliative surgery involves surgical interventions to achieve the same goals when curative treatment is not feasible. According to World Health Organization (WHO) reports, up to 56 million people are in need of palliative care worldwide and although only a small minority requires palliative surgery, palliative surgery affects tens of thousands of people yearly. While the importance of high-quality palliative surgery is well recognized, it remains a little studied field.

The aim of this thesis is to examine the surgical outcomes of palliative gastrointestinal surgical patients and to explore ways to enhance preoperative risk assessment including multidisciplinary assessments for the palliative patient group. The study moreover investigates the treatment of duodenal obstruction using either endoscopic or surgical techniques.

The data of this thesis consists of the retrospectively analyzed outcomes of patients undergoing palliative surgery at a single tertiary care center. Preoperative data, surgical outcomes, and follow-up information were collected from medical records. We evaluated the correlation between variables measured before surgery and their connection to surgical outcomes.

Study I included 93 patients, of whom 63% died within 90 days of surgery. Patient age, ASA classification, and ACS NSQIP were associated with higher mortality, but no statistically significant correlation was found with morbidity. Postoperative activities of daily living were significantly impaired compared to preoperative functional capacity. The results of Study II show a trend that the palliative consultation team's involvement in the patient's care before surgery could reduce in-hospital mortality and readmissions, although these results were not statistically significant. In Study III, duodenal bypass surgery proved to be preferable to endoscopic duodenal stenting in terms of long-term outcomes. Stented patients had shorter hospital stays and were able to eat sooner, but they experienced more severe complications, had shorter life expectancy, and a higher number of repeat visits for procedures and hospital readmissions. The results of Study IV showed no correlation

between sarcopenia and surgical outcomes in the palliative patient group. Sarcopenia was measured by surface area of the psoas muscle. Secondary outcomes indicated that preoperative elevated infection parameters (CRP and leukocytes) and low albumin levels correlated with 30- and 90-day mortality.

Surgical treatment for palliative gastrointestinal patients is associated with considerable mortality. Laboratory results, ASA classification, ACS NSQIP scoring, and multidisciplinary assessments are valuable tools for clinicians in predicting surgical outcomes for this patient group. More high-quality research is needed on palliative gastrointestinal surgical patients. Educating surgeons and increasing awareness of palliative care will be important in the future for improving the care of palliative surgical patients.

TIIVISTELMÄ

Palliatiivisella hoidolla tarkoitetaan potilaan kokonaisvaltaista elämänlaadun parantamiseen pyrkivää hoitoa, jonka tavoitteena on lievittää oireita ja antaa psykososiaalista tukea parantumattomasta sairaudesta kärsivillä potilailla. Palliatiivinen kirurgia tähtää potilaan oireiden helpottamiseen kirurgisilla toimenpiteillä, vaikka tautia parantavaan hoitoon ei ole mahdollisuuksia. Aiempien tutkimusten mukaan yli 56 miljoonaa ihmistä tarvitsee palliatiivista hoitoa vuosittain ja vaikka vain murto-osa näistä potilaista tarvitsee palliatiivista kirurgiaa, puhutaan kuitenkin kymmenistä tuhansista potilaista vuosittain. Palliatiivisen kirurgian tärkeys tiedostetaan hyvin gastroenterologisessa kirurgiassa, mutta aiheesta on siitä huolimatta vain vähän laadukasta tutkimusta.

Tämän väitöskirjan tavoitteena on tarkastella palliatiivisten vatsaelinkirurgisten potilaiden kirurgisen hoidon tuloksia ja etsiä keinoja leikkausta edeltävään arviointiin, sekä tarkastella moniammatillisen arvioinnin hyötyjä tämän potilasryhmän kohdalla. Lisäksi tutkimuksessa tarkastelimme duodenumin ahtauman hoitoa endoskooppisesti tai kirurgisesti Tampereen yliopistosairaalassa.

Tämän väitöskirjan aineisto koostuu Taysissa hoidetuista palliatiivisista gastrokirurgisista potilaista. Arvioimme ennen leikkausta, sekä leikkauksen aikaisten tekijöiden yhteyttä leikkauksen jälkeisiin tuloksiin.

Ensimmäisen osatyön aineisto koostui 93 potilaasta, joista 63 % menehtyi 90 päivän sisällä leikkaushoidosta. Potilaan ikä, ASA luokitus ja ACS NSQIP tulokset olivat yhteydessä kuolleisuuteen, mutta muilla tutkituilla mittareilla, kuten Palliative Indexilla ei tilastollisesti merkitsevää yhteyttä leikkaustuloksiin ollut. Leikkauksen jälkeen potilaat pärjäsivät itsenäisesti päivittäisissä toimissa selkeästi aiempaa huonommin. Toisen osatyön tuloksissa oli nähtävissä trendi palliatiivisen konsultaatioitiimin osallistumisen vaikutuksesta potilaan hoitoon ennen palliatiivista leikkaushoitoa, se vähensi sairaalakuolleisuutta, sekä uudelleen hakeutumista hoitoon, mutta nämä tulokset eivät olleet tilastollisesti merkitseviä. Kolmannessa osatyössä duodenumin ohitus leikkauksella osoittautui endoskooppista duodenumin stenttausta paremmaksi toimenpiteeksi pitkäaikastuloksissa. Stenttauspotilailla hoitoaika sairaalassa oli lyhyempi ja he pystyivät syömään nopeammin, toisaalta tällä potilasryhmällä oli enemmän vakavia komplikaatioita, lyhyempi elinajanodote ja

enemmän uusintatoimenpiteitä sekä uudelleenhakeutumisia sairaalaan. Neljännessä osatyössä tutkittiin sarkopenian yhteyttä leikkaustuloksiin mittaamalla psoaslihaksen pinta-alaa, mutta näillä ei ollut yhteyttä leikkaustuloksiin tässä potilasryhmässä. Toissijaisena muuttujana tutkittiin ennen leikkausta otettujen verikokeiden yhteyttä leikkaustuloksiin. Verikokeista tulehdusarvolla, leukosyyteillä ja albumiinilla oli tilastollisesti merkittävä yhteys 30 ja 90 päivän kuolleisuuteen.

Vatsaelinkirurgisten palliatiivisten potilaiden leikkaushoitoon liittyy runsaasti kuolleisuutta. Laboratoriotulokset, ASA luokitus, ACS NSQIP pisteytys sekä moniammatillinen arviointi ovat kliinikolle hyviä työkaluja tämän potilasryhmän leikkauksen jälkeisen kuolleisuuden ja riskien arvioinnissa. Palliatiivisista vatsaelinkirurgisista potilaista tarvitaan jatkossa enemmän laadukasta tutkimusta hoidon laadun parantamiseksi. Kirurgien kouluttaminen ja tietoisuuden lisääminen palliatiivisesta hoidosta on tarpeen tulevaisuudessa.

CONTENTS

ABBREVIATIONS

ACS NSQIP	American College of Surgeons National Surgical Quality Improvement Program
ASA	American Society of Anesthesiologists
CCI	Comprehensive complication index
CD	Clavien-Dindo
CT	Computer tomography
DVA	Department of Veterans Affairs
ERCP	Endoscopic retrograde cholangiopancreatography
GJ	Gastrojejunostomy
GOO	Gastric outlet obstruction
GOOSS	Gastric outlet obstruction scoring system
LOS	Length of (hospital) stay
MDT	Multidisciplinary team
MRI	Magnetic resonance imaging
PMA	Psoas muscle area
PSCS	Physical status classification system
PTD	Percutaneous transhepatic drainage
SEMS	Self-expanding metal stent
TUH	Tampere University Hospital
WHO	World Health Organization

LIST OF ORIGINAL PUBLICATIONS

This thesis is based on the following original publications, which are referred in the text by their Roman numerals I-IV.

I: Laitamäki M, Alamylläri I, Kalliomäki M, Laukkarinen J, Ukkonen M, Junttila E. Scoring Systems May be Effective in Predicting Mortality Associated with Palliative Emergency Gastrointestinal Surgery: A Retrospective Observational Study. World J Surg. 2021 Sep;45(9):2694-2702.

II: Laitamäki M, Piili RP, Laukkarinen J, Ukkonen M. Palliative gastrointestinal surgical oncology outcomes after palliative care consultation: A retrospective observational study. BMJ Support Pallia Care. 2023 Feb 28, 2022.

III: Laitamäki M, Tyrväinen T, Lehto JT, Laukkarinen J, Ukkonen M. Endoscopic duodenal stenting is efficient, but has higher rate of reoperations than gastrojejunostomy in palliative treatment for gastric outlet obstruction. Langenbecks Arch Surg. 2022 Sep 407(6):2509-2515

IV: Laitamäki M, Ukkonen M, Laukkarinen J. Radiologically measured low psoas muscle area does not predict higher mortality in palliative patients undergoing gastrointestinal tract surgery. Submitted 9.2.2025

1 AUTHOR'S CONTRIBUTION

Study I

The author (Matti Laitamäki) participated in the planning of the study design together with the co-authors, contributed to data collection with co-author Alamylläri. The author performed the implementations and analysis of the results and writing with the co-authors.

Study II
The design was done by the author in consultation with the supervisors. The author collected and analyzed all the study data and wrote the manuscript with help from the other authors. Submission and revisions were made by author.

Sturdy III
The study was designed by the author with his supervisors, data collection and analysis were done by the author. The writing of the manuscript was made by the author.

Study IV
Study design was made by the author with help from his supervisors. Data collection and psoas muscle measurements were made by the author. Writing, revisions, and the submission process completed by the author with support from his supervisors.

2 INTRODUCTION

Palliative gastroenterological surgery is symptomatic surgery aimed at alleviating symptoms in patients with incurable diseases. Although palliative patients represent a relatively small but challenging group in gastrointestinal surgery, the demand is increasing. This reflects a broader recognition of the need to prioritize quality of life and symptom management in patients facing advanced illnesses. However, a gap persists in the integration of palliative care into surgical settings. For instance, according to the study by Yefimofos et al., in a cohort of 95,204, only 3.5% of high-risk surgery patients operated on between 2012 and 2015 in 129 different USA hospitals had preoperative consultations with a palliative care specialist (Yefimova et al., 2020).

Palliative surgery has been a subject of increasing study in recent years, and publications on gastrointestinal palliative surgery outcomes have been presented (Lilley et al., 2016). Publications have increasingly explored the outcomes of palliative surgical procedures, yet a critical limitation remains: the lack of standardized preoperative assessment tools for clinical use. This absence makes it challenging to effectively stratify patient risk, optimize care, and guide surgical decision-making tailored to the goals of palliative treatment.(Lilley et al., 2017).

The most common causes for palliative surgery in gastrointestinal patients include obstruction, perforation, bleeding, need for nutritional support, dysphagia, ischemia, and bile duct obstruction typically caused by malignancy (Cauley et al., 2015; Mosenthal, 2019; Neoptolemos et al., 2018). Most common gastrointestinal palliative surgeries are stomas, bypasses, bowel resections, and endoscopic procedures. Despite the necessity of these interventions, postoperative outcomes are poor; mortality is high, and complications are common. Patients' independence following surgery is often limited (Alterio et al., 2023; Miner et al., 2004; Podnos et al., 2007; Voldby et al., 2022). Gastrointestinal surgery is often performed during emergency hours, and therefore palliative surgical decisions also have to be made outside office hours by surgeon without extensive consultation opportunities. In the study by Tolstrup et al., of 436 patients who underwent emergency surgery in 2019 at Copenhagen University Hospital, up to 21% became palliative during surgery. (Tolstrup et al., 2023)

This thesis focuses on palliative gastrointestinal surgery, exploring clinical tools to predict risks of palliative gastrointestinal surgery and examining the effect of a multidisciplinary approach to preoperative evaluation in palliative gastrointestinal surgery.

3 REVIEW OF THE LITERATURE

3.1 Palliative care

Palliative care aims to improve the quality of life of patients with life-threatening illnesses. The goal is to take care of the patient holistically regarding physical, psychological, psychosocial, and spiritual problems. Palliative care is needed in several diseases, such as noncommunicable diseases, malignancies, dementia, HIV disease, cerebrovascular disease, and many other conditions when the disease progresses to the point that its progression cannot be halted with any treatments. WHO estimates that over 56 million people are in need of palliative care worldwide every year, including over 25 million people in the last year of life. The majority of palliative patients (67.1%) are over 50-year-old adults but as many as 7% of patients are children. In Finland about 70,000-75,000 patients need palliative care every year. (Connor, 2020; Haun et al., 2017; Radbruch et al., 2020)

Various organizations have proposed their own definitions for palliative care with slight differences, but the most used are the World Health Organization: "Palliative care is an approach that improves the quality of life of patients (adults and children) and their families who are facing the problems associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and correct assessment and treatment of pain and other problems, whether physical, psychosocial or spiritual." (Connor, 2020) and the International Association for Hospice and Palliative Care: "Palliative care is the active holistic care of individuals across all ages with serious health-related suffering due to severe illness, especially of those near the end of life. It aims to improve the quality of life of patients, their families, and their caregivers. " (Radbruch et al., 2020).

End-of-life care or hospice care is different from palliative care; but clinicians often use these terms interchangeably. End-of-life care is treatment that patients receive in the last days or weeks of life, while palliative care has no defined temporal association with death. The cornerstone of end-of-life care is good communication and support for the patient and family until the last days of life. In addition to the treatment of physical symptoms, it is very important to respect the psychological situations of the patient and relatives. As death approaches, informing and supporting relatives is even more

important, not forgetting the time after the patient's death. (Aniśko-Trembecka et al., 2023; Hui et al., 2021; Radbruch et al., 2020).

Palliative care should be integrated into the patient's treatment well in advance, before the disease reaches the terminal phase (Connor, 2020). Integration of palliative care in oncology as a means to provide more patient-centered care (Kaasa et al., 2018). The bow tie model of palliative care published by oncologist Philippa Hawley is a visual presentation of the integration of palliative care with malignant disease management, as shown below in Figure 1 (Hawley, 2014).

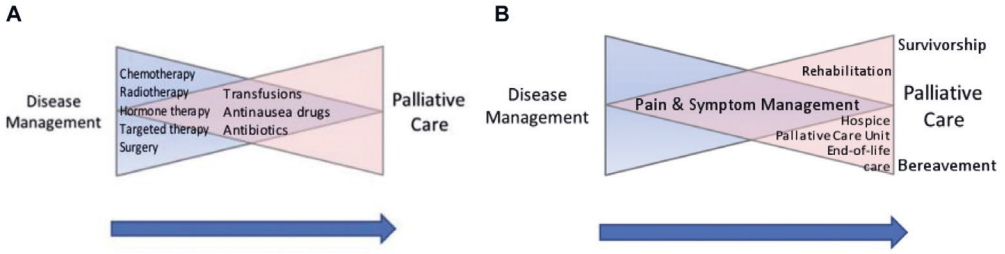


Figure 1. Bow tie model of palliative care. (Hawley, 2014)

Early integration of palliative care for advanced cancer patients improves quality of life, cost savings, and less intensive medical care, but the improvement of quality of life is often modest and conflicting results have been reported (Franciosi et al., 2019; Haun et al., 2017; Hui et al., 2014; Huo et al., 2022; Temel et al., 2010; Vanbutsele et al., 2020; Zimmermann et al., 2014). The study by Jordan et al. shows that early integration of palliative care still poorly implemented in practice,, median duration of initiation of palliative care is 18.9 days before the patient's death (Jordan et al., 2020). Systematic early palliative care has been shown to be better than on-demand palliative care consultations on quality of life with inoperable pancreatic cancer patients (Maltoni et al., 2016). Numerous different patient-reported outcome surveys are available for assessing health-related quality of life, none of which were superior and the selection of survey instruments should be made according to the disease group and intended use (King et al., 2020).

Palliative care can be implemented in several ways: outpatient palliative clinics, inpatient palliative consultation teams, acute palliative care units, or home palliative care (Hui & Bruera, 2020). For advanced cancer patients outpatient care integrated with oncology care, positive effects on quality of life, symptom burden, and survival were found (Fulton et al., 2019). In-hospital palliative care has been shown to slightly alleviate patient symptoms, slightly improve health-related quality of life, satisfaction with care, and improve the chances of patients to die in place they prefer (Bajwah et al., 2020).

Even one week's treatment on a palliative care unit has been shown to improve quality of life, particularly in emotional functioning (Salm et al., 2024). Over 50% of people prefer to die at home. Home palliative care has been shown to reduce system burden, but not to effect on relatives' grief (Gomes et al., 2013). The studies by Ma et al. and Liu et al. have shown that multidisciplinary end-of-life care effectively improves quality of end of life. (Liu et al., 2024; Ma et al., 2021).

Physical symptoms like pain, breathlessness, and gastrointestinal tract problems such as occlusion and vomiting are common in palliative care patients. Physical symptoms can often be treated with medication, but in some cases, surgical treatment is necessary to relieve symptoms (Haun et al., 2017; Radbruch et al., 2020).

3.2 Palliative surgical treatment

The terminology of palliative care for surgical patients is inconsistent. In this thesis we apply the following definitions of terms: *Palliative surgical care* is palliative treatment for surgical patients, which does not include any procedural aspects of treatment, such as medical symptom management, communication, care planning, psychological and social support. *Palliative surgical interventions* are procedural interventions, such as endoscopic stent placements, ultrasound-guided drainages, or nerve blockades targeted at relieving symptoms. *Palliative surgery* is a surgical procedure used to improve the quality of life or relieve palliative patients' symptoms, such as stomas or bowel bypass operations. *Hospice care* and *end-of-life care* is care usually taking the place of palliative care in the last days of life.(Kopecky et al., 2023) In surgical clinics, the difference between palliative care and end-of life care is unfortunately not properly understood even today (Galante, 2005).

Palliative surgery is not a new concept; even the 1950s literature mentions palliative surgery. As is often the case in surgery, development has taken place: the Royal Society of Medicine discussion panel of 1955 reports that colostomy was presented as a bad option for the treatment of advanced rectal cancer because it made patients over 70 years old more miserable (Ogilvie et al., 1955). In 1964, Dr. Gardham discussed the value of prolonging life at the expense of quality of life in his article on palliative surgery (Gardham, 1964). The goal of palliative surgery is not curative treatment, but symptom management and improving the quality of life. Although the benefits of palliative care were later documented in multiple studies, only few postoperative studies on palliative surgery have been published (Lilley et al., 2017).

Surgical palliative care should be integrated into the treatment of a patient at an early stage of serious illness such as malignancy (Sadler et al., 2018). Chen et al. showed in a registry study that in 142,304 patients with metastatic abdominal malignancy, over a 10-year period, palliative procedures increased significantly from 13.4% in 2004 to 19.8% in 2014, while palliative surgical procedures decreased from 3% in 2004 to 1.9% in 2014 (Chen et al., 2022). Palliative interventions other than palliative surgery are often a better option for the patient (Mosenthal, 2019).

3.3 Indications for palliative surgery

In gastrointestinal surgery for palliative patients, the most typical indication for surgery is bowel obstruction. Other common indications include perforation, gastrointestinal bleeding, nutritional support, dysphagia, and ischemia (Cauley et al., 2015; Mosenthal, 2019; Roses et al., 2018; Spaander et al., 2021; Wong et al., 2022a). Bile duct and pancreatic malignancies often cause obstruction of the bile ducts, and painless jaundice is a typical hallmark of these cancers. (Neoptolemos et al., 2018).

3.3.1 Intestinal obstruction

Intestinal obstruction is a typical reason for gastrointestinal palliative surgery, with up to 42-71% of palliative surgeries being performed due to this (Cauley et al., 2015; Tolstrup et al., 2023; Wong et al., 2022a). Malignancies such as colon, rectal, or small intestinal cancers may directly cause mechanical obstruction. Intestinal obstruction may be also caused by metastases or carcinomatosis (Roses et al., 2018), and in some cases by adhesions related to previous surgical procedures or inflammation (Sebastian-Valverde et al., 2019). Symptoms are related to the site of the obstruction, typical symptoms include nausea, pain, bloating, vomiting, and inability to eat (Krouse, 2019).

In an emergency situation, a nasogastric tube may relieve symptoms of intestinal obstruction before a procedure, and sometimes it reduces the pressure in the abdominal cavity, possibly sufficing as the only treatment (Madariaga et al., 2022). Percutaneous gastrostomy can also be used instead of a nasogastric tube to relieve gastric pressure in malignant bowel obstruction in some selected patients and it can be considered as only treatment for patients who are not eligible for surgery (Curry et al., 2019; Dalal et al., 2011; Kawata et al., 2014; Miller et al., 2017). Stoma procedures like colostomy or ileostomy are typical palliative treatment options that relieve obstructive symptoms. If

the patient's nutrition and general condition are adequate, bowel resection or bypassing the occlusive segment is an option. Bypassing operations or stoma surgeries had lower incidence of early complications and lower 30-day mortality than patients who underwent resection (B. Ma et al., 2024). The goal of these procedures is to prevent bowel perforation, ensure oral nutrition and alleviate the patients' symptoms (Rivet, 2019). Razak et al. showed that palliative surgery is associated with better overall survival rates than the best possible conservative supportive care (Razak O et al., 2023). In malignant small bowel obstruction, palliative intestinal bypass can be an effective treatment: 86% of patients were discharged home, 75% were able to tolerate nutrition per oral, and 49% of patients returned to oncological treatments. However, 26-41% of obstruction patients who underwent palliative surgery suffered postoperative complications and 30-day mortality was 7-18%. (B. Ma et al., 2024; Read et al., 2022). Mini-invasive options, such as laparoscopy may be used in some selected cases (Wiggins et al., 2015).

3.3.2 Perforation

Perforations can ensue from various underlying conditions, such as malignancies, infections, ulcers, and intestinal circulation problems. Tolstrup et al. reported that 23.3% of emergency palliative surgeries were performed due to perforation.(Tolstrup et al., 2023) Spontaneous colorectal perforation occurred in 3-3.6% of colorectal cancer patients (Høydahl et al., 2020; Nakao et al., 2024). In a study by Kang et al. (2010) only 32 out of 1,856 (1.7%) patients receiving disease modifying chemotherapy for gastric cancer suffered perforations. Of these patients, 53% ended up undergoing surgery, while the rest were treated conservatively (Kang et al., 2010). The primary goal of palliative surgery in perforation patients is to alleviate symptoms, manage complications, and restore oral nutrition function. Depending on the individual patient's circumstances, procedures such as diverting stomas, peritoneal lavage, bypass procedures, bowel resections, endoscopic stenting or simple closure of the perforation may be undertaken (Abelson et al., 2017; Daniels et al., 2015, 2015; Rivet, 2019). Mortality is high in surgeries due to perforations; 30-day mortality was 22-34%, and 68-69% had one or more postoperative complications in earlier studies. (Cauley et al., 2015; Gebran et al., 2023).

3.3.3 Gastrointestinal bleeding

Gastrointestinal bleeding in palliative patients may present in a variety of ways, from occult bleedings causing anemia over weeks, to excessive terminal bleeding (Ubogagu & Harris, 2012). The bleeding may be caused by a tumor, peptic ulcer, rupture of a pseudoaneurysm, variceal rupture, ischemic colitis, gastric mucosal lesions, or unknown etiology (Shibuki et al., 2023; Sood et al., 2020). Approximately 6-10% of patients with advanced cancers suffer from gastrointestinal bleeding (Schatz & Rockey, 2017). Gastrointestinal bleeding in palliative patients with advanced, incurable gastrointestinal malignancies or other conditions can be particularly challenging to manage because it often occurs in individuals who are not candidates for surgical interventions due to the severity of their disease, overall health status, or the presence of multiple comorbidities.

Management of bleeding in palliative patients is typically endoscopic hemostasis with clips, spray coagulants, powders, glue, or electric coagulation if the bleeding site is endoscopically accessible (Kawabata et al., 2019). Other palliative surgical interventions include angiography and embolization, radiotherapy, blood transfusions, and, if the patient's overall condition is good enough, even palliative surgery can be considered (Shibuki et al., 2023; Sood et al., 2020; Yu et al., 2021). A study by Yagi et al. showed that gastric cancer patients who underwent palliative surgery with bleeding indication lived significantly longer than patients who received radiotherapy: 12.1 months vs. 4.9 months. There may also be a bias here, as patients who end up undergoing surgery are often in better health (Yagi et al., 2023).

3.3.4 Gastric outlet obstruction

Gastric outlet obstruction is a condition caused by an occlusion of the pylorus or the duodenum that prevents normal emptying of the stomach into the small intestine. Typical causes are ulcers, malignant tumors, which are typically pancreatic tumors, and foreign objects. Typical symptoms include nausea, vomiting, pain, and weight loss. Treatment is aimed at reducing the pressure in the abdomen and stomach and enabling the passage of food. Treatment options include nasogastric tubes, medical treatments with proton pump inhibitors or macrolide antibiotics, endoscopic interventions with self-expanding metal stents (SEMS), gastrostomy, endoscopic ultrasound-guided gastrojejunostomy, endoscopic dilatation, and palliative surgery with gastrojejunostomy (Cominardi et al., 2021; Fiori et al., 2013; Mintziras et al., 2019).

Earlier studies have shown that the short-term outcomes of endoscopic SEMS are typically better than those of gastrojejunostomy, but for long-term outcomes,

gastrostomy is better. Patients treated with SEMS are typically able to eat earlier (2-3 vs. 4.5-6 days) and hospital stays are shorter than those of patients treated with gastrojejunostomy (4.7-12 vs. 9.8-27 days) (Jang et al., 2019; Mintziras et al., 2019; Uemura et al., 2018; Yukimoto et al., 2018), but SEMS patients have experienced problems with stent migration and stent occlusions (Uemura et al., 2018) Numerous studies have been presented on the treatment of malignant gastric outlet obstruction. The problems with these are typically small data sizes and retrospective data. In 2019, Mintziras et al. conducted a systematic review and meta-analysis that suggests that malignant gastric outlet obstruction patients should be treated with gastrojejunostomy rather than SEMS (Mintziras et al., 2019). Endoscopic ultrasound-guided gastrojejunostomy is a relatively new emerging procedure that appears to be better than the above-mentioned procedures for treating gastric outlet obstruction (Chan et al., 2023; Kastelijn et al., 2020; Miller et al., 2017).

3.4 Surgical techniques

Conventional open surgery has been the cornerstone of palliative gastrointestinal surgeries. A typical open surgery for a gastrointestinal palliative patient is a midline laparotomy. The size and location of the incision depend on the specific reason for the surgery and the structures that need to be accessed. Other possible laparotomy incisions include transverse incisions, which are made horizontally; McBurney incisions on both lateral quadrants; subcostal (Kocher) incisions on either side of the abdomen; a transverse lower abdominal incision (Pfannenstiel) made just superior to the pubic ridge; or a specific incision for a specific procedure, such as a stoma (Jelinek et al., 2024).

During surgery, an improperly placed incision can cause complications and make it more challenging or even impossible to perform the planned surgery. The incision can be extended or changed to a different type. If necessary, in some cases, other incisions can also be made if it is not safe or possible to perform the necessary procedure on the first incision (Jelinek et al., 2024). Typical palliative gastrointestinal surgeries performed using open techniques include stoma operations, bypasses, gastrostomies, resections, and adhesion release surgeries (B. J. Kim & Aloia, 2016; Maeda et al., 2017).

Laparoscopic surgery offers several benefits, including smaller incisions, less postoperative pain, shorter hospital stays, faster recovery, and fewer complications, making it particularly advantageous in palliative settings. Laparoscopic surgery reduces surgical site infections (4.5% laparoscopic vs. 32% open), Clavien-Dindo <2 complications (14% laparoscopic vs. 32% open), and requires a shorter hospital stay

(18.7 days laparoscopic vs. 23 days open) in patients undergoing palliative surgery for malignant bowel obstruction (Maeda et al., 2017).

Palliative resection of colorectal cancer with laparoscopic procedures reduces hospital stay (12-17 days laparoscopic vs. 15-20 days open), postoperative complications (22.7% laparoscopic vs. 26.9% open) (Akagi et al., 2011; Nishigori et al., 2012). Palliative laparoscopy has been found to be a safe method for performing gastrojejunostomy in gastric cancer and Roux-en-Y choledochojejunostomy in ampullary cancer (Eguchi et al., 2012; E. Y. Kim et al., 2022).

3.4.1 Emergency operations

Emergency gastrointestinal surgery has been found to increase complications and mortality compared to elective surgery in non-palliative patient groups (Hatchimonji et al., 2021; H. Zhou et al., 2023). Abdominal complaints are often acute in palliative care patients and occur during emergency hours. The study by Tolstrup et al. showed that 21% of all emergency laparotomies and laparoscopies changed to palliative during surgery. In their study, Clavien-Dindo >3 complications were 23.3%, 30-day mortality was 26.7%, and 90-day mortality was 38.9% in a palliative patient group (Tolstrup et al., 2023). Heavy disease burden, living in a care home, and older age have been found to increase mortality in all emergency abdominal operations (Chernock et al., 2020; Z. Cooper et al., 2018).

3.4.2 Endoscopic treatment

Endoscopic interventions may be better tolerated and effective alternatives for the treatment of palliative patients in some selected cases. Bowel or duodenal obstructions could be treated with metal stents or dilatations, biliary tract obstructions can be treated with endoscopic retrograde cholangiopancreatography (ERCP), gastrointestinal bleeding could be treated with endoscopic hemostasis and an endoscopically placed venting gastrostomy tube for malignant gastric outlet obstruction is a possible treatment option. (Aadam & Liu, 2019; Curry et al., 2019; Y.-I. Kim et al., 2013, 2013)

3.4.2.1 Endoscopic intestinal stenting

Malignant esophageal, gastric, and duodenal occlusion that causes dysphagia are typically treated with palliative endoscopic stenting. It can be treated endoscopically with self-expanding metal stents, which are fully or partially covered with a silicone membrane (Spaander et al., 2021; Uesato et al., 2017; van der Bogt et al., 2018). There is no significant difference between partially or fully covered stents in terms of major adverse events, such as pain, pneumonia, hemorrhage, or fistula (Didden et al., 2018). Endoscopic esophagus stenting morbidity is high (39.5%), the most common complications being stent migration (36.3%), pain (19.1%), obstruction (19.1%), bleeding (10.6%), and others (14.8%) according to data from So et al. (So et al., 2018). Dilatation without stent placement is not recommended due to high morbidity and short relief of symptoms (Adler & Baron, 2001).

Malignant outlet obstruction is typically caused by malignancies of the stomach, pancreas, or duodenum. Endoscopic stenting of the duodenum can be used as a treatment, although gastrojejunostomy has been found to be a better treatment in earlier studies (Mintziras et al., 2019). The technical success rate of stenting is reported to be over 95% (Tamura et al., 2023). Typical adverse events after stent placement include cholangitis, bleeding, vomiting, stent migration, perforation and pneumonia (Yamao et al., 2016).

Malignant tumors of the colon or rectum can cause obstruction and can be treated with stenting during colonoscopy. The European Society of Gastrointestinal Endoscopy guidelines recommend that palliative treatment of malignant colon obstruction include colonic stenting (Van Hooft et al., 2020). The reported technical success rate of colon stent placement is 73-100% in the literature (Liang et al., 2014; Ribeiro et al., 2018; Takahashi et al., 2015; Young et al., 2015). Postoperative hospital stays are significantly shorter after endoscopic stenting than after surgery (mean: 7 days vs. 11 days), but hospital readmission rates are higher after stenting (69% vs. 50%). Complications of colon stenting include hematochezia, colon perforation, stent migration, tumor ingrowth, and urinary infection and retention (Siddiqui et al., 2017; Young et al., 2015).

3.4.2.2 Endoscopic retrograde cholangiography

Endoscopic retrograde cholangiography is a frequently used method for biliary drainage in palliative patients (D. W. Lee & Kim, 2022). The stent options are self-expanding metal stents (SEMS), which may be covered or uncovered, and plastic stents. Plastic

stents are less expensive, but they often cause stent occlusion after 3-6 months. SEMS stay in place longer and often exceed the life expectancy of most palliative patients (Walter et al., 2015). The European Society of Gastrointestinal Endoscopy clinical guidelines recommend the implantation of SEMS for all palliative patients with extrahepatic biliary obstruction. Endoscopic ultrasound-guided stenting or drainage can be used as alternatives to ERCP or as palliative for treatment biliary obstruction (Zhang et al., 2024).

Typical complications after all ERCP procedures are pancreatitis (3.5-9.7%), cholangitis (0.5-3%), bleeding (0.3-9.6%), and perforation (0.08-0.6%). The majority of these complications are minor and rarely require invasive care. However major complications may occur (Dumonceau et al., 2019).

3.4.2.3 Endoscopic hemostasis

Endoscopic hemostasis for palliative gastrointestinal bleeding follows the same principles as the general guidelines for the management of gastrointestinal bleeding. Gastroscopy is the first-line treatment for upper gastrointestinal tract bleeding, which manifests as vomiting blood or melena (Y.-I. Kim & Choi, 2015). Before endoscopic assessment, the management of the patient's hemodynamic status is crucial. Following hemodynamic resuscitation, an upper gastroscopy should be performed within a 24-hour timeframe (Gralnek et al., 2021).

The various modalities for upper gastrointestinal tract endoscopic hemostasis include injections, spray coagulants, mechanical therapy, ablative therapy, or a combination of these modalities. Injection therapy includes adrenaline, fibrin, and cyanoacrylate adhesives. Hemostasis with these agents results in thrombosis, volume effects, tissue damage, and vascular constriction (Bhat, 2014). Mechanical therapy includes clips, balloon tamponade, and band ligation. All these methods cause hemostasis by mechanically obstructing the vessel. Clips are the most common method of mechanical hemostasis. Ablative therapy uses electrocoagulation, heater probes, or argon plasma coagulation to coagulate tissue proteins and cause tissue destruction to achieve hemostasis (Bering et al., 2024).

Lower gastrointestinal tract bleeding refers to bleeding distal to the ligament of Treitz, including the small bowel, colon, and rectum. Colon and rectal bleeding typically manifest as hematochezia, while more proximal small bowel bleeding usually presents as a combination of melena and hematochezia. Colonoscopy should be performed for all patients with lower gastrointestinal tract bleeding, although the timing remains controversial (Aoki et al., 2019). All patients with hematochezia should undergo

gastroscopy before colonoscopy. A hemodynamically stable patient should undergo colonoscopy during their hospital stay. If the patient is hemodynamically unstable or if the bleeding is uncontrolled, colonoscopy is not recommended for an unprepped bowel (Laine & Shah, 2010). Computed tomography angiography and radiological treatment are the first-line options for patients with hemodynamic instability (Sengupta et al., 2023; Triantafyllou et al., 2021).

3.5 Non-operative palliative treatment

Palliative interventions increased from 2004 to 2014, but the use of palliative surgery decreased in same time period (Chen et al., 2022). Other palliative interventions than palliative surgery are most times better for the patient (Mosenthal, 2019).

3.5.1 Radiological palliative treatment

Typical palliative radiological interventions are percutaneous abscess drainage, ablation therapy (radiofrequency and heat), endovascular bleeding control, or transhepatic drainage of the biliary tract.(Augustin et al., 2019; Dietrich et al., 2015; Requarth, 2019; Zhao et al., 2015) Simple ultrasound procedures are easy for the clinician to learn and are usually minor invasive procedures, which can be performed for palliative patients even in home care. (Dhamija et al., 2015; Mariani & Setla, 2010)

Abdominal abscesses are commonly treated with percutaneous drainage using pigtail drains, which are typically inserted under ultrasound or computed tomography (CT) guidance and local anesthesia (Charles, 2012; Prasad & Varadarajulu, 2012; Requarth, 2019). Akhan et al. reported the results of retroperitoneal abscess drainage in 170 patients. Seven of them had palliative drainage, one for a perirenal abscess, two for pararenal abscesses, and four for psoas abscesses. Most of the palliative drainages were performed on immunosuppressed patients (Akhan et al., 2020).

If endoscopic drainage of biliary tract obstruction is not possible due to previously performed surgeries such as Whipple or Roux-en-Y, or other reasons like duodenal obstruction, then an alternative method for draining the biliary tract is percutaneous transhepatic drainage (PTD). Cai et al.'s study shows that PTD is better than ERCP for reducing levels of total bilirubin (53 vs. 36.8) and the technical success rate is better (97.1% vs. 85.9%) (Cai et al., 2024). In Thornton et al.'s study population, only 31% of PTD patients maintained normal bilirubin serum levels 100 days after the procedure,

and median survival was only 107 days (Thornton et al., 2012). PTD carries higher morbidity than endoscopic interventions. Typical complications of PTD are cholangitis (7.7%-60%), bleeding (5%-5.9%), pain (0.9%), and drainage malfunction (7%-11.8%) (Cai et al., 2024; Chandrashekhara et al., 2016; Crosara Teixeira et al., 2013; Robson et al., 2010). Median overall survival time after palliative PTD is 2.6-4.8 months (Crosara Teixeira et al., 2013; Niemelä et al., 2018; Nikolić et al., 2022; Robson et al., 2010).

Intra-abdominal or gastrointestinal tract bleeding that cannot be controlled endoscopically can be treated endovascularly under local anesthesia by a radiologist. The choice of appropriate embolic material is often based on the experience of the operating physician and local availability of instruments, typically gelatine sponges, microspirals, cyanoacrylates or ethylene vinyl alcohol copolymer (Augustin et al., 2019; Loffroy et al., n.d., 2010). While the technical success rate of transarterial embolization is as high as 51-100%, median survival is still low (Loffroy et al., 2010; Meehan et al., 2014; Park, Shin, et al., 2017; Poultsides et al., 2008).

Palliative radiological procedures also include, thermal ablation therapy, radiofrequency ablation therapy, and transarterial chemoembolization (Dai et al., 2024; Q. Zhou et al., 2022). Hepatocellular carcinoma is the most common malignancy and is treated with palliative transarterial chemoembolization, but there is also an indication for the palliative treatment of cholangiocarcinoma with transarterial chemoembolization (Gairing et al., 2021; Mohr et al., 2022; Schumacher & Gebauer, 2009). Palliative radiofrequency ablation therapy can be used for pancreatic cancer patients alongside palliative surgery and other oncological treatments (Girelli et al., 2013). Thermal ablation therapy is typically used for the treatment of bone tumors (Ryan et al., 2022).

3.5.2 Conservative palliative treatment in surgical patients

Early integration of palliative care with surgical care in patients with life-threatening illnesses is an advantage for the patient. (Berlin & Carleton, 2019). A study by Suwanabol et al. showed that 76.1% of surgeons reported having received no formal education in palliative care. Surgeons reported that the most typical limitations for palliative care in clinical work were: training and knowledge of palliative care, communication challenges, difficulty with prognoses, and patient and family factors (Suwanabol et al., 2018). Patients often undergo extensive surgical procedures shortly before death. In 2008, of the patients who died in the USA, 31.9% had undergone surgery within a year before death, 18.3% within a month before death, and 8.0% within

a week before death (Kwok et al., 2011). Interventions can be based on an initial understanding of the values, hopes, and fears of palliative patients. Sometimes the best practice for the patient is not to operate (Cook, 2019). For example, the following drugs are used as conservative palliative treatment for intestinal obstruction in Finland: Opioids (morphin) for pain, haloperidol for nausea, ocreotide for nausea and to increase bowel motility and for some patients dexamethasone to alleviate swelling (*Palliatiivinen Hoito Ja Saattohoito, Käypähoitosuosistus*, 2019).

Palliative radiotherapy is a relatively rarely used treatment that can be given for many focal symptoms such as pain, bleeding, and obstruction of incurable malignancy, and also primary tumor or metastases (Spencer et al., 2018; Williams et al., 2021), and 9-15.3% of palliative cancer patients receive radiation therapy in the last 30 days of their lives (Park, Lee, et al., 2017). Earlier studies have shown that gastric cancer patients' palliative bleeding management by radiotherapy is safe and relatively effective; hemostasis was achieved in 59.6%-95% of patients and overall survival was 83 days to 3.7 months after palliative radiotherapy (Kawabata et al., 2022; Takeda et al., 2022; Tey et al., 2019). Pancreatic cancer patients' palliative radiotherapy could help to alleviate pain, to manage bleeding, and to improve overall quality of life in non-randomized studies. Overall survival after palliative radiotherapy is 11.8 weeks to 5.1 months. (Liu & Lefresne, 2023; Valverde et al., 2024).

3.5.2.1 Nutrition support

Weight loss, cachexia, nausea, and inability to eat can be problems in gastrointestinal surgical patients with malignant disease. The primary treatment option according to the European Society for Clinical Nutrition and Metabolism is to intensify oral nutrition to manage symptoms and change the diet to better tolerated foods (Arends et al., 2017). If this is not possible, other options are enteral nutrition with nasogastric tube or percutaneous endoscopic gastrostomy. However, neither of these has been found to improve quality of life in palliative patients (Laviano et al., 2016; Sánchez-Sánchez et al., 2021). If enteral nutrition is not possible, then parenteral nutrition may be considered, but in palliative patients it should be avoided (Uster et al., 2018).

3.6 Preoperative evaluation of surgical patients

All surgery involves a potential risk of postoperative complications or other recovery-related problems (Barberan-Garcia et al., 2018; Jakobson et al., 2014). Palliative surgery is often performed in an emergency situation thus prehabilitation similar to that in elective surgery is not feasible. (Tolstrup et al., 2023). Nevertheless, preoperative assessment is necessary to determine who will benefit from surgery.

3.6.1 American Society of Anesthesiologists (ASA) Physical Status Classification System (PSCS)

In 1940 the ASA tasked Meyer Saklad, Emery Rovenstine, and Ivan Taylor with developing a method for the collection and tabulation of statistical data in anesthesia (Saklad, 1941). The classification was updated for the first time in 1963 to define patients' perioperative mortality risks. The ASA classification went through several revisions, most recently in 2014, when for the first time it was evidence based. The classification is still very close to the original more than 80-year-old classification (Horvath et al., 2021; Mayhew et al., 2019). ASA PSCS was originally developed as a perioperative risk assessment tool for anesthesiologists, but it has been used extensively in medicine for many other purposes. The ASA classification is not reliable in predicting postoperative mortality or morbidity, and it should not be used for that purpose (Li et al., 2021). It has often been criticized because the ASA PSCS score is usually based on the assessment of a single clinician, so there is often variation in the scoring depending on the evaluator (Kwa et al., 2022; Sankar et al., 2014). Examples were added to the classification in 2014 to make it easier for the clinician; this has made ASA PSCS results more precise (Hurwitz & Shabot, 2017). Despite all the weaknesses, the ASA PSCS is widely used around the world (Pedrosa et al., 2021).

Table 1. ASA PSCS Scoring system current definitions

ASA PSCS	Definition
ASA I	A normal healthy patient
ASA II	A patient with mild systemic disease
ASA III	A patient with severe systemic disease
ASA IV	A patient with severe systemic disease that is a constant threat to life
ASA V	A moribund patient who is not expected to survive without the operation
ASA VI	A declared brain-dead patient whose organs are being removed for donor purposes

3.6.2 American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) Surgical Risk Calculator

In the late 1990s, surgeons at the Department of Veterans Affairs (DVA) developed the National DVA Surgical Risk Study, which collected preoperative, intraoperative, and postoperative outcome variables on more than 117,000 different operations. Using this data, the DVA developed risk models for mortality and morbidity for nine surgical specialties. In 1999, the National Surgical Quality Improvement Program (NSQIP) was expanded to other private sector hospitals and is nowadays in use in over 700 hospitals in the USA and 18 other countries. The risk calculator is a free, open-access tool, and by entering the patient's basic preoperative characteristics, clinicians get a database-based estimate of the 30-day postoperative morbidity and mortality (*ACS NSQIP History*, 2024). The ACS NSQIP risk calculator was developed as a reliable tool for clinicians to assess preoperative and postoperative morbidity risks in most surgical procedures (Bilimoria et al., 2013). Patients typically underestimate the personal risk of surgical complications, so clinicians need a tool that shows the risks in an easy-to-read format.

In earlier studies the ACS NSQIP risk calculator has been found to be unreliable for assessing postoperative outcomes for palliative patients. It overestimates the risk of complications and underestimates the length of hospital stay and mortality in the palliative patient group (Rodriguez et al., 2016; Vidri et al., 2015).

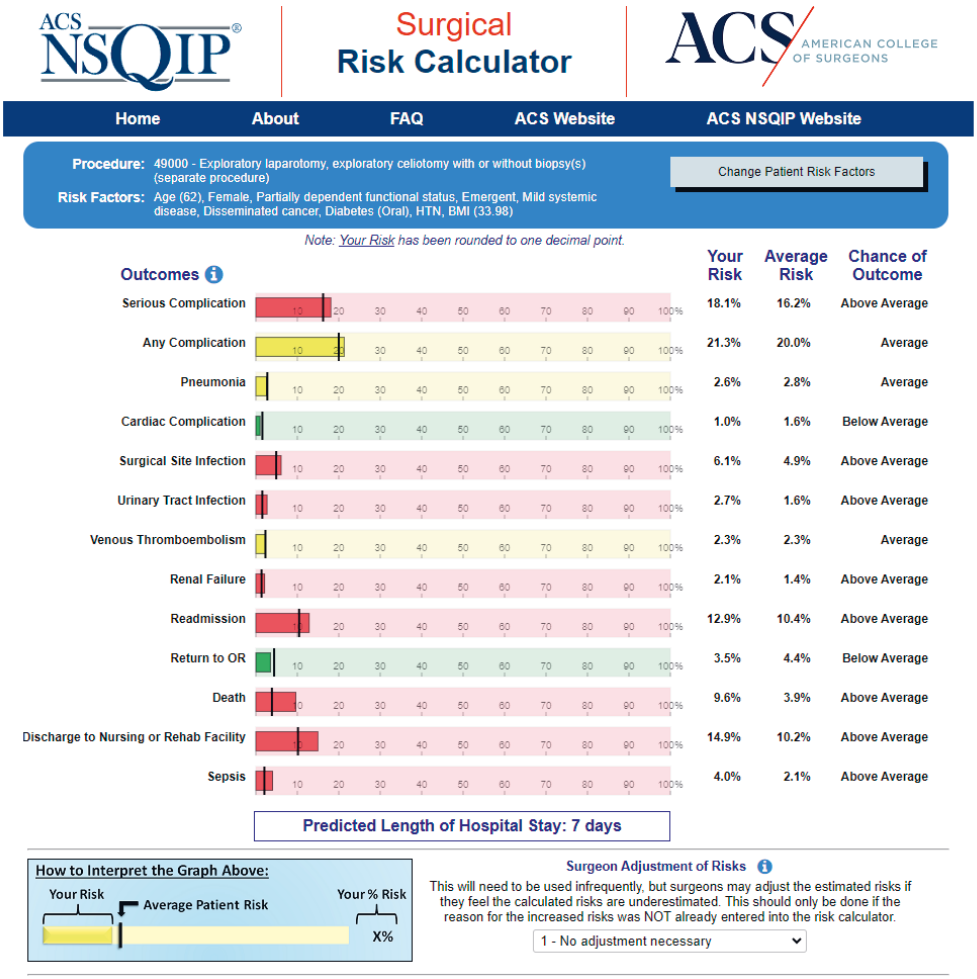


Figure 2. ACS NSQIP surgical risk calculator outcomes form (*ACS Risk Calculator*, 2024)

3.6.3 Palliative index

Roses et al. published in 2014 a study of 143 palliative patients with malignancies undergoing emergency surgery. Using multivariate analysis, they created a palliative index. The palliative index is a simple risk analysis tool for clinicians to predict the mortality of patients with malignancy. The maximum points are 5, and points are given for tumor-related indication (1 point), ASA PSCS > 3 (1 point), creatinine < 1.3 mg/dL (1 point), and advanced malignancy (2 points). In their data, the palliative index predicts postoperative overall survival, as seen in Figure 3 (Roses et al., 2014). Since its

publication, the palliative index has been cited only a few times in the literature and it has not achieved great popularity (Cohen & Miner, 2019; Folkert & Roses, 2016).

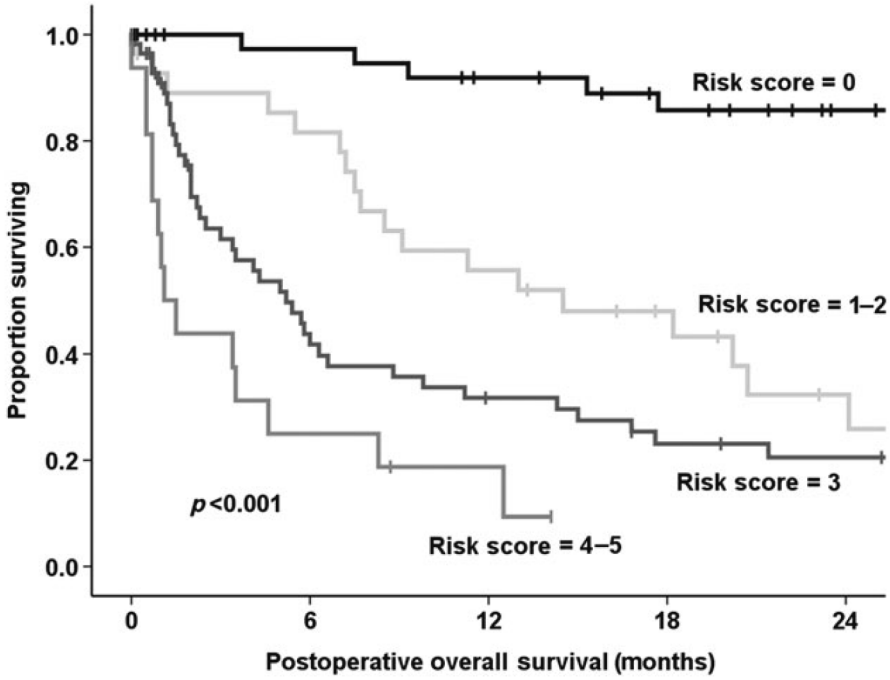


Figure 3. Palliative Index postoperative survival (Roses et al., 2014)

3.6.4 Sarcopenia

In 2010 the European Working Group on Sarcopenia in Older People published a definition of sarcopenia, and in early 2018 they released an updated version of that definition. The previous definition of sarcopenia was based solely on low muscle mass, but the updated version in 2018 includes three criteria: low muscle strength, low muscle quantity or quality, and low physical performance (Cruz-Jentoft et al., 2019).

There are many tools to diagnose sarcopenia in clinical practice. Anamnesis suitable for diagnosing sarcopenia is the most important factor in clinical suspicion. The 5-item simple SARC-F questionnaire is useful for clarification (Bahat, Yilmaz, KiliÃ§, et al., 2018; Bahat, Yilmaz, Oren, et al., 2018). Skeletal muscle strength can be measured by grip strength tests or the chair rise test (Cesari et al., 2009; Leong et al., 2015). Muscle mass or muscle quality can be estimated by multiple methods, which usually adjust the

results according to the patient's body size (BMI, height, height squared, or weight) (C. Cooper et al., 2013). The most typical methods for measuring muscle mass are total body skeletal muscle mass and appendicular skeletal muscle mass (Buehring et al., 2018; Heymsfield et al., 2015). Physical performance measures whole-body function, including central and peripheral nervous function and balance. Typical physical performance tests are gait speed, Timed-Up and Go Test, Short Physical Performance Battery, and the 400m walk test (Bergland et al., 2017; Guralnik et al., 2000; Vestergaard et al., 2009).

Most gastrointestinal surgery patients have undergone CT imaging. Muscle mass measured from CT scans is used in studies to determine sarcopenic muscle mass, although it does not meet the current criteria for sarcopenia. Lumbar vertebra L3 and psoas muscle mass can be determined from the images and this correlates with whole-body muscle mass. Imaging can also be done by MRI (Heymsfield et al., 2015; Sheng et al., 2023).

According to earlier studies, sarcopenia increases the risk of complications and 30-day readmissions in colorectal cancer surgery, gastric cancer surgery, and esophageal cancer surgery (Erkul et al., 2022; Kamada et al., 2022; Nagarajan et al., 2023; Wang et al., 2021). Elderly emergency abdominal surgery patients with sarcopenia have higher 90-day mortality rates than non-sarcopenic patients (Brandt et al., 2019). Lee et al. reported that 25.9% of colorectal cancer patients had sarcopenia, and those patients had lower 3-year disease-free survival than patients without preoperative sarcopenia (58.5% vs. 78.4%) (J. Lee et al., 2023). Sarcopenia is associated with poorer results in patients with advanced pancreatic ductal carcinoma who undergo palliative gastrojejunostomy and hepaticojejunostomy. Sarcopenia increases mortality, in-hospital time, and decreases the success of oral intake in this patient group (Pencovich et al., 2020). Sarcopenia, as measured by the total psoas area index, is not correlated with poorer outcomes in gastrointestinal cancer curative or palliative surgery, according to the study by Haiducu et al. (Haiducu et al., 2023).

3.6.5 Multidisciplinary approach

Medicine has always been about teamwork and the multidisciplinary team (MDT) approach to medical problems has been mentioned in the literature since the 1960s, in recent decades, the multidisciplinary approach has increased in the treatment of different patient groups. There is evidence of the benefits of MDT in the treatment of various diseases, malignancies, different surgical patients, pain patients, and palliative

patients (Lamb et al., 2012; McCorkle et al., 2015; Meguid et al., 2016). The European Society of Surgical Oncology recommends colorectal cancer MDT meeting attendees to be: endoscopist, pathologist, radiologist, surgeon, radiation oncologist, medical oncologist, while and extended MDT meetings require: geriatrician, palliative care specialist, psychologist and nutrition specialist (Beets et al., 2017).

MDT meetings have been found to refine the diagnosis and thus change the treatment recommendation in several different gastrointestinal malignancies, including pancreatic and biliary, esophageal and gastric, liver, neuroendocrine, and colorectal malignancies (H. Ma et al., 2024; Meguid et al., 2016). Basta et al. showed that MDT meetings led to the correct diagnosis in 93.4% of cases, and in 21.8% of cases the MDT meeting changed the referral diagnosis (Basta et al., 2017). Van Hagen et al. showed that for upper GI tract malignancies, 35.6% of treatment modalities were changed in MDT meetings. In this study, 29.8% of patient cases processed in MDT meetings were initially considered palliative, and 23.4% of patients could not be classified as either palliative or curative. Of patients initially classified as curative in MDT meetings 6.8% were changed to palliative treatment, and 2.7% of cases proposed for palliative treatment were altered to curative treatment (Van Hagen et al., 2013). Only a few surgical patients were offered palliative consultation, 0.8% of patients before the operation and 2.9% of patients after the high-risk surgery operation. Among patients who died within 30 days of surgery, 5.6% had a palliative care consultation before surgery, and 24.4% after surgery, according to Yefimova et al.'s data on patients who underwent high-risk surgical operations (Yefimova et al., 2020).

3.7 Postoperative outcomes

In gastrointestinal surgery, postoperative morbidity rates range from 23.2% to 81.6% (Alterio et al., 2023; D.-K. Lee et al., 2020; Scherman et al., 2023; Szakmany et al., 2017; Voldby et al., 2022). The most typical surgical complications are surgical site infections (which can be classified into superficial incisional, deep incisional, and organ/space infections), ileus, hemorrhage, anastomotic leakage, bowel obstruction, and gastric outlet obstruction (Slankamenac et al., 2017; Voldby et al., 2022). Other typical non-surgical, but operation-related complications are atrial fibrillation, pulmonary embolism, venous thrombosis, and pneumonia (Voldby et al., 2022). Complications may occur during the operation (i.e., iatrogenic injuries) or they may manifest after the operation (Dajenah et al., 2022). Late complications include hernias of the operating site (Bosanquet et al., 2015). Morbidity is associated with longer hospital stay and slower

symptom resolution, and mortality also increases with complications (Miner et al., 2004).

In palliative surgery, complications may be even more problematic due to patients' frailty and relatively short life expectancy. The complication rates in palliative surgery range from 17% to 56% (Badgwell et al., 2009; Deo et al., 2021; Gonzalez et al., 2005; Jaruvongvanich et al., 2020; Miner et al., 2004; Pencovich et al., 2020; Podnos et al., 2007; Wong, et al., 2022a; Wong, et al., 2022b). Typical postoperative complications are similar to those in non-palliative gastrointestinal surgery. The Clavien-Dindo (CD) classification is often used to classify postoperative gastrointestinal surgery complications (Clavien et al., 2009).

3.7.1 Clavien-Dindo classification (CD)

In 1992, Clavien et al. first published a 4-grade classification for postoperative complications in surgery (Clavien et al., 1992). In 2004, they modified it by increasing the grades to 7 by dividing grades 3 and 4 into categories (Dindo et al., 2004). Clavien-Dindo classifications, definitions, and examples shown in Table 2. The Clavien-Dindo classification is currently a widely used system to evaluate surgical complications, particularly in gastrointestinal surgery. It provides a standardized and replicable method for reporting and categorizing postoperative complications (Bolliger et al., 2018; Clavien et al., 2009; Rassweiler et al., 2012). Seven different centers around the world which had previously routinely used the CD classification were presented with 11 imaginary patient scenarios, with 89% agreement in ratings, according to a study by Clavien et al. (Dindo et al., 2004).

The CD classification has often been considered too simple to classify complex complication situations. The CD classification takes into account only the most severe complications, while the recovery of a patient with multiple complications may be less successful than that of a patient with a single complication. Therefore, in response, Slankamenac et al. developed the comprehensive complication index (CCI) classification, which is based on the CD classification but takes account of several complications and has been found to be better correlated with length of hospital stay and reoperations (Golder et al., 2023; Slankamenac et al., 2013).

While the CD is commonly used, there are no studies so far examining the use of the CD classification specifically in palliative gastrointestinal surgery.

Table 2. Table: Modified Clavien-Dindo classification definitions and examples (Dindo et al., 2004)

Clavien-Dindo	Definition	Example
I	Any deviation from normal postoperative healing, without need for pharmacological, surgical, endoscopic or radiological interventions. Physiotherapy, diuretics, electrolytes and antipyretics are acceptable in this grade.	Bedside wound infection opening.
II	Complication requiring pharmacological intervention, blood transfusion, antibiotics, and total parenteral nutrition.	Antibiotic treatment other than normal prophylaxis medication
III	Complication requiring surgical, endoscopic or radiological intervention.	
IIIA	Complications requiring intervention that can be done under /local anesthesia.	Gastroscopy for bleeding from the suture in obesity surgery
IIIB	Complications requiring intervention that can be performed under general anesthesia.	Laparoscopy and lavage for abcess treatment
IV	Life-threatening complication requiring intensive care unit management.	
IVA	Single organ dysfunction	Renal failure that can be treated with dialysis
IVB	Multi-organ dysfunction	Multiorgan failure: renal, heart and pulmonary failure after anastomotic leakage and peritonitis
V	Complication that causes death of patient	

3.7.2 Hospital readmissions

After emergency general surgery, 30-day hospital readmission rates are 8.1%–31.9%, and 90-day readmissions are 14.5%–28.2% according to earlier reports (İ Soylu et al., 2024; Kelley et al., 2020; Khalil et al., 2024; Rossi et al., 2021; Urrechaga et al., 2021). A significant factor for 30-day readmission was length of hospital stay, the stoma created during surgery, and ASA classification score >3, as well as discharge disposition, especially to home or a rehabilitation center (Kelley et al., 2020; Khalil et al., 2024; Rossi et al., 2021). Typical reasons for hospital readmissions are infections, sepsis,

gastrointestinal tract problems, surgical wound problems, pancreatitis, heart failure, hemorrhage, and dehydration (Rossi et al., 2021; Urrechaga et al., 2021) According to the study by Khalil et al., a planned general practitioner clinical check-up after gastrointestinal cancer surgery reduced hospital readmissions, thereby also reducing costs (Khalil et al., 2024).

Hospital readmission rates after palliative gastrointestinal surgery are 2.5%–56.1% in patients with malignant disease (De Boer et al., 2019; Maddalon et al., 2024; Wong et al., 2022b, 2022a). Frequent readmissions were typical in the palliative patient group, with 26.2%–35% of patients being readmitted twice or more (De Boer et al., 2019; Wong et al., 2022a). Reasons included operation-related problems and progression of malignancy. The median stay after readmission was 5.7 days (De Boer et al., 2019). In locally advanced pancreatic cancer, surgical palliation increased readmissions to 8.1% versus 2.0% compared to medical palliation; however, palliative surgery marginally improved survival (Kramer et al., 2024). Wong et al. reported a 5.9% risk of unplanned reoperations after palliative_surgery_readmission (Wong et al., 2022b).

3.7.3 End of life care

Sometimes the patient's clinical condition is determined to be so near end of life that the only humane treatment option is to move to end-of-life care (Schlick & Bentrem, 2019). End-of-life care means support for the patient at end of their life. End-of-life care includes physical and emotional symptom control, pain management, and consideration for the patient's relatives as death approaches (Currow et al., 2020). When death is imminent, it is important for healthcare professionals to make the experience for the dying person and their loved ones as least distressing as possible. Lees et al. showed in their retrospective study that most people in Canada prefer to spend their last days at home, and 70% of their study population received palliative home care in the last 30 days of their lives (Lees et al., 2022). Of 3581 people with cancer diagnoses, 490 (13.7%) had ≥3 admissions in the last 90 days, 1,640 (45.8%) had ≥1 admission in the last 30 days, 1,042 (28.6%) had ≥1 emergency department visits in the last two weeks of their life. Pain, dyspnea, and other exacerbating symptoms can lead to patients to make emergency department visits and require hospitalizations (Leniz et al., 2022). Contact to a palliative care unit reduced emergency department visits by 30% and in-hospital care was decreased 60% among cancer patients in the last 90 days of their lives according to a Finnish study by Haltia et al. (Haltia et al., 2023). Well-implemented palliative care reduces unnecessary hospital visits and alleviates stress for both patients

and their families in the last days of life (Gomes et al., 2013; Lees et al., 2022; Prachanukool et al., 2023; Smith et al., 2012). Krawczyk et al. summarized good clinical practices in end-of-life care: proactive co-authorship of disease trajectory, mutual acknowledgment of the dying process, naturalizing the direction and outcome of care, minimizing social disruption, being recognized as compassionate and efficient providers, and utilizing specialized knowledge and interventions (Krawczyk, 2021). In a systematic literature review by Krikorian et al. of patients' perspectives on a good death, the main results were pain and symptom control, preparation for death and contributing to others, but culture, religion, age, life circumstances, disease, and financial issues strongly influenced patients' experiences of imminent death (Krikorian et al., 2020).

3.8 How to improve end-of-life care by surgical means?

Very few studies of palliative and end-of-life gastrointestinal surgery outcomes have been published so far. Even fewer studies have focused on preoperative clinical tools that assess who will benefit from surgery. Earlier studies have shown that only few palliative surgery patients underwent preoperative multidisciplinary evaluation, and there are no studies available to demonstrate its effectiveness. (Wong et al., 2022b, 2022a; Yefimova et al., 2020). To improve the treatment of palliative gastrointestinal patients, we need more studies focusing on palliative gastrointestinal surgery patients and their preoperative evaluation.

4 AIMS OF THE STUDY

The aim of this thesis was to investigate gastrointestinal surgery in a palliative patient group. The specific aims of the studies were:

I. To determine the outcomes of palliative gastrointestinal surgery.

II. To investigate clinical tools for the preoperative evaluation of palliative gastrointestinal surgery patients.

III. To investigate the value of a multidisciplinary approach to the evaluation of palliative gastrointestinal surgery patients.

IV. To review the results of endoscopic gastric outlet obstruction treatment in a palliative patient group

5 PATIENTS AND METHODS

5.1 Study I

5.1.1 Patient population

The medical records of all consecutive emergency patients undergoing abdominal operations at Tampere University Hospital (TUH) from 2015 to 2016 were collected from the medical database (URANUS; CGI Inc., Montreal, Quebec, Canada) and assessed retrospectively for eligibility (n = 2,817). Patients undergoing palliative surgery were manually selected for the study. The medical records had to clearly indicate that the surgery was intended to be palliative or became palliative during the procedure. Overall, 93 patients were included in the study. The study flowchart is presented in Figure 4.

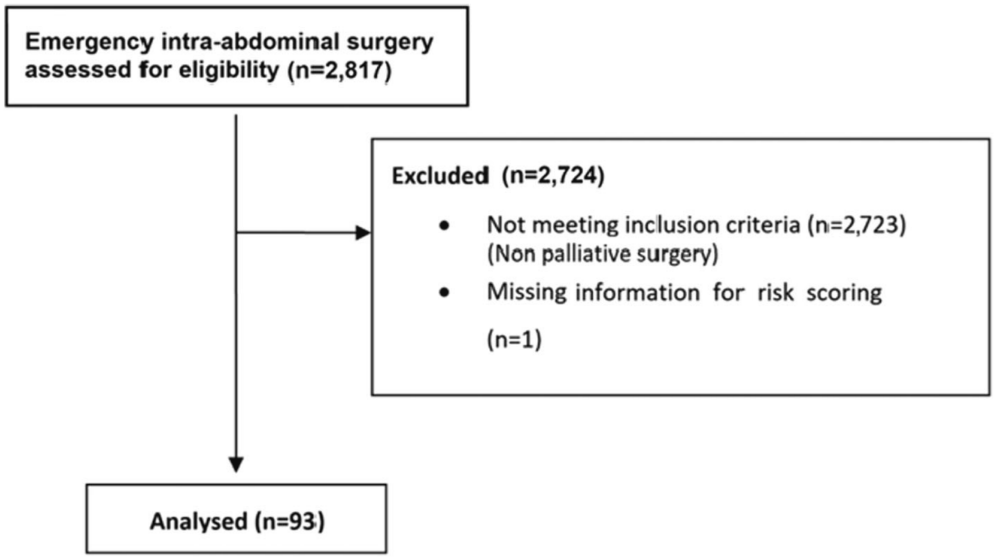


Figure 4. Flowchart of Study

5.1.2 Methods

From the medical records, the following data were collected: patient demographics, comorbidities, type of malignancy, ASA classification, best functional status in daily activities before the operation (divided into three categories: "independent," "partially dependent," and "totally dependent"), palliative index scores and ACS NSQIP Surgical Risk Calculator scores. The main outcome variables included mortality, morbidity, rate of readmissions, postoperative functional status in daily activities (same three categories: "independent," "partially dependent," and "totally dependent" as preoperatively), length of hospital stay, length of stay in the postoperative care unit. Postoperative complications were defined and graded using the CD classification. Functional status in daily activities was assessed at discharge using the same three-level classifications as preoperatively. Both in-hospital mortality and overall mortality were registered, likewise overall survival time. Mortality data were extracted from the Finnish Population Information System.

5.2 Study II

5.2.1 Patient population

In this study all patients attending a palliative care consultation and receiving treatment on a gastrointestinal ward from 2018 to 2019 were assessed retrospectively for eligibility. Patients with no palliative indication for surgical intervention or for whom the palliative care treatment decision was made more than 30 days after the surgical intervention were excluded.

The control group consisted of palliative surgical patients receiving no palliative team consultation preoperatively. The patient selection process is illustrated in Figure 5. and the study population in Figure 6. Outcomes of patients who underwent surgery without a palliative care consultation (n=149) were compared to those of patients who had a palliative care consultation prior to surgery (n=24). The control group consisted of patient data collected in 2015-2016 (Study I) and new data collected in 2018-2019. Additionally, outcomes of patients undergoing palliative gastrointestinal surgery and receiving endoscopic (n=77) and conservative palliative care (n=62) were also reported as secondary outcomes.

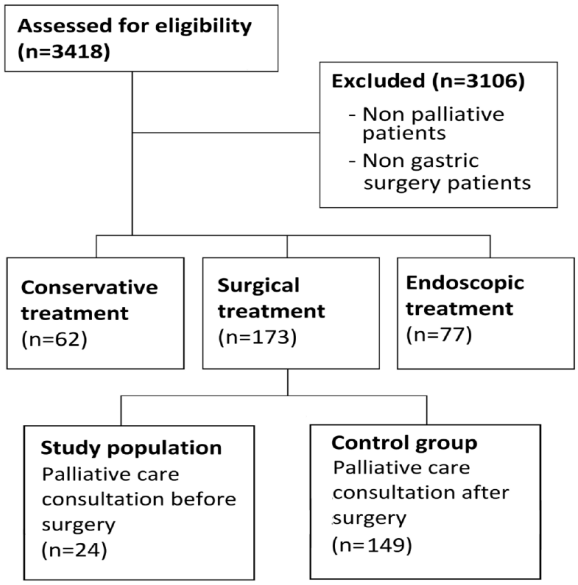


Figure 5. Flowchart of Study II.

5.2.2 Methods

Palliative care consultations were integrated into standard practice on the gastrointestinal surgery wards of TUH at the beginning of 2017. The palliative care teams included specialist palliative care physicians and nurses. The teams were available during office hours. Patient data were collected from hospital medical records. The data collected preoperatively included demographics, comorbidities, type of malignancy, ASA classification, best functional status in daily activities categorized into three groups: 'independent,' 'partially dependent,' and 'totally dependent,' surgery type and indications for surgery. Postoperative outcomes included length of stay (LOS), morbidity defined by CD classification, functional status using at discharge the same three classifications as preoperatively, follow-up location at discharge, readmissions to hospital, hospital mortality, overall mortality, and survival time. Mortality data were extracted from the Finnish Population Information System.

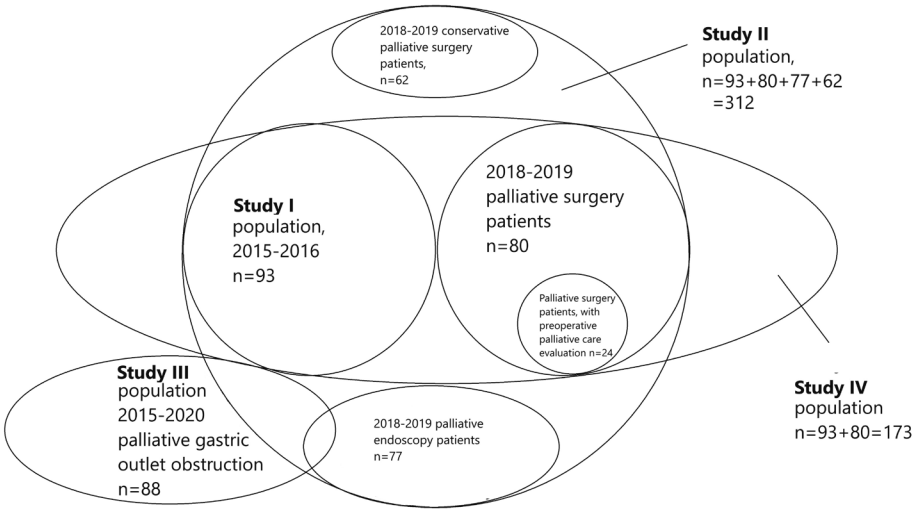


Figure 6. Population plot chart of the studies

5.3 Study III

5.3.1 Patient population

All patients at TUH from 2015 to 2020 who underwent gastrojejunostomy or who received endoscopic self-expanding metal stents (SEMS) for malignant gastric outlet obstruction (GOO) were assessed retrospectively for eligibility. One hundred and forty-four patients had malignant GOO, of whom 70 underwent gastrojejunostomy and 74 received endoscopic SEMS. Twenty-four gastrojejunostomy patients and 32 SEMS patients were excluded because their treatment was essentially intended to be curative. Forty-two patients treated with SEMS and 46 treated with gastrojejunostomy were palliative. Gastrojejunostomy was performed using both laparoscopic and open techniques with side-to-side anastomosis. The flowchart is shown in Figure 7. For endoscopic procedures, the study hospital uses two different self-expanding stent options for duodenal stenting: Olympus Hanarostent® and Boston Scientific Wallflex®.

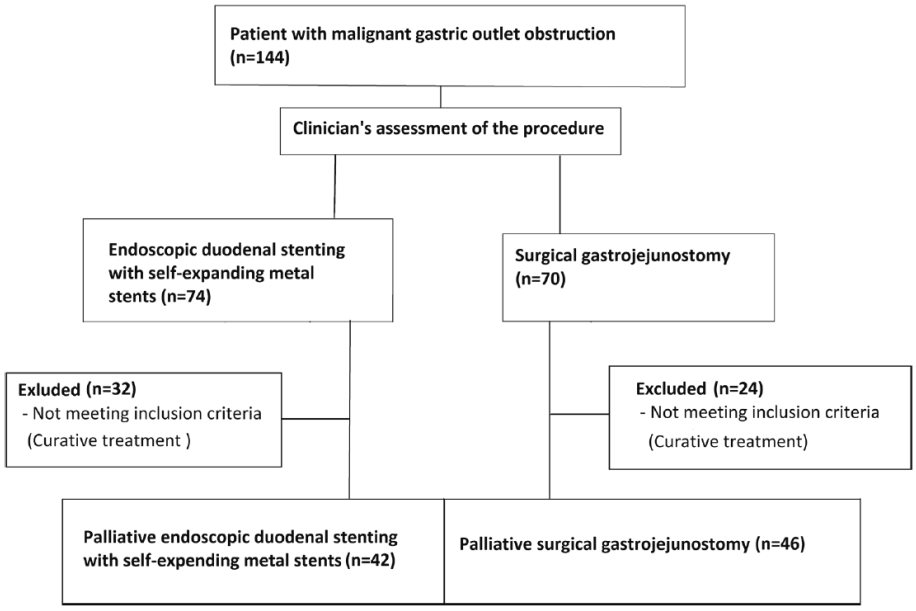


Figure 7. Flowchart of Study.

5.3.2 Methods

Patient data collected preoperatively included age, sex, comorbidities, type of malignancy, preoperative functional ability, and preoperative gastric outlet score according to the Gastric Outlet Obstruction Scoring System (GOOSS), which ranges from 0 to 3: (0: no oral intake at all, 1: liquid oral intake, 2: soft foods oral intake, 3: normal food oral intake) (Adler & Baron, 2002), along with the indication for the procedure. The main postoperative outcomes included morbidity defined by CD classification, reoperations, postoperative GOOSS, postoperative oral intake ability, postoperative length of hospital stay, follow-up treatment location, and mortality.

5.4 Study IV

5.4.1 Patient population

The study population consisted of the surgical patients from Studies I and II, totalling 173 patients treated with palliative gastrointestinal surgery. The study population is shown in Figure 6.

5.4.2 Methods

To determine the muscle surface area, we used the mean psoas muscle areas measured from CT images at the level of the middle of the third lumbar vertebra. Both the right and left psoas muscle areas at this level were drawn, measured, and calculated using Sectra Workstation Version 23.1 (Sectra AB, Linköping, Sweden). Patient data were collected from hospital medical records and the hospital's surgical database. Patient characteristics were recorded, including age, sex, comorbidities, ASA classification, type of malignancy, type of surgery, and laboratory values (hemoglobin, C-reactive protein, leukocytes, albumin, and prealbumin levels). The main outcomes were the associations of sarcopenia with 30- and 90-day mortality. For further analysis, the study population was divided by sex and into three age groups (<65, 65–79, and >80 years).

5.5 Statistics

Statistical analyses for Studies I, II, and III were performed using SPSS Statistics Version 22 for Windows (IBM Corp., Armonk, NY, USA), for Study IV using SPSS Statistics Version 28 for Windows (IBM Corp., Armonk, NY, USA), and R software version 4.1.2 (R Foundation for Statistical Computing, Vienna, Austria). Summary measurements were expressed as means with standard deviations or as medians with minimum and maximum values unless otherwise stated. Continuous variables were analyzed using Student's t-test or Mann–Whitney U-test, with the latter for non-normally distributed data. Chi-square or Fisher's exact test was used for categorical variables. ROC curves were used to visualize the performance of different preoperative classifications in Study I and to identify cutoff values for psoas muscle area in Study IV. Two-tailed P values were reported and a P value of < 0.05 was deemed statistically significant.

5.6 Ethics

All studies were conducted according to the requirements of the Helsinki Declaration. All studies were retrospective, registry studies and patients were not contacted during the study, thus case ethical approval was not required. Permission to use the patient registers in the studies was obtained by TUH.

6 RESULTS

Study I showed the postoperative outcomes of palliative gastrointestinal emergency surgery patients operated on in the period 2015–2016 at TUH. A total of 93 patients were included. In Study II we included palliative gastrointestinal surgery patients from the years 2018–2019 (n=80), bringing the total number of patients meeting the inclusion criteria to 173. Study IV patients were the same palliative surgery patients as in Study II. Patient- and disease-specific characteristics are shown in Table 3.

Table 3. Main characteristics of palliative gastrointestinal surgery patients 2015-2016 and 2018-2019 (Studies I, II, and IV)

Variable		All palliative surgery patients (Studies II, IV) n=173	2018-2019 palliative surgery patients n=80	2015-2016 (study I) n=93
Age, median (min-max)		70 (28-98)	70 (33-98)	69 (28-92)
Sex, female, n (%)		78 (45)	31 (39)	47 (51)
Sex, male, n (%)		95 (55)	49 (61)	46 (49)
Comorbidities n (%)		120 (69)	50 (63)	67 (72)
	Diabetes	39 (23)	15 (19)	24 (26)
	Hypertension	77 (46)	28 (35)	49 (53)
	Heart failure	11 (6.4)	4 (5)	7 (7.5)
	COPD	10 (5.8)	3 (3.8)	7 (7.5)
	Coronary artery disease	20 (12)	9 (11)	11 (12)
Malignancy, n (%)		157 (91)	68 (85)	89 (96)
	Colorectal	58 (34)	25 (31)	33 (35)
	Upper gastrointestinal tract	33 (19)	15 (19)	18 (19)
	Hepatic or pancreatic	26 (15)	12 (15)	14 (15)
	Breast or gynecological	15 (8.7)	5 (6.3)	10 (11)
	Other	26 (15)	12 (15)	14 (15)
	Non-malignant disease	15 (8.7)	11 (14)	4 (4.3)
Indication for surgery, n (%)				
	Occlusion	106 (53)	58 (73)	48 (52)
	Perforation	20 (12)	14 (18)	6 (6.5)
	Other	47 (27)	8 (10)	39 (42)
ASA classification, n (%)				
	1-2	20 (11)	9 (11)	11 (12)
	3-5	153 (88)	71 (89)	82 (88)
Planned palliative operation, n (%)		115 (66)	50 (62)	65 (70)

6.1 Study I

6.1.1 Surgical outcomes

Median survival of palliative gastrointestinal surgery patients was 46 days (0–971). Postoperative mortality was 22% at 14 days, 38% at 30 days, 63% at 90 days, and 87% at 1-year. Minor complications (CD 1–2) were observed in 9 (10%) patients, while major complications (CD 3–4) were noted in 12 (13%) patients. Reoperation was performed on 7 (7.5%) patients, and in-hospital mortality was 13 (14%). Preoperatively, 60 (65%) patients were independent, 31 (33%) were partially dependent, and only 2 (2.2%) were totally dependent on help for activities of daily living. However, postoperatively, on the day of discharge, only 11 (12%) were independent, 36 (39%) were partially dependent, and 32 (34%) were totally dependent in activities of daily living. Eighteen patients were discharged home and 60 (65%) patients were discharged to follow-up treatment at another hospital or primary healthcare ward.

Table 4. Main outcomes of palliative gastrointestinal surgery patients.

Variable	N=93
Surgical morbidity, n (%)	
CD I-II	9 (10)
CD III-IV	12 (13)
In-hospital mortality, n (%)	13 (14)
Mortality, n (%)	
14 days	20 (22)
30 days	38 (41)
90 days	59 (63)
1 year	81 (87)
Postoperative lifetime, median (IQR; max)	46 (16.5-178; 971)
Functional ability at discharge, n (%)	
Independent	11 (12)
partially dependent	36 (39)
Totally dependent	32 (34)
Hospital LOS, days (median)	5 (3-7.5)

6.1.2 Preoperative evaluation

Older age (p=0.004), ASA classification (p=0.016), and coronary artery disease (p=0.048) were statistically significantly associated with 90-day mortality. Several variables, such as comorbidities other than coronary artery disease, type of malignancy, pre-operative functional ability in daily activities, and surgery indication, were not statistically significantly correlated with 90-day mortality. Both the ACS NSQIP risk calculator for risk of death and the ASA classification had significant associations with 14-day, 30-day, 90-day, and one-year mortality. Palliative index had no statistically significant association with mortality or morbidity. Figure 8. and Table 5. present the ROC curves and AUC values of morbidity and mortality. The area under curve (AUC) values show that ACS NSQIP was a reliable variable in the classification of mortality (AUC over 0.7) and that ASA was reliable in 14-day and 1year mortality, Palliative index was not a good tool for predicting mortality. Neither ASA, ACS NSQIP nor Palliative Index proved good for predicting morbidity (AUC < 0.7).

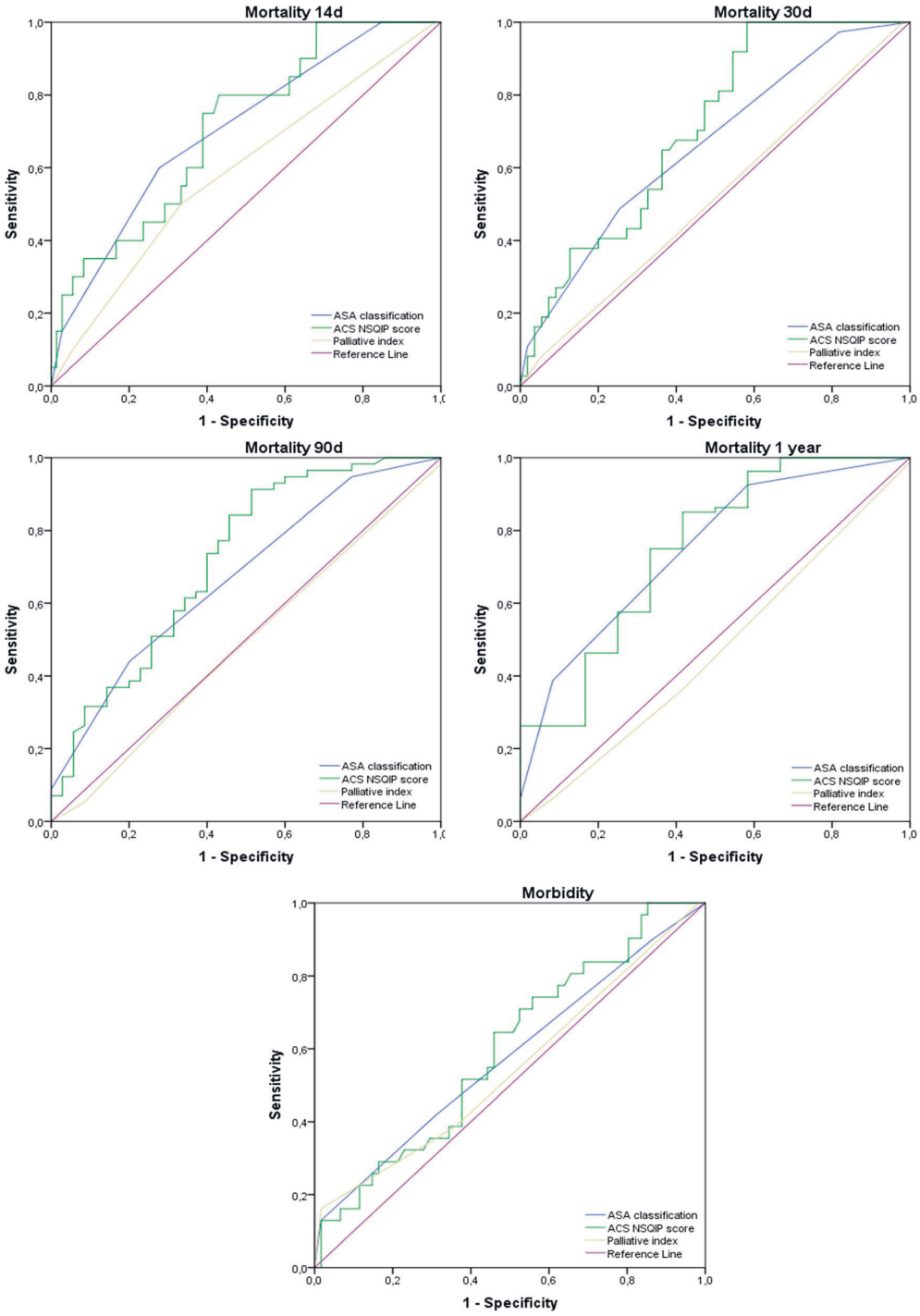


Figure 8. ROC curves of mortality and morbidity

Table 5. ROC AUC values

	ASA	ACS NSQIP	Palliative index
14- day mortality	0,704	0.710	0.590
30-day mortality	0.662	0.707	0.517
90-day mortality	0.671	0.718	0.487
1 year mortality	0.748	0.749	0.467
Morbidity	0.575	0.595	0.544

6.2 Study II

6.2.1 Surgical outcomes

Postoperative mortality was 26% at 14 days, 42% at 30 days, 68% at 90 days, and 88% at 1 year. Postoperatively, 5 patients were admitted to the intensive care unit, 10 (5.7%) had minor complications (CD 1–2), and 26 (15%) had major complications (CD 3–4). Twenty-seven (16%) patients underwent reoperation, and in-hospital mortality was 16%. The median postoperative length of hospital stay was 6 days (min 1–max 32).

Twenty-seven (16%) patients were discharged home (11 with home care and 16 without), 71 (41%) patients were discharged to other hospitals or primary healthcare wards, and 8 (4.6%) patients were discharged to the palliative care ward. 33 patients had a hospital readmission to TUH. Preoperatively, 116 (67%) patients were independent, 54 (31%) were partially dependent, and only 1.7% were totally dependent on help for activities of daily living. However, postoperatively, on the day of discharge, only 16 (9%) were independent, 77 (45%) were partially dependent, and 49 (28%) were totally dependent on help for activities of daily living.

6.2.2 Effect of preoperative palliative care consultation

Among patients having had a preoperative palliative care specialist consultation (n=24) there was a trend for lower operation-related in-hospital mortality (8.3% vs. 25%, p = 0.051), and lower rate of hospital readmissions (8.3% vs. 13%, p = 0.052); than among those who had a palliative specialist consultation after palliative surgery (2015-2016 n=93 + 2018-2019 n=56, in total n= 149) but these outcomes were not statistically

significant. There was no difference in outcomes for median survival (49 days [2–440] vs. 45 days [1–971]) and 14-day, 30-day, 90-day, and 1-year mortality. The main outcomes of Study II shown in Table 6.

Table 6. Preoperative palliative care consultation team effectiveness

Variable		**Preoperative palliative care consultation before surgery (n=173)**		
		No 2015-2016 Before PTs [1]	**No 2018-2019** After PTs [2]	**Yes 2018-2019**
Number of patients n, (%)		93 (54)	56 (32)	24 (14)
Morbidity CD, n (%)		21 (23)	13 (23)	2 (8.3)
	Minor CD I-II	9 (9.7)	0 (0.0)	1 (4.2)
	Major CD III-IV	12 (13)	13 (23)	1 (4.2)
Re-operation, n (%)		13 (14)	13 (23)	1 (4.2)
In-hospital mortality, n (%)		11 (12)	14 (25)	2 (8.3)
LOS, days, median, (min-max) [5]		5 (1-22)	7 (2-32)	6 (2-14)
Readmissions, n (%)		24 (26)	7 (13)	2 (8.3)
Postoperative functional ability, n (%)				
	Independent in daily activities	11 (14)	3 (7.1)	2 (9.5)
	Partially dependent in daily activities	36 (46)	27 (64)	14 (67)
	Totally dependent in daily activities	32 (41)	12 (29)	5 (24)
Survival, days, median, (min-max)		46 (1-971)	33 (2-507)	49 (2-440)
Mortality, n (%)				
	14 days	20 (22)	20 (37)	5 (21)
	30 days	38 (41)	26 (48)	10 (42)
	90 days	59 (63)	41 (76)	17 (71)
	1 year	81 (87)	50 (93)	22 (92)

[1] Patients undergoing surgery without palliative care consultation before implementation of palliative care consultation teams 2015-2016

[2] Patients undergoing surgery without palliative care consultation after the implementation of palliative care consultation teams 2018-2019

6.3 Study III

Study III is a retrospective study of palliative patients who underwent endoscopic SEMS duodenal stenting (n = 42) or palliative gastrojejunostomy (GJ) surgery (n = 46) in the period 2015–2020 at TUH. The main characteristics of Study III are shown in Table 7.

Table 7. Main characteristics of Study III population

	Gastrojejunostomy	Duodenal stenting
Population, n (%)	46 (52)	42 (48)
Age, median (min-max)	66 (47-92)	72 (37-95)
Sex, female, n (%)	24 (52)	16 (38)
Sex, male, n (%)	22 (48)	26 (62)
BMI, median (min-max)	24 (17-57)	26 (18-44)
Comorbidities, n (%)	41 (89)	38 (91)
Diabetes	17 (37)	14 (33)
Hypertension	31 (67)	25 (60)
Heart failure	1 (2.2)	4 (9.5)
COPD	4 (8.7)	3 (7.1)
Coronary artery disease	8 (17)	4 (9.5)
Hypothyroidism	4 (8.7)	5 (12)
Atrial fibrillation	3 (6.5)	11 (26)
Malignancy, n (%)		
Hepatopancreatic	27 (59)	26 (62)
Other	19 (41)	16 (38)
Advanced cancer, n (%)	45 (98)	34 (81)
Locally advanced	21 (46)	9 (21)
Metastatic cancer	24 (52)	25 (60)
Peritoneal carcinosis	11 (24)	14 (33)
Ascites	6 (13)	15 (36)
ASA Classification, n (%)		
1-2	4 (8.7)	
3-5	42 (91)	
Preoperative vomiting, n (%)	36 (78)	33 (79)
Preoperative GOOS, n (%)		
0	27 (59)	22 (52)
1	7 (15)	12 (29)
2	5 (12)	1 (2.2)
3	3 (7.1)	11 (24)
Nasogastric tube preoperatively, n (%)	29 (63)	20 (49)

6.3.1 Outcomes

Morbidity was 14 (30%) in the gastrojejunostomy (GJ) group and 19 (45%) in the self-expanding metal stent (SEMS) group, when which minor complications (CD 1–2) numbered eight (17%) in the GJ group and 0 in the SEMS group. Major complications numbered six (13%) in GJ patients and 19 (45%) in SEMS patients. Nineteen patients (45%) in the SEMS group and four (8.7%) in the GJ group underwent reoperation. In the SEMS group, the most typical reoperations were re-stenting (21%) or

gastrojejunostomy (21%). The most common reason for reoperation was stent obstruction as the disease progressed or problems with gastric emptying even when the stent was open. In three months, hospital readmissions amounted to 7 (15%) in the GJ group and 17 (41%) in the SEMS group. Mortality rates were similar in both groups, and postoperative GOOSS was also similar in both groups. SEMS group patients were able to consume liquids at a median of 0 days (0–3), while GJ group patients needed a median of 2 days (1–24). They consumed soft foods after 2 days (1–6) compared to 4 days (1–26) for the GJ group, and solid foods after 2 days (0–5) compared to 6.5 days (1–10) for the GJ group. Forty (87%) of the GJ patients had a nasogastric tube for a median of 2 days (0–10), while only 7 (13%) of the SEMS group patients needed a nasogastric tube for a median of one day (0–6). Postoperative median survival times were 50 days (9–597) in the SEMS group and 180 days (3–972) in the GJ group. Main outcomes are shown in Table 8.

Table 8. Outcomes of Study III

Variable	Gastrojejunostomy	Duodenal stenting
Morbidity, n (%)	14 (30)	19 (45)
Minor (CD 1-2)	8 (17)	0
Major (CD 3-4)	6 (13)	19 (45)
Reoperation n (%)	4 (8.7)	19 (45)
Duodenal stenting		9 (21)
Gastrojejunostomy		9 (21)
Other	4 (8.7)	1 (2.4)
Length of hospital stay, days (min-max)	7 (1-27)	5 (0-20)
Short term hospital readmissions n (%)	7 (15)	17 (41)
Postoperative survival, days (min-max)	108 (3-972)	50 (9-597)
Oral intake, days (min-max)		
Liquids	2 (1-24)	0 (0-3)
Soft food	4 (1-26)	2 (1-6)
Normal food	6.5 (1-10)	2 (0-5)
Days with nasogastric tube, days (min-max)	2 (0-10)	1 (0-6)

6.4 Study IV

The main characteristics of Study IV are shown in Table 3. Seventy-eight percent of patients had low psoas muscle area (PMA), with a median of 638 mm^2 (113–1347 mm^2) among males and 380 mm^2 (119–960 mm^2) among females. Median albumin levels were 29 g/L (22–33 g/L) for low PMA patients and 31 g/L (25–39 g/L) for normal PMA patients ($p = 0.265$); the corresponding values were 28 g/L (22–32 g/L) in females and 28 g/L (23–31 g/L) in males.

6.4.1 Reduced psoas muscle area and surgical outcomes

No statistically or clinically relevant association was found in this study between low PMA and 30- or 90-day mortality in either sex. Furthermore, ROC analysis failed to provide new cutoff values with reasonable sensitivity and specificity for iliopsoas muscle surface area in palliative surgical patients. Nor was there any association between mortality and low PMA in the various age groups (<65 years, 65–79 years, and >80 years).

Patients who died within 30 and 90 days were older ($p < 0.001$ and $p = 0.004$), had higher ASA classification ($p = 0.011$ and $p < 0.001$), had higher body mass index ($p = 0.004$ and $p = 0.035$), had lower albumin levels ($p = 0.001$ and $p = 0.003$), and had higher infection parameters (leukocytes [$p < 0.001$ and $p < 0.001$] and CRP [$p < 0.001$ and $p < 0.001$]).

7 DISCUSSION

7.1 Morbidity and mortality

Palliative surgery aims to relieve symptoms and improve the quality of life for terminally ill patients. However, given the advanced stage of disease and overall frailty of this patient population, it is not surprising that mortality rates following palliative surgery are often high. In our study, the mortality rate was even higher than those reported in earlier studies, where 30-day mortality rates have been reported to range between 4.6% and 34%(De Boer et al., 2019; Gonzalez et al., 2005; Roses et al., 2014; Tolstrup et al., 2023; Wong et al., 2022b, 2022a). Over 40% of patients in this study died within 30 days of the operation.

The mortality rates in our studies are higher than in any earlier publications. Very few results of palliative gastrointestinal surgery have been reported. The majority of the patients in our study underwent emergency surgery, which may partly explain the high mortality rate (Hatchimonji et al., 2021; To et al., 2019; Ukkonen et al., 2015). The treatment of palliative gastrointestinal surgery patients at TUH is likely not of lower quality than at other hospitals as the results of other gastrointestinal surgeries are fully in line with international outcomes (Helavirta et al., 2016; Mönttinen et al., 2023; Ukkonen et al., 2015).

The research data from 2015-2016 only included palliative patients who underwent surgery, and gastrointestinal surgery patients who received end-of-life care or conservative palliative care were not included in the research data at all. The 2018-2019 data included conservatively treated palliative patients and included 21 patients who had not opted for surgical treatment due to the patient's poor general condition. The high mortality in our studies would indicate that surgical treatment should be considered more carefully and other palliative surgical interventions, conservative palliative care or even end-of-life care should be considered even more frequently (Chen et al., 2022).

The morbidity rates in our study population are even lower than in previous publications, so morbidity did not correlate with mortality rates in our study population. Earlier studies have reported complication rates of 17-56% in palliative surgery (Badgwell et al., 2009, 2009; Deo et al., 2021; Gonzalez et al., 2005; Jaruvongvanich et al., 2020; Miner et al., 2004; Pencovich et al., 2020; Podnos et al., 2007; Wong et al.,

2022a, 2022b). Tolstrup et al. reported 23.3% major surgical complications and 23.3% medical complications in emergency palliative surgery (Tolstrup et al., 2023). Cauley et al. reported even higher morbidity rates after emergency surgery: 69% in intestinal perforation patients and 47% in occlusion patients (Cauley et al., 2015). Preventing major complications is extremely important, because they always impair patients' quality of life and complications can cause prolonged hospital stay, reoperations and mortality.

7.2 Preoperative evaluation

ASA classification and ACS NSQIP had statistically significant correlations with mortality but not with morbidity or other postoperative outcomes (Study I).

The ASA classification has often been criticized because the score is usually based on an assessment made by a single clinician, leading to variation in the scoring depending on the evaluator (Kwa et al., 2022; Sankar et al., 2014). Li et al. suggest that the ASA classification should not be used for preoperative evaluation of morbidity or mortality because it is not reliable for that purpose (Li et al., 2021). On the other hand, ASA is simple to use, relatively easily replicable and has been widely used for evaluating postoperative outcomes, even though not originally intended for that purpose. The ACS NSQIP risk calculator is based on extensive patient data. Its use requires a fair amount of detailed information about the patient. However, both the ASA classification and the ACS NSQIP are easily to utilize in everyday clinical practice.

The Palliative Index, which was developed to evaluate palliative emergency surgery outcomes, did not correlate with morbidity or mortality in our study population. The Palliative Index has only been used in a single publication since its publication in 2014, possibly because its results have not been able to be replicated in follow-up studies (Cohen & Miner, 2019; Folkert & Roses, 2016, 2016).

Higher body mass index, elevated infection parameters (CRP and leukocytes), and low albumin levels are statistically significantly associated with 30- and 90-day mortality (Study IV). The study by Wong et al. reported that, age, low albumin levels, preoperative sepsis, and emergency surgery were predictors of 30-day mortality (Wong et al., 2022b).

7.3 Multidisciplinary approach with palliative care consultation

Palliative care consultation was associated with better overall end-of-life care, communication, and support in a study by Yefimova et al. (Yefimova et al., 2020). Our Study II corroborates this, indicating that preoperative palliative care consultation was

associated with lower hospital admissions and lower in-hospital mortality. As the study population was relatively small, only 24 patients, the results did not reach statistical significance.

Preoperative multidisciplinary evaluation should be available to every patient. In palliative gastrointestinal surgery, a large number of surgeries are performed outside office hours, and are emergency or urgent surgeries, making palliative care consultation challenging. It is not feasible to implement a preoperative multidisciplinary approach during emergency hours. Discussions held in advance with the patient about the desire for treatment and surgery facilitate the treatment of emergency situations. An open and honest discussion with the patient about the procedure, its benefits, the goals of palliative surgery, and possible harms and complications should be carried out in a way that is as understandable to the patient as possible (Z. Cooper et al., 2016). Shared decision-making in palliative surgery is challenging, because the surgical procedures and their mortality and morbidity risk are individual and their assessment is difficult even for a specialist. However, patients' preferences and priorities in life vary, making individual decision-making essential (Rabben et al., 2024).

Additionally, 34% of surgeries in our patient data became palliative during surgery, making preoperative multidisciplinary palliative evaluation impossible.

7.4 Gastric outlet obstruction

Our study results are similar to those of earlier studies; patients undergoing endoscopic duodenal stenting with SEMS are more likely to achieve rapid oral intake and have shorter hospital stays (Jang et al., 2019; Yukimoto et al., 2018). On the other hand, there were more reoperations, more short-term hospital readmissions, more major complications, and lower survival rates in the endoscopic duodenal stenting group than in the GJ group; this result is also consistent with those of earlier publications showing at GJ group patients had longer survival and also longer time to oral intake. (Fiori et al., 2013; Jang et al., 2019; Yukimoto et al., 2018).

The endoscopic patients in Study II did not receive general anesthesia unless it was absolutely necessary. GJ patients were older, and they had more advanced cancer which is why patients are likely to undergo stenting instead of GJ surgery, which may explain the poorer outcomes of endoscopic stenting. Our study corroborates the findings of earlier prospective studies. Patients with expected short survival time should be considered for SEMS, but if expected survival time if longer, GJ is a better option (Jeurnink et al., 2010; Mehta et al., 2006).

7.5 Psoas muscle area

Using the psoas muscle area to assess total muscle mass has been criticized as it is not representative of overall sarcopenia (Cruz-Jentoft et al., 2019). However, we chose this method because it is simple and fast, allowing any clinician to perform the measurement preoperatively without requiring special computer programs or training. Sarcopenia has been shown to cause poorer outcomes in gastrointestinal surgery beyond palliative surgery, but methods for measuring sarcopenia vary widely across studies (Brandt et al., 2019; Erkul et al., 2022; J. Lee et al., 2023; Nagarajan et al., 2023). A good, standardized method for measuring sarcopenia from imaging studies is needed to produce consistent research results.

7.6 Limitations and strengths of the studies

The greatest limitation of all the patient data of this thesis is that all studies were single-center retrospective data studies, where the clinician's view of the patient is likely to cause selection bias that cannot be avoided in this study setting. Moreover, the research data were collected from several different years, which may have affected the results. Sample size was relatively small, which may have limited our ability to detect a statistically significant association. The study population was heterogeneous, over two thirds (68%) of patients had gastrointestinal malignancies, but there were 24% of patients with other malignancies and as many as 8.7% of patients with nonmalignant diagnoses as the reason for the surgery.

The strength of our studies was that despite being retrospective studies, almost all the necessary patient data were available, including comprehensive postoperative details, and complete mortality follow-up obtained from national registries. Patient data were real life data, which provides valuable information about real results withoutany potential distortion caused by the research.

7.7 Future perspectives

The multidisciplinary approach and systematic preoperative risk assessment of palliative patients should be increased. Since 2019, there has been an annual increase in studies on palliative gastrointestinal surgery and a lot of interest in the field. Morbidity and mortality are important outcomes in surgery, but especially in the palliative patient group, improved quality of life should be the main target due to these patients' short

life expectancy. High-quality, prospective studies focusing on quality of life are needed in the future regarding the care of palliative gastrointestinal surgical patients to enhance knowledge and improve surgeons' understanding of palliative patients' surgical treatment.

8 CONCLUSION

The main conclusions of this thesis are:

I Palliative gastrointestinal surgery has high mortality rates and postoperative functional ability in activities of daily living is poor.

II Preoperative ASA classification, ACS NSQIP risk calculator, infection parameters, and albumin are suitable for the assessment of preoperative palliative gastrointestinal surgery suitability.

III Multidisciplinary preoperative evaluation of palliative gastrointestinal surgery patients may improve outcomes.

IV In line with earlier findings, for selected patients, gastrojejunostomy is preferable to endoscopic stenting in the treatment of palliative gastric outlet obstruction.

9 ACKNOWLEDGEMENTS

This study was carried out in the Department of Gastroenterology and Alimentary Tract Surgery, Tampere University Hospital, and at Tampere University between 2019 and 2025. The study was financially supported by the Cancer Foundation Finland, the Satakunta Regional Fund, and the then Satakunta Hospital District.

I owe my most profound gratitude to my supervisors, Chief of Gastrointestinal Surgery, Research Director, Docent Mika Ukkonen and the Head of the Department of Gastroenterology and Alimentary Tract Surgery, Professor of Gastrointestinal Surgery, Johanna Laukkarinen. I thank Johanna for her encouraging and constructive feedback at every step throughout this project. Mika, I cannot thank you enough for everything you have done to help me with all the manuscripts and with this dissertation. All those discussions about science, clinical work, and life have meant a lot to me. Your contribution to this work has been invaluable.

I wish to sincerely thank my pre-examiners, Professor Tiina Saarto and Matti Tolonen PhD. Dr Tolonen evaluated this work from a surgical perspective, and Professor Saarto from a palliative perspective. Both of you helped to improve this manuscript with valuable criticism and comments. I express my appreciation to Professor Juha Saarnio of the University of Oulu for kindly agreeing to be my opponent at the public defence of this dissertation.

I warmly thank Eija Junttila PhD and Chief of Anesthesia, Docent Maija Kalliomäki of the Department of Anesthesiology and Intensive Care Medicine for your irreplaceable work in the first steps of this project. After all, the study of palliative gastrointestinal surgery patients was your idea in the first place. I would like to thank Professor Juho Lehto and Reetta Piili PhD of the Palliative Care Centre, Department of Oncology, for providing a valuable palliative care perspective for my articles. I am also grateful to the other co-authors of our articles, Iida Alamylläri MD and Tuula Tyrväinen MD.

I wish to thank Virginia Mattila, MA, for her fast and precise checking of the language of the manuscripts, and research coordinator Satu Järvinen her valuable assistance in the studies.

I thank all my colleagues at Tampere University Hospital and Satasairaala, Pori. It has been a privilege to work with all of you. Special thanks to the Head of

Gastrointestinal Surgery, Jyrki Haikonen, Satasairaala. Thank you for everything you have taught me; I owe you several Grappas for all of that!

I thank my old friends from Nurmo. Thank you for keeping my feet on the ground and giving me a perspective on life outside of hospitals and medicine. Especially, I would like to thank Mikko and Niko for all the hiking trips we have made together in Lapland. Those trips were sometimes heavy but always pleasant. Anssi, thank you, and thanks to all of Ujot ja Raittiit (Nuoret) Pojat (URPOT). It is an honor to be part of that group.

My warmest thanks go to my mom and dad. You have always supported and believed in me in every step of my life. Special thanks go to my mom, who made writing this dissertation a lot easier by helping to babysit Kaspian. I want to thank also my in-laws Terttu and Hannu for all their support.

Finally, above all, I want to thank my dearest Camilla. You mean everything to me. Thank you for making me a better person by sharing life with me. Our little Kaspian, thank you for reminding me every day what really matters most in this life.

Tampere, January 26, 2025
Matti Laitamäki

10 REFERENCES

Aadam, A. A., & Liu, K. (2019). Endoscopic palliation of biliary obstruction. *Journal of Surgical Oncology*, *120*(1), 57–64. https://doi.org/10.1002/jso.25483

Abelson, J. S., Yeo, H. L., Mao, J., Milsom, J. W., & Sedrakyan, A. (2017). Long-term Postprocedural Outcomes of Palliative Emergency Stenting vs Stoma in Malignant Large-Bowel Obstruction. *JAMA Surgery*, *152*(5), 429–435. https://doi.org/10.1001/jamasurg.2016.5043

ACS NSQIP history. (2024). ACS. https://www.facs.org/quality-programs/data-and-registries/acs-nsqip/history/

ACS Risk Calculator. (2024). https://riskcalculator.facs.org/RiskCalculator/Outcome.jsp

Adler, D. G., & Baron, T. H. (2001). Endoscopic palliation of malignant dysphagia. *Mayo Clinic Proceedings*, *76*(7), 731–738. https://doi.org/10.4065/76.7.731

Akagi, T., Inomata, M., Etoh, T., Yasuda, K., Shiraishi, N., & Kitano, S. (2011). Laparoscopic Versus Conventional Palliative Resection for Incurable, Symptomatic Stage IV Colorectal Cancer: Impact on Short-Term Results.

Surgical Laparoscopy Endoscopy & Percutaneous Techniques, *21*(3), 184. https://doi.org/10.1097/SLE.0b013e31821db75e

Akhan, O., Durmaz, H., Balcı, S., Birgi, E., Çiftçi, T., & Akıncı, D. (2020). Percutaneous drainage of retroperitoneal abscesses: Variables for success, failure, and recurrence. *Diagnostic and Interventional Radiology*, *26*(2), 124–130. https://doi.org/10.5152/dir.2019.19199

Alterio, R. E., Meier, J., Radi, I., Bhat, A., Tellez, J. C., Al Abbas, A., Wang, S., Porembka, M., Mansour, J., Yopp, A., Zeh, H. J., & Polanco, P. M. (2023). Defining the Price Tag of Complications Following Pancreatic Surgery: A US National Perspective. *Journal of Surgical Research*, *288*, 87–98. https://doi.org/10.1016/j.jss.2023.02.032

Aniśko-Trembecka, P., Popławska, M., Krajewska-Kułak, E., Mickiewicz, I., & Kułak, W. (2023). The Functioning of Hospice in the Perception of Family Members of Cancer Surgery and Hospice Patients. *International Journal of Environmental Research and Public Health*, *20*(7), 5334. https://doi.org/10.3390/ijerph20075334

Aoki, T., Hirata, Y., Yamada, A., & Koike, K. (2019). Initial management for acute lower gastrointestinal bleeding. *World Journal of Gastroenterology*, *25*(1), 69–84. https://doi.org/10.3748/wjg.v25.i1.69

Arends, J., Bachmann, P., Baracos, V., Barthelemy, N., Bertz, H., Bozzetti, F., Fearon, K., Hütterer, E., Isenring, E., Kaasa, S., Krznaric, Z., Laird, B., Larsson, M., Laviano, A., Mühlebach, S., Muscaritoli, M., Oldervoll, L., Ravasco, P., Solheim, T., … Preiser, J.-C. (2017). ESPEN guidelines on nutrition in cancer patients. *Clinical Nutrition (Edinburgh, Scotland)*, *36*(1), 11–48. https://doi.org/10.1016/j.clnu.2016.07.015

Augustin, A. M., Fluck, F., Bley, T., & Kickuth, R. (2019). Endovascular Therapy of Gastrointestinal Bleeding. *RöFo - Fortschritte Auf Dem Gebiet Der Röntgenstrahlen Und Der Bildgebenden Verfahren*, *191*(12), 1073–1082. https://doi.org/10.1055/a-0891-1116

Badgwell, B. D., Smith, K., Liu, P., Bruera, E., Curley, S. A., & Cormier, J. N. (2009). Indicators of surgery and survival in oncology inpatients requiring surgical evaluation for palliation. *Supportive Care in Cancer*, *17*(6), 727–734. https://doi.org/10.1007/s00520-008-0554-6

Bahat, G., Yilmaz, O., Oren, M. M., Karan, M. A., Reginster, J. Y., Bruyère, O., & Beaudart, C. (2018). Cross-cultural adaptation and validation of the SARC-F to assess sarcopenia: Methodological report from European Union Geriatric Medicine Society Sarcopenia Special Interest Group. *European Geriatric Medicine*, *9*(1), 23–28. https://doi.org/10.1007/s41999-017-0003-5

Bahat, Yilmaz, O., KiliÃ§, C., Oren, M. M., & Karan, M. A. (2018). Performance of SARC-F in Regard to Sarcopenia Definitions, Muscle Mass and Functional Measures. *The Journal of Nutrition, Health and Aging*, *22*(8), 898–903. https://doi.org/10.1007/s12603-018-1067-8

Bajwah, S., Oluyase, A. O., Yi, D., Gao, W., Evans, C. J., Grande, G., Todd, C., Costantini, M., Murtagh, F. E., & Higginson, I. J. (2020). *The effectiveness and cost-effectiveness of hospital-based specialist palliative care for adults with advanced illness and their caregivers—Bajwah, S - 2020 | Cochrane Library*. https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD012780.pub2/full

Barberan-Garcia, A., Ubré, M., Roca, J., Lacy, A. M., Burgos, F., Risco, R., Momblán, D., Balust, J., Blanco, I., & Martínez-Pallí, G. (2018). Personalised Prehabilitation in High-risk Patients Undergoing Elective Major Abdominal Surgery: A Randomized Blinded Controlled Trial. *Annals of Surgery*, *267*(1), 50–56. https://doi.org/10.1097/SLA.0000000000002293

Basta, Y. L., Bolle, S., Fockens, P., & Tytgat, K. M. A. J. (2017). The Value of Multidisciplinary Team Meetings for Patients with Gastrointestinal Malignancies: A Systematic Review. *Annals of Surgical Oncology*, *24*(9), 2669–2678. https://doi.org/10.1245/s10434-017-5833-3

Beets, G., Sebag-Montefiore, D., Andritsch, E., Arnold, D., Beishon, M., Crul, M., Dekker, J. W., Delgado-Bolton, R., Fléjou, J.-F., Grisold, W., Henning, G., Laghi, A., Lovey, J., Negrouk, A., Pereira, P., Roca, P., Saarto, T., Seufferlein, T., Taylor, C., … Naredi, P. (2017). ECCO Essential Requirements for Quality Cancer Care: Colorectal Cancer. A critical review. *Critical Reviews in Oncology/Hematology*, *110*, 81–93. https://doi.org/10.1016/j.critrevonc.2016.12.001

Bergland, A., Jørgensen, L., Emaus, N., & Strand, B. H. (2017). Mobility as a predictor of all-cause mortality in older men and women: 11.8 year follow-up in the Tromsø study. *BMC Health Services Research*, *17*(1), 22. https://doi.org/10.1186/s12913-016-1950-0

Bering, J., Batheja, M. J., & Abraham, N. S. (2024). Endoscopic Hemostasis and Antithrombotic Management. *Gastroenterology Clinics of North America*, *53*(4), 573–586. https://doi.org/10.1016/j.gtc.2024.08.004

Berlin, A., & Carleton, T. J. (2019). Concurrent Palliative Care for Surgical Patients. *Surgical Clinics of North America*, *99*(5), 823–831. https://doi.org/10.1016/j.suc.2019.06.001

Bhat, Y. M. (2014). Tissue Adhesives for Endoscopic Use. *Gastroenterology & Hepatology*, *10*(4), 251–253.

Bilimoria, K. Y., Liu, Y., Paruch, J. L., Zhou, L., Kmiecik, T. E., Ko, C. Y., & Cohen, M. E. (2013). Development and Evaluation of the Universal ACS NSQIP Surgical Risk Calculator: A Decision Aid and Informed Consent Tool for Patients and Surgeons. *Journal of the American College of Surgeons*, *217*(5), 833-842e3. https://doi.org/10.1016/j.jamcollsurg.2013.07.385

Bolliger, M., Kroehnert, J.-A., Molineus, F., Kandioler, D., Schindl, M., & Riss, P. (2018). Experiences with the standardized classification of surgical complications (Clavien-Dindo) in general surgery patients. *European Surgery*, *50*(6), 256–261. https://doi.org/10.1007/s10353-018-0551-z

Bosanquet, D. C., Ansell, J., Abdelrahman, T., Cornish, J., Harries, R., Stimpson, A., Davies, L., Glasbey, J. C. D., Frewer, K. A., Frewer, N. C., Russell, D., Russell, I., & Torkington, J. (2015). Systematic Review and Meta-Regression of Factors Affecting Midline Incisional Hernia Rates: Analysis of 14 618 Patients. *PLoS ONE*, *10*(9), e0138745. https://doi.org/10.1371/journal.pone.0138745

Brandt, E., Tengberg, L. T., & Bay-Nielsen, M. (2019). Sarcopenia predicts 90-day mortality in elderly patients undergoing emergency abdominal surgery. *Abdominal Radiology*, *44*(3), 1155–1160. https://doi.org/10.1007/s00261-018-1870-z

Buehring, B., Siglinsky, E., Krueger, D., Evans, W., Hellerstein, M., Yamada, Y., & Binkley, N. (2018). Comparison of muscle/lean mass measurement methods:

Correlation with functional and biochemical testing. *Osteoporosis International*, *29*(3), 675–683. https://doi.org/10.1007/s00198-017-4315-6

Cai, Y., Fan, Z., Yang, G., Zhao, D., Shan, L., Lin, S., Zhang, W., & Liu, R. (2024). Analysis of the efficacy of Percutaneous Transhepatic Cholangiography Drainage (PTCD) and Endoscopic Retrograde Cholangiopancreatography (ERCP) in the treatment of Malignant Obstructive Jaundice (MOJ) in palliative drainage and preoperative biliary drainage: A single-center retrospective study. *BMC Surgery*, *24*(1), 307. https://doi.org/10.1186/s12893-024-02595-w

Cauley, C. E., Panizales, M. T., Reznor, G., Haynes, A. B., Havens, J. M., Kelley, E., Mosenthal, A. C., & Cooper, Z. (2015). Outcomes after emergency abdominal surgery in patients with advanced cancer: Opportunities to reduce complications and improve palliative care. *The Journal of Trauma and Acute Care Surgery*, *79*(3), 399–406. https://doi.org/10.1097/TA.0000000000000764

Cesari, M., Kritchevsky, S. B., Newman, A. B., Simonsick, E. M., Harris, T. B., Penninx, B. W., Brach, J. S., Tylavsky, F. A., Satterfield, S., Bauer, D. C., Rubin, S. M., Visser, M., & Pahor, M. (2009). Added Value of Physical Performance Measures in Predicting Adverse Health-Related Events: Results from the Health, Aging, and Body Composition Study. *Journal of the American Geriatrics Society*, *57*(2), 251–259. https://doi.org/10.1111/j.1532-5415.2008.02126.x

Chan, S. M., Dhir, V., Chan, Y. Y. Y., Cheung, C. H. N., Chow, J. C. S., Wong, I. W. M., Shah, R., Yip, H. C., Itoi, T., & Teoh, A. Y. B. (2023). Endoscopic ultrasound-guided balloon-occluded gastrojejunostomy bypass, duodenal stent or laparoscopic gastrojejunostomy for unresectable malignant gastric outlet obstruction. *Digestive Endoscopy*, *35*(4), 512–519. https://doi.org/10.1111/den.14472

Chandrashekhara, S., Gamanagatti, S., Singh, A., & Bhatnagar, S. (2016). Current status of percutaneous transhepatic biliary drainage in palliation of malignant obstructive jaundice: A review. *Indian Journal of Palliative Care*, *22*(4), 378. https://doi.org/10.4103/0973-1075.191746

Charles, H. W. (2012). Abscess Drainage. *Seminars in Interventional Radiology*, *29*, 325–336. https://doi.org/10.1055/s-0032-1330068

Chen, V. W., Portuondo, J. I., Cooper, Z., & Massarweh, N. N. (2022). Use of Palliative Interventions at End of Life for Advanced Gastrointestinal Cancer. *Annals of Surgical Oncology*, *29*(12), 7281–7292. https://doi.org/10.1245/s10434-022-12342-1

Chernock, B., Hwang, F., Berlin, A., Pentakota, S. R., Singh, R., Singh, R., & Mosenthal, A. C. (2020). Emergency abdominal surgery in patients presenting from skilled nursing facilities: Opportunities for palliative care. *The American Journal of Surgery*, *219*(6), 1076–1082. https://doi.org/10.1016/j.amjsurg.2019.09.015

Clavien, P. A., Barkun, J., De Oliveira, M. L., Vauthey, J. N., Dindo, D., Schulick, R. D., De Santibañes, E., Pekolj, J., Slankamenac, K., Bassi, C., Graf, R., Vonlanthen, R., Padbury, R., Cameron, J. L., & Makuuchi, M. (2009). The Clavien-Dindo Classification of Surgical Complications: Five-Year Experience. *Annals of Surgery*, *250*(2), 187–196. https://doi.org/10.1097/SLA.0b013e3181b13ca2

Clavien, P. A., Sanabria, J. R., & Strasberg, S. M. (1992). Proposed classification of complications of surgery with examples of utility in cholecystectomy. *Surgery*, *111*(5), 518–526.

Cohen, J. T., & Miner, T. J. (2019). Patient selection in palliative surgery: Defining value. *Journal of Surgical Oncology*, *120*(1), 35–44. https://doi.org/10.1002/jso.25512

Cominardi, A., Tamanini, G., Brighi, N., Fusaroli, P., & Lisotti, A. (2021). Conservative management of malignant gastric outlet obstruction syndrome-evidence based evaluation of endoscopic ultrasound-guided gastroentero-anastomosis. *World Journal of Gastrointestinal Oncology*, *13*(9), 1086–1098. https://doi.org/10.4251/wjgo.v13.i9.1086

Connor, S. (2020, October 21). *Global Atlas of Palliative Care (2nd edition)—PAHO/WHO | Pan American Health Organization*. https://www.paho.org/en/node/75063

Cook, M. R. (2019). Goals of Care. *Surgical Clinics of North America*, *99*(5), 833–847. https://doi.org/10.1016/j.suc.2019.06.005

Cooper, C., Fielding, R., Visser, M., van Loon, L., Rolland, Y., Orwoll, E., Reid, K., Boonen, S., Dere, W., Epstein, S., Mitlak, B., Tsouderos, Y., Sayer, A., Rizzoli, R., Reginster, J., & Kanis, J. (2013). Tools in the assessment of sarcopenia. *Calcified Tissue International*, *93*(3), 201–210. https://doi.org/10.1007/s00223-013-9757-z

Cooper, Z., Koritsanszky, L. A., Cauley, C. E., Frydman, J. L., Bernacki, R. E., Mosenthal, A. C., Gawande, A. A., & Block, S. D. (2016). Recommendations for Best Communication Practices to Facilitate Goal-concordant Care for Seriously Ill Older Patients With Emergency Surgical Conditions. *Annals of Surgery*, *263*(1), 1–6. https://doi.org/10.1097/SLA.0000000000001491

Cooper, Z., Lilley, E. J., Bollens-Lund, E., Mitchell, S. L., Ritchie, C. S., Lipstiz, S. R., & Kelley, A. S. (2018). High Burden of Palliative Care Needs of Older Adults During Emergency Major Abdominal Surgery. *Journal of the American Geriatrics Society*, *66*(11), 2072–2078. https://doi.org/10.1111/jgs.15516

Crosara Teixeira, M., Mak, M. P., Marques, D. F., Capareli, F., Carnevale, F. C., Moreira, A. M., Ribeiro, U., Cecconello, I., & Hoff, P. M. (2013). Percutaneous Transhepatic Biliary Drainage in Patients with Advanced Solid Malignancies: Prognostic Factors and Clinical Outcomes. *Journal of Gastrointestinal Cancer*, *44*(4), 398–403. https://doi.org/10.1007/s12029-013-9509-3

Cruz-Jentoft, A. J., Bahat, G., Bauer, J., Boirie, Y., Bruyère, O., Cederholm, T., Cooper, C., Landi, F., Rolland, Y., Sayer, A. A., Schneider, S. M., Sieber, C. C., Topinkova, E., Vandewoude, M., Visser, M., Zamboni, M., Writing Group for the European Working Group on Sarcopenia in Older People 2 (EWGSOP2), and the Extended Group for EWGSOP2, Bautmans, I., Baeyens, J.-P., … Schols, J. (2019). Sarcopenia: Revised European consensus on definition and diagnosis. *Age and Ageing*, *48*(1), 16–31. https://doi.org/10.1093/ageing/afy169

Currow, D. C., Agar, M. R., & Phillips, J. L. (2020). Role of Hospice Care at the End of Life for People With Cancer. *Journal of Clinical Oncology*, *38*(9), 937–943. https://doi.org/10.1200/JCO.18.02235

Curry, R. S., Evans, E., Raftery, A.-M., Hiscock, J., & Poolman, M. (2019). Percutaneous venting gastrostomy/gastrojejunostomy for malignant bowel obstruction: A qualitative study. *BMJ Supportive & Palliative Care*, *9*(4), 381–388. https://doi.org/10.1136/bmjspcare-2019-001866

Dai, R., Uppot, R., Arellano, R., & Kalva, S. (2024). Image-guided Ablative Procedures. *Clinical Oncology*, *36*(8), 484–497. https://doi.org/10.1016/j.clon.2023.11.037

Dajenah, M., Ahmed, F., Thabet, A., Ghaleb, K., & Nikbakht, H.-A. (2022). Early Postoperative Complications of Gastrointestinal Surgery and Its Associated Factors in Yemeni Patients Treated in a Teaching Hospital: A Retrospective

Monocentric Study. *Cureus*, *14*(5), e25215. https://doi.org/10.7759/cureus.25215

Dalal, K. M., Gollub, M. J., Miner, T. J., Wong, W. D., Gerdes, H., Schattner, M. A., Jaques, D. P., & Temple, L. K. F. (2011). Management of Patients with Malignant Bowel Obstruction and Stage IV Colorectal Cancer. *Journal of Palliative Medicine*, *14*(7), 822–828. https://doi.org/10.1089/jpm.2010.0506

Daniels, M., Merkel, S., Agaimy, A., & Hohenberger, W. (2015). Treatment of perforated colon carcinomas—Outcomes of radical surgery. *International Journal of Colorectal Disease*, *30*(11), 1505–1513. https://doi.org/10.1007/s00384-015-2336-1

De Boer, N. L., Hagemans, J. A. W., Schultze, B. T. A., Brandt-Kerkhof, A. R. M., Madsen, E. V. E., Verhoef, C., & Burger, J. W. A. (2019). Acute malignant obstruction in patients with peritoneal carcinomatosis: The role of palliative surgery. *European Journal of Surgical Oncology*, *45*(3), 389–393. https://doi.org/10.1016/j.ejso.2018.12.015

Deo, S. V. S., Kumar, N., Rajendra, V. K. J., Kumar, S., Bhoriwal, S. K., Ray, M., Bhatnagar, S., & Mishra, S. (2021). Palliative Surgery for Advanced Cancer: Clinical Profile, Spectrum of Surgery and Outcomes from a Tertiary Care Cancer Centre in Low-Middle-Income Country. *Indian Journal of Palliative Care*, *27*, 281–285. https://doi.org/10.25259/IJPC_399_20

Dhamija, E., Thulkar, S., & Bhatnagar, S. (2015). Utility and Potential of Bedside Ultrasound in Palliative Care. *Indian Journal of Palliative Care*, *21*(2), 132–136. https://doi.org/10.4103/0973-1075.156465

Dietrich, C., Lorentzen, T., Appelbaum, L., Buscarini, E., Cantisani, V., Correas, J., Cui, X., D'Onofrio, M., Gilja, O., Hocke, M., Ignee, A., Jenssen, C., Kabaalioğlu, A., Leen, E., Nicolau, C., Nolsøe, C., Radzina, M., Serra, C., Sidhu, P., … Piscaglia, F. (2015). EFSUMB Guidelines on Interventional Ultrasound (INVUS), Part III – Abdominal Treatment Procedures (Long Version). *Ultraschall in Der Medizin - European Journal of Ultrasound*, *37*(01), E1–E32. https://doi.org/10.1055/s-0035-1553917

Dindo, D., Demartines, N., & Clavien, P.-A. (2004). Classification of Surgical Complications: A New Proposal With Evaluation in a Cohort of 6336 Patients and Results of a Survey. *Annals of Surgery*, *240*(2), 205–213. https://doi.org/10.1097/01.sla.0000133083.54934.ae

Dumonceau, J.-M., Kapral, C., Aabakken, L., Papanikolaou, I. S., Tringali, A., Vanbiervliet, G., Beyna, T., Dinis-Ribeiro, M., Hritz, I., Mariani, A., Paspatis, G., Radaelli, F., Lakhtakia, S., Veitch, A. M., & Hooft, J. E. van. (2019). ERCP-related adverse events: European Society of Gastrointestinal Endoscopy (ESGE) Guideline. *Endoscopy*, *52*, 127–149. https://doi.org/10.1055/a-1075-4080

Eguchi, H., Yada, K., Shibata, K., Matsumoto, T., Etoh, T., Yasuda, K., Inomata, M., Shiraishi, N., Ohta, M., & Kitano, S. (2012). Laparoscopic stomach-partitioning gastrojejunostomy is an effective palliative procedure to improve quality of life in patients with malignant gastroduodenal outlet obstruction. *Asian Journal of Endoscopic Surgery*, *5*(4), 153–156. https://doi.org/10.1111/j.1758-5910.2012.00151.x

Erkul, O., Cekic, A. B., Cansu, A., Yildirim, R., & Guner, A. (2022). Effects of Sarcopenia on Postoperative Outcomes in Patients Who Underwent Gastrectomy for Gastric Cancer. *Journal of Surgical Research*, *274*, 196–206. https://doi.org/10.1016/j.jss.2021.12.051

Fiori, E., Lamazza, A., DeMasi, E., DeCesare, A., Schillaci, A., & Sterpetti, A. V. (2013). Endoscopic stenting for gastric outlet obstruction in patients with unresectable antro pyloric cancer. Systematic review of the literature and final results of a prospective study. The point of view of a surgical group. *The American Journal of Surgery*, *206*(2), 210–217. https://doi.org/10.1016/j.amjsurg.2012.08.018

Folkert, I. W., & Roses, R. E. (2016). Value in palliative cancer surgery: A critical assessment. *Journal of Surgical Oncology*, *114*(3), 311–315. https://doi.org/10.1002/jso.24303

Franciosi, V., Maglietta, G., Esposti, C. D., Caruso, G., Cavanna, L., Bertè, R., Bacchini, G., Bocchi, L., Piva, E., Monfredo, M., Scafuri, V., Cesare, P. D., Melotti, B.,

Sequino, M., Rimanti, A., Binovi, C., Ghisoni, F., & Caminiti, C. (2019). Early palliative care and quality of life of advanced cancer patients—A multicenter randomized clinical trial. *Annals of Palliative Medicine*, *8*(4), Article 4. https://doi.org/10.21037/apm.2019.02.07

Fulton, J. J., LeBlanc, T. W., Cutson, T. M., Porter Starr, K. N., Kamal, A., Ramos, K., Freiermuth, C. E., McDuffie, J. R., Kosinski, A., Adam, S., Nagi, A., & Williams, J. W. (2019). Integrated outpatient palliative care for patients with advanced cancer: A systematic review and meta-analysis. *Palliative Medicine*, *33*(2), 123–134. https://doi.org/10.1177/0269216318812633

Gairing, S. J., Thol, F., Müller, L., Hahn, F., Thomaidis, T., Czauderna, C., Bartsch, F., Pitton, M. B., Marquardt, J. U., Wörns, M.-A., Galle, P. R., Moehler, M., Weinmann, A., Kloeckner, R., & Foerster, F. (2021). The Addition of Transarterial Chemoembolization to Palliative Chemotherapy Extends Survival in Intrahepatic Cholangiocarcinoma. *Journal of Clinical Medicine*, *10*(12), 2732. https://doi.org/10.3390/jcm10122732

Galante, J. M. (2005). Experience and Attitudes of Surgeons Toward Palliation in Cancer. *Archives of Surgery*, *140*(9), 873. https://doi.org/10.1001/archsurg.140.9.873

Gardham, J. (1964). Palliative surgery. *Proceedings Ofthe Royal Society ofMedicine*, *1964*(57), 123–128.

Gebran, A., Proaño-Zamudio, J. A., Argandykov, D., Dorken-Gallastegi, A., Renne, A. M., Parks, J. J., Kaafarani, H. M. A., Paranjape, C., Velmahos, G. C., & Hwabejire, J. O. (2023). Association of Comorbidities and Functional Level With Mortality in Geriatric Bowel Perforation. *Journal of Surgical Research*, *285*, 90–99. https://doi.org/10.1016/j.jss.2022.12.027

Girelli, R., Frigerio, I., Giardino, A., Regi, P., Gobbo, S., Malleo, G., Salvia, R., & Bassi, C. (2013). Results of 100 pancreatic radiofrequency ablations in the context of a multimodal strategy for stage III ductal adenocarcinoma. *Langenbeck's Archives of Surgery*, *398*(1), 63–69. https://doi.org/10.1007/s00423-012-1011-z

Golder, H., Casanova, D., & Papalois, V. (2023). Evaluation of the usefulness of the Clavien-Dindo classification of surgical complications. *Cirugía Española (English Edition)*, *101*(9), 637–642. https://doi.org/10.1016/j.cireng.2023.02.002

Gomes, B., Calanzani, N., Curiale, V., McCrone, P., Higginson, I. J., & Brito, M. de. (2013). *Effectiveness and cost-effectiveness of home palliative care services for adults with advanced illness and their caregivers—Gomes, B - 2013 | Cochrane Library*. https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD007760.pub2/full

Gonzalez, R., Smith, C. D., Ritter, E. M., Mason, E., Duncan, T., & Ramshaw, B. J. (2005). Laparoscopic palliative surgery for complicated colorectal cancer. *Surgical Endoscopy*, *19*(1), 43–46. https://doi.org/10.1007/s00464-003-8207-9

Gralnek, I. M., Stanley, A. J., Morris, A. J., Camus, M., Lau, J., Lanas, A., Laursen, S. B., Radaelli, F., Papanikolaou, I. S., Cúrdia Gonçalves, T., Dinis-Ribeiro, M., Awadie, H., Braun, G., De Groot, N., Udd, M., Sanchez-Yague, A., Neeman, Z., & Van Hooft, J. E. (2021). Endoscopic diagnosis and management of nonvariceal upper gastrointestinal hemorrhage (NVUGIH): European Society of Gastrointestinal Endoscopy (ESGE) Guideline – Update 2021. *Endoscopy*, *53*(03), 300–332. https://doi.org/10.1055/a-1369-5274

Guralnik, J. M., Ferrucci, L., Pieper, C. F., Leveille, S. G., Markides, K. S., Ostir, G. V., Studenski, S., Berkman, L. F., & Wallace, R. B. (2000). Lower Extremity Function and Subsequent Disability: Consistency Across Studies, Predictive Models, and Value of Gait Speed Alone Compared With the Short Physical Performance Battery. *The Journals of Gerontology: Series A*, *55*(4), M221–M231. https://doi.org/10.1093/gerona/55.4.M221

Haiducu, C., Buzea, C. A., Delcea, C., Brasoveanu, V., Grasu, C. M., & Dan, G.-A. (2023). Sarcopenia assessed by total psoas index – is it correlated with post-operative complications in all digestive cancers? *Medicine and Pharmacy Reports*, *96*(3), 274–282. https://doi.org/10.15386/mpr-2539

Haltia, O., Vesinurm, M., Leskelä, R.-L., Rahko, E., Tyynelä-Korhonen, K., Lehto, J. T., Saarto, T., & Akrén, O. M. (2023). The effect of palliative outpatient units

on resource use for cancer patients in Finland. *Acta Oncologica*, *62*(9), Article 9. https://doi.org/10.1080/0284186X.2023.2241988

Hatchimonji, J. S., Ma, L. W., Kaufman, E. J., Dowzicky, P. M., Scantling, D. R., Yang, W., & Holena, D. N. (2021). Differences Between Center-level Outcomes in Emergency and Elective General Surgery. *Journal of Surgical Research*, *261*, 1–9. https://doi.org/10.1016/j.jss.2020.11.086

Haun, M. W., Estel, S., Rücker, G., Friederich, H.-C., Villalobos, M., Thomas, M., & Hartmann, M. (2017). Early palliative care for adults with advanced cancer. *Cochrane Database of Systematic Reviews*, *2017*(6). https://doi.org/10.1002/14651858.CD011129.pub2

Hawley, P. H. (2014). The Bow Tie Model of 21st Century Palliative Care. *Journal of Pain and Symptom Management*, *47*(1), e2–e5. https://doi.org/10.1016/j.jpainsymman.2013.10.009

Helavirta, I., Huhtala, H., Hyöty, M., Collin, P., & Aitola, P. (2016). Restorative Proctocolectomy for Ulcerative Colitis in 1985–2009. *Scandinavian Journal of Surgery*, *105*(2), 73–77. https://doi.org/10.1177/1457496915590540

Heymsfield, S. B., Gonzalez, M. C., Lu, J., Jia, G., & Zheng, J. (2015). Skeletal muscle mass and quality: Evolution of modern measurement concepts in the context

of sarcopenia. *Proceedings of the Nutrition Society*, *74*(4), 355–366. https://doi.org/10.1017/S0029665115000129

Horvath, B., Kloesel, B., Todd, M. M., Cole, D. J., & Prielipp, R. C. (2021). The Evolution, Current Value, and Future of the American Society of Anesthesiologists Physical Status Classification System. *Anesthesiology*, *135*(5), 904–919. https://doi.org/10.1097/ALN.0000000000003947

Høydahl, Ø., Edna, T.-H., Xanthoulis, A., Lydersen, S., & Endreseth, B. H. (2020). Long-term trends in colorectal cancer: Incidence, localization, and presentation. *BMC Cancer*, *20*(1). https://doi.org/10.1186/s12885-020-07582-x

Hui, D., & Bruera, E. (2020). Models of Palliative Care Delivery for Patients With Cancer. *Journal of Clinical Oncology*, *38*(9), 852–865. https://doi.org/10.1200/JCO.18.02123

Hui, D., Hoge, G., & Bruera, E. (2021). Models of supportive care in oncology. *Current Opinion in Oncology*, *33*(4), 259–266. https://doi.org/10.1097/CCO.0000000000000733

Hui, D., Kim, S. H., Roquemore, J., Dev, R., Chisholm, G., & Bruera, E. (2014). Impact of timing and setting of palliative care referral on quality of end-of-life care in cancer patients. *Cancer*, *120*(11), 1743–1749. https://doi.org/10.1002/cncr.28628

Huo, B., Song, Y., Chang, L., & Tan, B. (2022). Effects of early palliative care on patients with incurable cancer: A meta-analysis and systematic review. *European Journal of Cancer Care*, *31*(6), e13620. https://doi.org/10.1111/ecc.13620

Hurwitz, E. E., & Shabot, S. M. (2017). Adding Examples to the ASA-Physical Status Classification Improves Correct Assignment to Patients. *PERIOPERATIVE MEDICINE*.

Í Soylu, L., Kokotovic, D., Gögenur, I., Ekeloef, S., & Burcharth, J. (2024). Short and long-term readmission after major emergency abdominal surgery: A prospective Danish study. *European Journal of Trauma and Emergency Surgery*, *50*(1), 295–304. https://doi.org/10.1007/s00068-023-02352-3

Jakobson, T., Karjagin, J., Vipp, L., Padar, M., Parik, A.-H., Starkopf, L., Kern, H., Tammik, O., & Starkopf, J. (2014). Postoperative complications and mortality after major gastrointestinal surgery. *Medicina*, *50*(2), 111–117. https://doi.org/10.1016/j.medici.2014.06.002

Jang, S., Stevens, T., Lopez, R., Bhatt, A., & Vargo, J. J. (2019). Superiority of Gastrojejunostomy Over Endoscopic Stenting for Palliation of Malignant Gastric Outlet Obstruction. *Clinical Gastroenterology and Hepatology*, *17*(7), 1295-1302.e1. https://doi.org/10.1016/j.cgh.2018.10.042

Jaruvongvanich, V., Chesta, F., Baruah, A., Oberoi, M., Adamo, D., Singh, P. G., Meyer, A., Law, R. J., & Buttar, N. (2020). Palliative treatment for malignant gastrointestinal obstruction with peritoneal carcinomatosis: Enteral stenting versus surgery. *Endoscopy International Open*, *08*(10), E1487–E1494. https://doi.org/10.1055/a-1237-3956

Jelinek, L. A., Marietta, M., & Jones, M. W. (2024). Surgical Access Incisions. In *StatPearls*. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK541018/

Jeurnink, S. M., Steyerberg, E. W., van Hooft, J. E., van Eijck, C. H. J., Schwartz, M. P., Vleggaar, F. P., Kuipers, E. J., & Siersema, P. D. (2010). Surgical gastrojejunostomy or endoscopic stent placement for the palliation of malignant gastric outlet obstruction (SUSTENT study): A multicenter randomized trial. *Gastrointestinal Endoscopy*, *71*(3), 490–499. https://doi.org/10.1016/j.gie.2009.09.042

Jordan, R. I., Allsop, M. J., ElMokhallalati, Y., Jackson, C. E., Edwards, H. L., Chapman, E. J., Deliens, L., & Bennett, M. I. (2020). Duration of palliative care before death in international routine practice: A systematic review and meta-analysis. *BMC Medicine*, *18*, 368. https://doi.org/10.1186/s12916-020-01829-x

Kaasa, S., Loge, J. H., Aapro, M., Albreht, T., Anderson, R., Bruera, E., Brunelli, C., Caraceni, A., Cervantes, A., Currow, D. C., Deliens, L., Fallon, M., Gómez-

Batiste, X., Grotmol, K. S., Hannon, B., Haugen, D. F., Higginson, I. J., Hjermstad, M. J., Hui, D., … Lundeby, T. (2018). Integration of oncology and palliative care: A *Lancet Oncology* Commission. *The Lancet Oncology*, *19*(11), e588–e653. https://doi.org/10.1016/S1470-2045(18)30415-7

Kamada, T., Ohdaira, H., Ito, E., Fuse, Y., Takahashi, J., Nakashima, K., Nakaseko, Y., Yoshida, M., Eto, K., & Suzuki, Y. (2022). Preoperative Masseter Muscle Sarcopenia Predicts Mortality in Patients With Oesophageal Cancer. *Anticancer Research*, *42*(1), 301–310. https://doi.org/10.21873/anticanres.15486

Kang, M. H., Kim, S. N., Kim, N. K., Park, Y.-I., Kim, Y.-W., Ryu, K. W., Lee, J. H., Lee, J. S., & Park, S. R. (2010). Clinical outcomes and prognostic factors of metastatic gastric carcinoma patients who experience gastrointestinal perforation during palliative chemotherapy. *Annals of Surgical Oncology*, *17*(12), 3163–3172. https://doi.org/10.1245/s10434-010-1164-3

Kastelijn, J. B., Moons, L. M. G., Garcia-Alonso, F. J., Pérez-Miranda, M., Masaryk, V., Will, U., Tarantino, I., van Dullemen, H. M., Bijlsma, R., Poley, J.-W., Schwartz, M. P., & Vleggaar, F. P. (2020). Patency of endoscopic ultrasound-guided gastroenterostomy in the treatment of malignant gastric outlet obstruction. *Endoscopy International Open*, *8*(9), E1194–E1201. https://doi.org/10.1055/a-1214-5659

Kawabata, H., Fujii, T., Yamamoto, T., Satake, H., Yamaguchi, K., Okazaki, Y., Nakase, K., Miyata, M., & Motoi, S. (2022). Palliative Radiotherapy for Bleeding from Unresectable Gastric Cancer Using Three-Dimensional Conformal Technique. *Biomedicines*, *10*(6), 1394. https://doi.org/10.3390/biomedicines10061394

Kawabata, H., Hitomi, M., & Motoi, S. (2019). Management of Bleeding from Unresectable Gastric Cancer. *Biomedicines*, *7*(3), 54. https://doi.org/10.3390/biomedicines7030054

Kawata, N., Kakushima, N., Tanaka, M., Sawai, H., Imai, K., Hagiwara, T., Takao, T., Hotta, K., Yamaguchi, Y., Takizawa, K., Matsubayashi, H., & Ono, H. (2014). Percutaneous endoscopic gastrostomy for decompression of malignant bowel obstruction. *Digestive Endoscopy: Official Journal of the Japan Gastroenterological Endoscopy Society*, *26*(2), 208–213. https://doi.org/10.1111/den.12139

Kelley, K. M., Collins, J., Britt, L. D., Taylor, D. D. H., & Britt, R. (2020). Readmission after emergency general surgery. *The American Journal of Surgery*, *220*(3), 731–735. https://doi.org/10.1016/j.amjsurg.2020.01.010

Khalil, M., Woldesenbet, S., Munir, M. M., Khan, M. M. M., Rashid, Z., Altaf, A., Katayama, E., Dillhoff, M., Tsai, S., & Pawlik, T. M. (2024). Impact of early primary care physician follow-up on hospital readmission following gastrointestinal cancer surgery. *Journal of Surgical Oncology*, *130*(2), 241–248. https://doi.org/10.1002/jso.27696

Kim, B. J., & Aloia, T. A. (2016). Cost-effectiveness of palliative surgery versus nonsurgical procedures in gastrointestinal cancer patients. *Journal of Surgical Oncology*, *114*(3), 316–322. https://doi.org/10.1002/jso.24280

Kim, E. Y., Lee, S. H., & Hong, T. H. (2022). Palliative laparoscopic Roux-en-Y choledochojejunostomy as a feasible treatment option for malignant distal biliary obstruction. *Surgery Today*, *52*(11), 1568–1575. https://doi.org/10.1007/s00595-022-02513-8

Kim, Y.-I., & Choi, I. J. (2015). Endoscopic Management of Tumor Bleeding from Inoperable Gastric Cancer. *Clinical Endoscopy*, *48*(2), 121. https://doi.org/10.5946/ce.2015.48.2.121

Kim, Y.-I., Choi, I. J., Cho, S.-J., Lee, J. Y., Kim, C. G., Kim, M.-J., Ryu, K. W., Kim, Y.-W., & Park, Y. I. (2013). Outcome of endoscopic therapy for cancer bleeding in patients with unresectable gastric cancer. *Journal of Gastroenterology and Hepatology*, *28*(9), 1489–1495. https://doi.org/10.1111/jgh.12262

King, M. T., Agar, M., Currow, D. C., Hardy, J., Fazekas, B., & McCaffrey, N. (2020). Assessing quality of life in palliative care settings: Head-to-head comparison of four patient-reported outcome measures (EORTC QLQ-C15-PAL, FACT-Pal, FACT-Pal-14, FACT-G7). *Supportive Care in Cancer*, *28*(1), 141–153. https://doi.org/10.1007/s00520-019-04754-9

Kopecky, K. E., Strong, E. A., & Pellizzeri, K. F. (2023). Nomenclature in Palliative Surgery. *The American Surgeon™*, *89*(5), 1343–1346. https://doi.org/10.1177/00031348231161667

Kramer, S. P., Tonelli, C., Luchette, F. A., Swanson, J., Abdelsattar, Z., Cohn, T., & Baker, M. S. (2024). Locally advanced pancreatic cancer: Is surgical palliation associated with improved clinical outcome relative to medical palliation? *The American Journal of Surgery*, *230*, 73–77. https://doi.org/10.1016/j.amjsurg.2024.01.017

Krawczyk, M. (2021). Organizing end of life in hospital palliative care: A Canadian example. *Social Science & Medicine*, *291*, 112493. https://doi.org/10.1016/j.socscimed.2019.112493

Krikorian, A., Maldonado, C., & Pastrana, T. (2020). Patient's Perspectives on the Notion of a Good Death: A Systematic Review of the Literature. *Journal of Pain and Symptom Management*, *59*(1), 152–164. https://doi.org/10.1016/j.jpainsymman.2019.07.033

Krouse, R. S. (2019). Malignant bowel obstruction. *Journal of Surgical Oncology*, *120*(1), 74–77. https://doi.org/10.1002/jso.25451

Kwa, C. X. W., Cui, J., Lim, D. Y. Z., Sim, Y. E., Ke, Y., & Abdullah, H. R. (2022). Discordant American Society of Anesthesiologists Physical Status Classification

between anesthesiologists and surgeons and its correlation with adverse patient outcomes. *Scientific Reports*, *12*(1), 7110. https://doi.org/10.1038/s41598-022-10736-5

Kwok, A., Semel, M., Lipstiz, S. R., & Bader, A. M. (2011). The intensity and variation of surgical care at the end of life: A retrospective cohort study. *The Lancet*, *378*(9800), 1408–1413. https://doi.org/10.1016/S0140-6736(11)61268-3

Laine, L., & Shah, A. (2010). Randomized Trial of Urgent vs. Elective Colonoscopy in Patients Hospitalized With Lower GI Bleeding. *American Journal of Gastroenterology*, *105*(12), 2636–2641. https://doi.org/10.1038/ajg.2010.277

Lamb, B. W., Sevdalis, N., Taylor, C., Vincent, C., & Green, J. S. A. (2012). Multidisciplinary team working across different tumour types: Analysis of a national survey. *Annals of Oncology*, *23*(5), 1293–1300. https://doi.org/10.1093/annonc/mdr453

Laviano, A., Di Lazzaro Giraldi, G., & Koverech, A. (2016). Does nutrition support have a role in managing cancer cachexia? *Current Opinion in Supportive & Palliative Care*, *10*(4), 288–292. https://doi.org/10.1097/SPC.0000000000000242

Lee, D. W., & Kim, E. Y. (2022). Endoscopic Management of Pancreatobiliary Malignancies. *Digestive Diseases and Sciences*, *67*(5), 1635–1648. https://doi.org/10.1007/s10620-022-07394-y

Lee, D.-K., Frye, A., Louis, M., Koshy, A. N., Tosif, S., Yii, M., Ma, R., Nikfarjam, M., Perini, M. V., Bellomo, R., & Weinberg, L. (2020). Postoperative complications and hospital costs following small bowel resection surgery. *PLoS ONE*, *15*(10), e0241020. https://doi.org/10.1371/journal.pone.0241020

Lee, J., Cho, J. R., Kim, D., Yang, I. J., Suh, J. W., Oh, H., & Kang, S. (2023). Clinical impact of preoperative and postoperative sarcopenia on oncological outcomes in non-metastatic colorectal cancer. *Colorectal Disease*, *25*(4), 775–786. https://doi.org/10.1111/codi.16439

Lees, C. S., Seow, H., Chan, K. K., Gayowsky, A., & Sinnarajah, A. (2022). Quality of End-of-Life Care in Gastrointestinal Cancers: A 13-Year Population-Based Retrospective Analysis in Ontario, Canada. *Current Oncology*, *29*(12), 9163–9171. https://doi.org/10.3390/curroncol29120717

Leniz, J., Henson, L. A., Potter, J., Gao, W., Newsom-Davis, T., Ul-Haq, Z., Lucas, A., Higginson, I. J., & Sleeman, K. E. (2022). Association of primary and community care services with emergency visits and hospital admissions at the end of life in people with cancer: A retrospective cohort study. *BMJ Open*, *12*(2), e054281. https://doi.org/10.1136/bmjopen-2021-054281

Leong, D. P., Teo, K. K., Rangarajan, S., Lopez-Jaramillo, P., Avezum, A., Orlandini, A., Seron, P., Ahmed, S. H., Rosengren, A., Kelishadi, R., Rahman, O., Swaminathan, S., Iqbal, R., Gupta, R., Lear, S. A., Oguz, A., Yusoff, K.,

Zatonska, K., Chifamba, J., … Yusuf, S. (2015). Prognostic value of grip strength: Findings from the Prospective Urban Rural Epidemiology (PURE) study. *The Lancet*, *386*(9990), 266–273. https://doi.org/10.1016/S0140-6736(14)62000-6

Li, G., Walco, J. P., Mueller, D. A., Wanderer, J. P., & Freundlich, R. E. (2021). Reliability of the ASA Physical Status Classification System in Predicting Surgical Morbidity: A Retrospective Analysis. *Journal of Medical Systems*, *45*(9), 83. https://doi.org/10.1007/s10916-021-01758-z

Liang, T., Sun, Y., Wei, Y., & Yang, D. (2014). Palliative treatment of malignant colorectal obstruction caused by advanced malignancy: A self-expanding metallic stent or surgery? A system review and meta-analysis. *Surgery Today*, *44*(1), 22–33. https://doi.org/10.1007/s00595-013-0665-7

Lilley, E. J., Cooper, Z., Schwarze, M. L., & Mosenthal, A. C. (2017). Palliative Care in Surgery: Defining the Research Priorities. *Journal of Palliative Medicine*, *20*(7), 702–709. https://doi.org/10.1089/jpm.2017.0079

Lilley, E. J., Khan, K. T., Johnston, F. M., Berlin, A., Bader, A. M., Mosenthal, A. C., & Cooper, Z. (2016). Palliative Care Interventions for Surgical Patients: A Systematic Review. *JAMA Surgery*, *151*(2), 172. https://doi.org/10.1001/jamasurg.2015.3625

Liu, A. K. N., & Lefresne, S. (2023). Palliative radiotherapy in pancreatic cancer: A retrospective study of 100 cases and regional patterns of practice. *Annals of Palliative Medicine*, *12*(5), Article 5. https://doi.org/10.21037/apm-22-1417

Liu, Kang, J., Lv, J., & Ding, S. (2024). A controlled study: Evaluating the clinical impact of a nurse-centred multidisciplinary hospice care model on anxiety, depression, and quality of life in patients with advanced malignant tumours. *Journal of Evaluation in Clinical Practice*, *9/2024*(n/a). https://doi.org/10.1111/jep.14165

Loffroy, R., Guiu, B., Cercueil, J.-P., & Krause, D. (n.d.). Endovascular Therapeutic Embolisation: An Overview of Occluding Agents and their Effects on Embolised Tissues. *Current Vascular Pharmacology*, *7*(2), 250–263. https://doi.org/10.2174/157016109787455617

Loffroy, R., Rao, P., Ota, S., De Lin, M., Kwak, B.-K., & Geschwind, J.-F. (2010). Embolization of Acute Nonvariceal Upper Gastrointestinal Hemorrhage Resistant to Endoscopic Treatment: Results and Predictors of Recurrent Bleeding. *CardioVascular and Interventional Radiology*, *33*(6), 1088–1100. https://doi.org/10.1007/s00270-010-9829-7

Ma, B., Ren, T., Cai, C., Chen, B., & Zhang, J. (2024). Palliative procedures for advanced obstructive colorectal cancer: A systematic review and meta-analysis. *International Journal of Colorectal Disease*, *39*(1), 148. https://doi.org/10.1007/s00384-024-04724-6

Ma, H., Li, H., Xu, T., Gao, Y., Liu, S., Wang, W., Wei, L., Wang, X., Jiang, L., Chi, Y., Shi, J., Shuai, J., Zou, S., Cai, Y., Zhu, Y., Cheng, G., Zhang, H., Wang, X., Zhu, S., … Jin, J. (2024). Multidisciplinary team quality improves the survival outcomes of locally advanced rectal cancer patients: A post hoc analysis of the STELLAR trial. *Radiotherapy and Oncology*, *200*, 110524. https://doi.org/10.1016/j.radonc.2024.110524

Ma, Sun, S., Zhao, Y., Wang, X., Meng, W., Pang, Z., Gao, H., & Wang, B. (2021). Impact of pain care and hospice care on quality of life in patients with advanced gastric cancer. *American Journal of Translational Research*, *13*(7), 8235–8240. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8340148/

Madariaga, A., Lau, J., Ghoshal, A., Dzierżanowski, T., Larkin, P., Sobocki, J., Dickman, A., Furness, K., Fazelzad, R., Crawford, G. B., & Lheureux, S. (2022). MASCC multidisciplinary evidence-based recommendations for the management of malignant bowel obstruction in advanced cancer. *Supportive Care in Cancer*, *30*(6), 4711–4728. https://doi.org/10.1007/s00520-022-06889-8

Maddalon, B., Cenzi, C., Tonello, M., Pizzolato, E., Barina, A., De Simoni, O., Franzato, B., Gruppo, M., Mattara, G., Tolin, F., Moretto, V., Nardi, M., Zagonel, V., Pilati, P., & Sommariva, A. (2024). Clinical benefits of symptom resolution after palliative surgery in advanced cancer: A single-center experience. *European*

Journal of Surgical Oncology, *50*(6), 108368. https://doi.org/10.1016/j.ejso.2024.108368

Maeda, Y., Shinohara, T., Katayama, T., Minagawa, N., Sunahara, M., Nagatsu, A., Futakawa, N., & Hamada, T. (2017). A laparoscopic approach is associated with a decreased incidence of SSI in patients undergoing palliative surgery for malignant bowel obstruction. *International Journal of Surgery*, *42*, 90–94. https://doi.org/10.1016/j.ijsu.2017.04.052

Maltoni, M., Scarpi, E., Dall'Agata, M., Zagonel, V., Bertè, R., Ferrari, D., Broglia, C. M., Bortolussi, R., Trentin, L., Valgiusti, M., Pini, S., Farolfi, A., Casadei Gardini, A., Nanni, O., Amadori, D., Frassineti, G. L., Sansoni, E., Ragazzini, A., Ruscelli, S., … Montanari, L. (2016). Systematic versus on-demand early palliative care: Results from a multicentre, randomised clinical trial. *European Journal of Cancer*, *65*, 61–68. https://doi.org/10.1016/j.ejca.2016.06.007

Mariani, P. J., & Setla, J. A. (2010). Palliative Ultrasound for Home Care Hospice Patients. *Academic Emergency Medicine*, *17*(3), 293–296. https://doi.org/10.1111/j.1553-2712.2009.00678.x

Mayhew, D., Mendonca, V., & Murthy, B. V. S. (2019). A review of ASA physical status – historical perspectives and modern developments. *Anaesthesia*, *74*(3), 373–379. https://doi.org/10.1111/anae.14569

McCorkle, R., Jeon, S., Ercolano, E., Lazenby, M., Reid, A., Davies, M., Viveiros, D., & Gettinger, S. (2015). An Advanced Practice Nurse Coordinated Multidisciplinary Intervention for Patients with Late-Stage Cancer: A Cluster Randomized Trial. *Journal of Palliative Medicine*, *18*(11), 962–969. https://doi.org/10.1089/jpm.2015.0113

Meehan, T., Stecker, M. S., Kalva, S. P., Oklu, R., Walker, T. G., & Ganguli, S. (2014). Outcomes of Transcatheter Arterial Embolization for Acute Hemorrhage Originating from Gastric Adenocarcinoma. *Journal of Vascular and Interventional Radiology*, *25*(6), 847–851. https://doi.org/10.1016/j.jvir.2014.02.005

Meguid, C., Schulick, R. D., Schefter, T. E., Lieu, C. H., Boniface, M., Williams, N., Vogel, J. D., Gajdos, C., McCarter, M., & Edil, B. H. (2016). The Multidisciplinary Approach to GI Cancer Results in Change of Diagnosis and Management of Patients. Multidisciplinary Care Impacts Diagnosis and Management of Patients. *Annals of Surgical Oncology*, *23*(12), 3986–3990. https://doi.org/10.1245/s10434-016-5343-8

Mehta, S., Hindmarsh, A., Cheong, E., Cockburn, J., Saada, J., Tighe, R., Lewis, M. P. N., & Rhodes, M. (2006). Prospective randomized trial of laparoscopic gastrojejunostomy versus duodenal stenting for malignant gastric outflow obstruction. *Surgical Endoscopy And Other Interventional Techniques*, *20*(2), 239–242. https://doi.org/10.1007/s00464-005-0130-9

Miller, Z. A., Mohan, P., Tartaglione, R., & Narayanan, G. (2017). Bowel Obstruction: Decompressive Gastrostomies and Cecostomies. *Seminars in Interventional Radiology*, *34*(4), 349–360. https://doi.org/10.1055/s-0037-1608706

Miner, T. J., Brennan, M. F., & Jaques, D. P. (2004). A Prospective, Symptom Related, Outcomes Analysis of 1022 Palliative Procedures for Advanced Cancer. *Annals of Surgery*, *240*(4), 719–727. https://doi.org/10.1097/01.sla.0000141707.09312.dd

Mintziras, I., Miligkos, M., Wächter, S., Manoharan, J., & Bartsch, D. K. (2019). Palliative surgical bypass is superior to palliative endoscopic stenting in patients with malignant gastric outlet obstruction: Systematic review and meta-analysis. *Surgical Endoscopy*, *33*(10), 3153–3164. https://doi.org/10.1007/s00464-019-06955-z

Mohr, I., Vogeler, M., Pfeiffenberger, J., Sprengel, S. D., Klauss, M., Radeleff, B., Teufel, A., Chang, D.-H., Springfeld, C., Longerich, T., Merle, U., Mehrabi, A., Weiss, K. H., & Mieth, M. (2022). Clinical effects and safety of different transarterial chemoembolization methods for bridging and palliative treatments in hepatocellular carcinoma. *Journal of Cancer Research and Clinical Oncology*, *148*(11), 3163–3174. https://doi.org/10.1007/s00432-021-03900-3

Mönttinen, T., Kangaspunta, H., Laukkarinen, J., & Ukkonen, M. (2023). Routine use of laparoscopic techniques in daily practice improves outcomes after

appendectomy. *European Journal of Trauma and Emergency Surgery*, *49*(4), 1763–1769. https://doi.org/10.1007/s00068-022-02125-4

Mosenthal, A. C. (with Dunn, G. P.). (2019). *Surgical Palliative Care*. Oxford University Press USA - OSO.

Nagarajan, G., Doshi, P., Bardeskar, N. S., Kulkarni, A., Punamiya, A., & Tongaonkar, H. (2023). Association between sarcopenia and postoperative complications in patients undergoing surgery for gastrointestinal or hepato–pancreatico–biliary cancer. *Journal of Surgical Oncology*, *128*(4), 682–691. https://doi.org/10.1002/jso.27315

Nakao, E., Kawamura, H., Honda, M., Takano, Y., Kinuta, S., Kamiga, T., Yamazaki, S., Muto, A., Shiraso, S., Yamashita, N., Iwao, T., Kono, K., & Konno, S. (2024). Prognostic impact and survival outcomes of colon perforation in patients with metastatic colorectal cancer: A multicenter retrospective cohort study. *International Journal of Clinical Oncology*, *29*(2), 179–187. https://doi.org/10.1007/s10147-023-02444-5

Neoptolemos, J. P., Kleeff, J., Michl, P., Costello, E., Greenhalf, W., & Palmer, D. H. (2018). Therapeutic developments in pancreatic cancer: Current and future perspectives. *Nature Reviews Gastroenterology & Hepatology*, *15*(6), 333–348. https://doi.org/10.1038/s41575-018-0005-x

Niemelä, J., Kallio, R., Ohtonen, P., Perälä, J., Saarnio, J., & Syrjälä, H. (2018). Is Palliative Percutaneous Drainage for Malignant Biliary Obstruction Useful? *World Journal of Surgery*, *42*(9), 1. https://doi.org/10.1007/s00268-018-4567-0

Nikolić, I., Radić, J., Petreš, A., Djurić, A., Protić, M., Litavski, J., Popović, M., Kolarov-Bjelobrk, I., Dragin, S., & Popović, L. (2022). The Clinical Benefit of Percutaneous Transhepatic Biliary Drainage for Malignant Biliary Tract Obstruction. *Cancers*, *14*(19), 4673. https://doi.org/10.3390/cancers14194673

Nishigori, H., Ito, M., Nishizawa, Y., Kohyama, A., Koda, T., Nakajima, K., Nishizawa, Y., Kobayashi, A., Sugito, M., & Saito, N. (2012). Laparoscopic surgery for palliative resection of the primary tumor in incurable stage IV colorectal cancer. *Surgical Endoscopy*, *26*(11), 3201–3206. https://doi.org/10.1007/s00464-012-2323-3

Ogilvie, H., Simmons, H., Gavey, C., & Dott, N. (1955). Palliation in cancer. *British Medical Journal*, *1955*(1), 222–224.

Palliatiivinen hoito ja saattohoito, käypähoitosuositus. (2019, October). Www.Kaypahoito.Fi. https://www.kaypahoito.fi/hoi50063

Park, Lee, C. G., Tseng, Y. D., Liao, J. J., Reddy, S., Bruera, E., & Yennurajalingam, S. (2017). Palliative radiation therapy in the last 30 days of life: A systematic

review. *Radiotherapy and Oncology*, *125*(2), 193–199. https://doi.org/10.1016/j.radonc.2017.09.016

Park, S., Shin, J. H., Gwon, D.-I., Kim, H. J., Sung, K.-B., Yoon, H.-K., Ko, G.-Y., & Ko, H. K. (2017). Transcatheter Arterial Embolization for Gastrointestinal Bleeding Associated with Gastric Carcinoma: Prognostic Factors Predicting Successful Hemostasis and Survival. *Journal of Vascular and Interventional Radiology*, *28*(7), 1012–1021. https://doi.org/10.1016/j.jvir.2017.03.017

Pedrosa, E., Silva, M., Department of Anesthesiology, Instituto Portugueˆs de Oncologia Do Porto Francisco Gentil, EPE, Porto, Portugal, Lobo, A., Department of Anesthesiology, Faculdade de Medicina da Universidade Do Porto, Porto, Portugal, Barbosa, J., Department of Anesthesiology, Faculdade de Medicina da Universidade Do Porto, Porto, Portugal, Mourao, J., & Department of Anesthesiology, Faculdade de Medicina da Universidade Do Porto, Porto, Portugal. (2021). Is the ASA Classification Universal? *Turkish Journal of Anaesthesiology and Reanimation*, *49*(4), 298–303. https://doi.org/10.5152/TJAR.2021.103

Pencovich, N., Orbach, L., Lessing, Y., Elazar, A., Barnes, S., Berman, P., Blachar, A., Nachmany, I., & Sagie, B. (2020). Palliative bypass surgery for patients with advanced pancreatic adenocarcinoma: Experience from a tertiary center. *World*

Journal of Surgical Oncology, *18*(1), 63. https://doi.org/10.1186/s12957-020-01828-5

Podnos, Y. D., Juarez, G., Pameijer, C., Uman, G., Ferrell, B. R., & Wagman, L. D. (2007). Surgical Palliation of Advanced Gastrointestinal Tumors. *Journal of Palliative Medicine*, *10*(4), 871–876. https://doi.org/10.1089/jpm.2006.0174

Poultsides, G. A., Kim, C. J., Orlando, R., Peros, G., Hallisey, M. J., & Vignati, P. V. (2008). Angiographic embolization for gastroduodenal hemorrhage: Safety, efficacy, and predictors of outcome. *Archives of Surgery (Chicago, Ill.: 1960)*, *143*(5), 457–461. https://doi.org/10.1001/archsurg.143.5.457

Prachanukool, T., George, N., Bowman, J., Ito, K., & Ouchi, K. (2023). Best Practices in End of Life and Palliative Care in the Emergency Department. *Clinics in Geriatric Medicine*, *39*(4), 575–597. https://doi.org/10.1016/j.cger.2023.05.011

Prasad, G. A., & Varadarajulu, S. (2012). Endoscopic Ultrasound-Guided Abscess Drainage. *Gastrointestinal Endoscopy Clinics of North America*, *22*(2), 281–290. https://doi.org/10.1016/j.giec.2012.04.002

Rabben, J., Vivat, B., Fossum, M., & Rohde, G. E. (2024). Shared decision-making in palliative cancer care: A systematic review and metasynthesis. *Palliative Medicine*, *38*(4), 406–422. https://doi.org/10.1177/02692163241238384

Radbruch, L., De Lima, L., Knaul, F., Wenk, R., Ali, Z., Bhatnaghar, S., Blanchard, C., Bruera, E., Buitrago, R., Burla, C., Callaway, M., Munyoro, E. C., Centeno, C., Cleary, J., Connor, S., Davaasuren, O., Downing, J., Foley, K., Goh, C., … Pastrana, T. (2020). Redefining Palliative Care—A New Consensus-Based Definition. *Journal of Pain and Symptom Management*, *60*(4), 754–764. https://doi.org/10.1016/j.jpainsymman.2020.04.027

Rassweiler, J. J., Rassweiler, M.-C., & Michel, M.-S. (2012). Classification of Complications: Is the Clavien-Dindo Classification the Gold Standard? *European Urology*, *62*(2), 256–258. https://doi.org/10.1016/j.eururo.2012.04.028

Razak O, A., Yang, S. Y., Cho, M. S., Min, B. S., & Han, Y. D. (2023). Palliative surgery as a bridge to systemic treatment for malignant bowel obstruction due to peritoneal metastases: A retrospective, case-control study. *Asian Journal of Surgery*, *46*(1), 160–165. https://doi.org/10.1016/j.asjsur.2022.02.028

Read, M., Powers, B. D., Pimiento, J. M., Laskowitz, D., Mihelic, E., Imanirad, I., Dessureault, S., Felder, S., & Dineen, S. P. (2022). Management of Malignant Small Bowel Obstruction: Is Intestinal Bypass Effective Palliation? *Annals of Surgical Oncology*, *29*(11), 6980–6987. https://doi.org/10.1245/s10434-022-12204-w

Requarth, J. A. (2019). Image-Guided Palliative Interventions. *Surgical Clinics of North America*, *99*(5), 921–939. https://doi.org/10.1016/j.suc.2019.06.003

Ribeiro, I. B., Bernardo, W. M., Martins, B. da C., de Moura, D. T. H., Baba, E. R., Josino, I. R., Miyajima, N. T., Coronel Cordero, M. A., Visconti, T. A. de C., Ide, E., Sakai, P., & de Moura, E. G. H. (2018). Colonic stent versus emergency surgery as treatment of malignant colonic obstruction in the palliative setting: A systematic review and meta-analysis. *Endoscopy International Open*, *6*(5), E558–E567. https://doi.org/10.1055/a-0591-2883

Rivet, E. B. (2019). Ostomy Management. *Surgical Clinics of North America*, *99*(5), 885–898. https://doi.org/10.1016/j.suc.2019.06.007

Robson, P. C., Heffernan, N., Gonen, M., Thornton, R., Brody, L. A., Holmes, R., Brown, K. T., Covey, A. M., Fleischer, D., Getrajdman, G. I., Jarnagin, W., Sofocleous, C., Blumgart, L., & D'Angelica, M. (2010). Prospective Study of Outcomes after Percutaneous Biliary Drainage for Malignant Biliary Obstruction. *Annals of Surgical Oncology*, *17*(9), 2303–2311. https://doi.org/10.1245/s10434-010-1045-9

Rodriguez, R. A., Fahy, B. N., McClain, M., & Morris, K. T. (2016). Estimation of Risk in Cancer Patients Undergoing Palliative Procedures by the American College of Surgeons Risk Calculator. *Journal of Palliative Medicine*, *19*(10), 1039–1042. https://doi.org/10.1089/jpm.2015.0482

Roses, R. E., Folkert, I. W., & Krouse, R. S. (2018). Malignant Bowel Obstruction: Reappraising the Value of Surgery. *Surgical Oncology Clinics*, *27*(4), 705–715. https://doi.org/10.1016/j.soc.2018.05.010

Roses, R. E., Tzeng, C.-W. D., Ross, M. I., Fournier, K. F., Abbott, D. E., & You, Y. N. (2014). The Palliative Index: Predicting Outcomes of Emergent Surgery in Patients with Cancer. *Journal of Palliative Medicine*, *17*(1), 37–42. https://doi.org/10.1089/jpm.2013.0235

Rossi, I. R., Ross, S. W., May, A. K., & Reinke, C. E. (2021). Readmission After Emergency General Surgery: NSQIP Review of Risk, Cause and Ideal Follow-Up. *Journal of Surgical Research*, *260*, 359–368. https://doi.org/10.1016/j.jss.2020.11.035

Ryan, A., Byrne, C., Pusceddu, C., Buy, X., Tsoumakidou, G., & Filippiadis, D. (2022). CIRSE Standards of Practice on Thermal Ablation of Bone Tumours. *Cardiovascular and Interventional Radiology*, *45*(5), 591–605. https://doi.org/10.1007/s00270-022-03126-x

Sadler, E. M., Hawley, P. H., & Easson, A. M. (2018). Palliative care and active disease management are synergistic in modern surgical oncology. *Surgery*, *163*(4), 950–953. https://doi.org/10.1016/j.surg.2017.10.001

Saklad, M. (1941). GRADING OF PATIENTS FOR SURGICAL PROCEDURES. *Anesthesiology*, *2*(3), 281–284. https://doi.org/10.1097/00000542-194105000-00004

Salm, H., Doberschütz, F., Hallmann, F., Munzert, P., Rahm, J., Uhlig, S., & Pink, D. (2024). How Do Quality of Life (QoL) and Symptom Burden Evolve in Inpatient Palliative Care (PC) Patients following One Week of Care in a Specialized Palliative Care Unit (PCU)? A Comparison of Two Groups, with One Receiving Specialized Outpatient Palliative Care Prior to Admission. *Cancers*, *16*(8), Article 8. https://doi.org/10.3390/cancers16081612

Sánchez-Sánchez, E., Ruano-Álvarez, M. A., Díaz-Jiménez, J., Díaz, A. J., & Ordonez, F. J. (2021). Enteral Nutrition by Nasogastric Tube in Adult Patients under Palliative Care: A Systematic Review. *Nutrients*, *13*(5), 1562. https://doi.org/10.3390/nu13051562

Sankar, A., Johnson, S. R., Beattie, W. S., Tait, G., & Wijeysundera, D. N. (2014). Reliability of the American Society of Anesthesiologists physical status scale in clinical practice. *British Journal of Anaesthesia*, *113*(3), 424–432. https://doi.org/10.1093/bja/aeu100

Schatz, R. A., & Rockey, D. C. (2017). Gastrointestinal Bleeding Due to Gastrointestinal Tract Malignancy: Natural History, Management, and Outcomes. *Digestive*

Diseases and Sciences, *62*(2), 491–501. https://doi.org/10.1007/s10620-016-4368-y

Scherman, P., Syk, I., Holmberg, E., Naredi, P., & Rizell, M. (2023). Risk Factors for Postoperative Complications Following Resection of Colorectal Liver Metastases and the Impact on Long-Term Survival: A Population-Based National Cohort Study. *World Journal of Surgery*, *47*(9), 2230–2240. https://doi.org/10.1007/s00268-023-07043-z

Schlick, C. J. R., & Bentrem, D. J. (2019). Timing of palliative care: When to call for a palliative care consult. *Journal of Surgical Oncology*, *120*(1), 30–34. https://doi.org/10.1002/jso.25499

Schumacher, G., & Gebauer, B. (2009). Transarterial chemoembolization for hepatocellular carcinoma with portal vein invasion: A helpful palliative approach. *Journal of Gastroenterology and Hepatology*, *24*(8), 1317–1319. https://doi.org/10.1111/j.1440-1746.2009.05976.x

Sebastian-Valverde, E., Poves, I., Membrilla-Fernández, E., Pons-Fragero, M. J., & Grande, L. (2019). The role of the laparoscopic approach in the surgical management of acute adhesive small bowel obstruction. *BMC Surgery*, *19*(1), 40. https://doi.org/10.1186/s12893-019-0504-x

Sengupta, N., Feuerstein, J. D., Jairath, V., Shergill, A. K., Strate, L. L., Wong, R. J., & Wan, D. (2023). Management of Patients With Acute Lower Gastrointestinal Bleeding: An Updated ACG Guideline. *American Journal of Gastroenterology*, *118*(2), 208–231. https://doi.org/10.14309/ajg.0000000000002130

Sheng, M., Cao, J., Hou, S., Li, M., Wang, Y., Fang, Q., Miao, A., Yang, M., Liu, S., Hu, C., Liu, C., Wang, S., Zheng, J., Xiao, J., Zhang, X., Liu, H., Liu, B., & Wang, B. (2023). Computed tomography-determined skeletal muscle density predicts 3-year mortality in initial-dialysis patients in China. *Journal of Cachexia, Sarcopenia and Muscle*, *14*(6), 2569–2578. https://doi.org/10.1002/jcsm.13331

Shibuki, T., Sasaki, M., Yamaguchi, S., Inoue, K., Taira, T., Satake, T., Watanabe, K., Imaoka, H., Mitsunaga, S., Fujisawa, T., Tomizawa, K., Oyoshi, H., Nakamura, M., Hojo, H., & Ikeda, M. (2023). Palliative radiotherapy for tumor bleeding in patients with unresectable pancreatic cancer: A single-center retrospective study. *Radiation Oncology (London, England)*, *18*, 178. https://doi.org/10.1186/s13014-023-02367-5

Siddiqui, A., Cosgrove, N., Yan, L. H., Brandt, D., Janowski, R., Kalra, A., Zhan, T., Baron, T. H., Repici, A., Taylor, L. J., & Adler, D. G. (2017). Long-term outcomes of palliative colonic stenting versus emergency surgery for acute proximal malignant colonic obstruction: A multicenter trial. *Endoscopy International Open*, *05*, E232–E238. https://doi.org/10.1055/s-0043-102403

Slankamenac, K., Graf, R., Barkun, J., Puhan, M. A., & Clavien, P.-A. (2013). The Comprehensive Complication Index: A Novel Continuous Scale to Measure Surgical Morbidity. *Annals of Surgery*, *258*(1), 1. https://doi.org/10.1097/SLA.0b013e318296c732

Slankamenac, K., Slankamenac, M., Schlegel, A., Nocito, A., Rickenbacher, A., Clavien, P.-A., & Turina, M. (2017). Impact of postoperative complications on readmission and long-term survival in patients following surgery for colorectal cancer. *International Journal of Colorectal Disease*, *32*(6), 805–811. https://doi.org/10.1007/s00384-017-2811-y

Smith, A. K., McCarthy, E., Weber, E., Cenzer, I. S., Boscardin, J., Fisher, J., & Covinsky, K. (2012). Half Of Older Americans Seen In Emergency Department In Last Month Of Life; Most Admitted To Hospital, And Many Die There. *Health Affairs*, *31*(6), 1277–1285. https://doi.org/10.1377/hlthaff.2011.0922

So, H., Ahn, J. Y., Han, S., Jung, K., Na, H. K., Lee, J. H., Jeong, K. W., Kim, D. H., Choi, K. D., Song, H. J., Lee, G. H., & Jung, H.-Y. (2018). Efficacy and Safety of Fully Covered Self-Expanding Metal Stents for Malignant Esophageal Obstruction. *Digestive Diseases and Sciences*, *63*(1), 234–241. https://doi.org/10.1007/s10620-017-4839-9

Sood, R., Mancinetti, M., Betticher, D., Cantin, B., & Ebneter, A. (2020). Management of bleeding in palliative care patients in the general internal medicine ward: A

systematic review. *Annals of Medicine and Surgery*, *50*, 14–23. https://doi.org/10.1016/j.amsu.2019.12.002

Spaander, M. C. W., Van Der Bogt, R. D., Baron, T. H., Albers, D., Blero, D., De Ceglie, A., Conio, M., Czakó, L., Everett, S., Garcia-Pagán, J.-C., Ginès, A., Jovani, M., Repici, A., Rodrigues-Pinto, E., Siersema, P. D., Fuccio, L., & Van Hooft, J. E. (2021). Esophageal stenting for benign and malignant disease: European Society of Gastrointestinal Endoscopy (ESGE) Guideline – Update 2021. *Endoscopy*, *53*(07), 751–762. https://doi.org/10.1055/a-1475-0063

Spencer, K., Parrish, R., Barton, R., & Henry, A. (2018). Palliative radiotherapy. *BMJ*, *360*, k821. https://doi.org/10.1136/bmj.k821

Suwanabol, P. A., Reichstein, A. C., Suzer-Gurtekin, Z. T., Forman, J., Silveira, M. J., Mody, L., & Morris, A. M. (2018). Surgeons' Perceived Barriers to Palliative and End-of-Life Care: A Mixed Methods Study of a Surgical Society. *Journal of Palliative Medicine*, *21*(6), 780–788. https://doi.org/10.1089/jpm.2017.0470

Szakmany, T., Ditai, J., Kirov, M., Protsenko, D., Osinaike, B., Venara, A., Demartines, N., Hubner, M., Pearse, R. M., & Prowle, J. R. (2017). In-hospital clinical outcomes after upper gastrointestinal surgery: Data from an international observational study. *European Journal of Surgical Oncology*, *43*(12), 2324–2332. https://doi.org/10.1016/j.ejso.2017.08.002

Takahashi, H., Okabayashi, K., Tsuruta, M., Hasegawa, H., Yahagi, M., & Kitagawa, Y. (2015). Self-Expanding Metallic Stents Versus Surgical Intervention as Palliative Therapy for Obstructive Colorectal Cancer: A Meta-analysis. *World Journal of Surgery*, *39*(8), 1. https://doi.org/10.1007/s00268-015-3068-7

Takeda, K., Sakayauchi, T., Kubozono, M., Katagiri, Y., Umezawa, R., Yamamoto, T., Ishikawa, Y., Takahashi, N., Suzuki, Y., Kishida, K., & Jingu, K. (2022). Palliative radiotherapy for gastric cancer bleeding: A multi-institutional retrospective study. *BMC Palliative Care*, *21*, 52. https://doi.org/10.1186/s12904-022-00943-2

Tamura, T., Mamoru, T., Terai, T., Ogura, T., Tani, M., Shimokawa, T., Kitahata, Y., Matsumoto, I., Mitoro, A., Asakuma, M., Inatomi, O., Omoto, S., Sho, M., Ueno, S., Maehira, H., & Kitano, M. (2023). Gastrojejunostomy versus endoscopic duodenal stent placement for gastric outlet obstruction in patients with unresectable pancreatic cancer: A propensity score-matched analysis. *Surgical Endoscopy*, *37*(3), 1890–1900. https://doi.org/10.1007/s00464-022-09685-x

Temel, J. S., Greer, J. A., Muzikansky, A., Gallagher, E. R., Admane, S., Jackson, V. A., Dahlin, C. M., Blinderman, C. D., Jacobsen, J., Pirl, W. F., Billings, J. A., & Lynch, T. J. (2010). Early Palliative Care for Patients with Metastatic Non–

Small-Cell Lung Cancer. *New England Journal of Medicine*, *363*(8), 733–742. https://doi.org/10.1056/NEJMoa1000678

Tey, J., Zheng, H., Soon, Y. Y., Leong, C. N., Koh, W. Y., Lim, K., So, J. B. Y., Shabbir, A., Tham, I. W. K., & Lu, J. (2019). Palliative radiotherapy in symptomatic locally advanced gastric cancer: A phase II trial. *Cancer Medicine*, *8*(4), 1447–1458. https://doi.org/10.1002/cam4.2021

Thornton, R. H., Ulrich, R., Hsu, M., Moskowitz, C., Reidy-Lagunes, D., Covey, A. M., Brody, L. A., Robson, P. M., Sofocleous, C. T., Solomon, S. B., Getrajdman, G. I., & Brown, K. T. (2012). Outcomes of Patients Undergoing Percutaneous Biliary Drainage to Reduce Bilirubin for Administration of Chemotherapy. *Journal of Vascular and Interventional Radiology*, *23*(1), 89–95. https://doi.org/10.1016/j.jvir.2011.09.022

To, K. B., Kamdar, N. S., Patil, P., Collins, S. D., Seese, E., Krapohl, G. L., Campbell, D. (Skip), Englesbe, M. J., Hemmila, M. R., Napolitano, L. M., & Group, for the M. S. Q. C. (MSQC) E. G. S. S. G. and the M. R. A. (2019). Acute Care Surgery Model and Outcomes in Emergency General Surgery. *Journal of the American College of Surgeons*, *228*(1), 21. https://doi.org/10.1016/j.jamcollsurg.2018.07.664

Tolstrup, M., Jensen, T. K., & Gögenur, I. (2023). Intraoperative Surgical Strategy in Abdominal Emergency Surgery. *World Journal of Surgery*, *47*(1), 162–170. https://doi.org/10.1007/s00268-022-06782-9

Triantafyllou, K., Gkolfakis, P., Gralnek, I. M., Oakland, K., Manes, G., Radaelli, F., Awadie, H., Camus Duboc, M., Christodoulou, D., Fedorov, E., Guy, R. J., Hollenbach, M., Ibrahim, M., Neeman, Z., Regge, D., Rodriguez De Santiago, E., Tham, T. C., Thelin-Schmidt, P., & Van Hooft, J. E. (2021). Diagnosis and management of acute lower gastrointestinal bleeding: European Society of Gastrointestinal Endoscopy (ESGE) Guideline. *Endoscopy*, *53*(08), 850–868. https://doi.org/10.1055/a-1496-8969

Ubogagu, E., & Harris, D. G. (2012). Guideline for the management of terminal haemorrhage in palliative care patients with advanced cancer discharged home for end-of-life care. *BMJ Supportive & Palliative Care*, *2*(4), 294–300. https://doi.org/10.1136/bmjspcare-2012-000253

Uemura, S., Iwashita, T., Iwata, K., Mukai, T., Osada, S., Sekino, T., Adachi, T., Kawai, M., Yasuda, I., & Shimizu, M. (2018). Endoscopic duodenal stent versus surgical gastrojejunostomy for gastric outlet obstruction in patients with advanced pancreatic cancer. *Pancreatology*, *18*(5), 601–607. https://doi.org/10.1016/j.pan.2018.04.015

Uesato, M., Akutsu, Y., Murakami, K., Muto, Y., Kagaya, A., Nakano, A., Aikawa, M., Tamachi, T., Arasawa, T., Amagai, H., Muto, Y., & Matsubara, H. (2017). Comparison of Efficacy of Self-Expandable Metallic Stent Placement in the Unresectable Esophageal Cancer Patients. *Gastroenterology Research and Practice*, *2017*, 2560510. https://doi.org/10.1155/2017/2560510

Ukkonen, M., Kivivuori, A., Rantanen, T., & Paajanen, H. (2015). Emergency Abdominal Operations in the Elderly: A Multivariate Regression Analysis of 430 Consecutive Patients with Acute Abdomen. *World Journal of Surgery*, *39*(12), 1. https://doi.org/10.1007/s00268-015-3207-1

Urrechaga, E. M., Cioci, A. C., Parreco, J. P., Gilna, G. P., Saberi, R. A., Yeh, D. D., Zakrison, T. L., Namias, N., & Rattan, R. (2021). The hidden burden of unplanned readmission after emergency general surgery. *Journal of Trauma and Acute Care Surgery*, *91*(5), 891–897. https://doi.org/10.1097/TA.0000000000003325

Uster, A., Ruehlin, M., Mey, S., Gisi, D., Knols, R., Imoberdorf, R., Pless, M., & Ballmer, P. E. (2018). Effects of nutrition and physical exercise intervention in palliative cancer patients: A randomized controlled trial. *Clinical Nutrition*, *37*(4), 1202–1209. https://doi.org/10.1016/j.clnu.2017.05.027

Valverde, C. P., Ebrahimi, G., Sprangers, M. A., Pateras, K., Bruynzeel, A. M. E., Jacobs, M., Wilmink, J. W., Besselink, M. G., Crezee, H., van Tienhoven, G., &

Versteijne, E. (2024). Impact of Short-Course Palliative Radiation Therapy on Pancreatic Cancer-Related Pain: Prospective Phase 2 Nonrandomized PAINPANC Trial. *International Journal of Radiation Oncology*Biology*Physics*, *118*(2), 352–361. https://doi.org/10.1016/j.ijrobp.2023.08.055

van der Bogt, R. D., Vermeulen, B. D., Reijm, A. N., Siersema, P. D., & Spaander, M. C. W. (2018). Palliation of dysphagia. *Best Practice & Research Clinical Gastroenterology*, *36–37*, 97–103. https://doi.org/10.1016/j.bpg.2018.11.010

Van Hagen, P., Spaander, M. C. W., Van Der Gaast, A., Van Rij, C. M., Tilanus, H. W., Van Lanschot, J. J. B., & Wijnhoven, B. P. L. (2013). Impact of a multidisciplinary tumour board meeting for upper-GI malignancies on clinical decision making: A prospective cohort study. *International Journal of Clinical Oncology*, *18*(2), 214–219. https://doi.org/10.1007/s10147-011-0362-8

Van Hooft, J. E., Veld, J. V., Arnold, D., Beets-Tan, R. G. H., Everett, S., Götz, M., Van Halsema, E. E., Hill, J., Manes, G., Meisner, S., Rodrigues-Pinto, E., Sabbagh, C., Vandervoort, J., Tanis, P. J., Vanbiervliet, G., & Arezzo, A. (2020). Self-expandable metal stents for obstructing colonic and extracolonic cancer: European Society of Gastrointestinal Endoscopy (ESGE) Guideline – Update 2020. *Endoscopy*, *52*(05), 389–407. https://doi.org/10.1055/a-1140-3017

Vanbutsele, G., Van Belle, S., Surmont, V., De Laat, M., Colman, R., Eecloo, K., Naert, E., De Man, M., Geboes, K., Deliens, L., & Pardon, K. (2020). The effect of

early and systematic integration of palliative care in oncology on quality of life and health care use near the end of life: A randomised controlled trial. *European Journal of Cancer*, *124*, 186–193. https://doi.org/10.1016/j.ejca.2019.11.009

Vestergaard, S., Patel, K. V., Bandinelli, S., Ferrucci, L., & Guralnik, J. M. (2009). Characteristics of 400-Meter Walk Test Performance and Subsequent Mortality in Older Adults. *Rejuvenation Research*, *12*(3), 177–184. https://doi.org/10.1089/rej.2009.0853

Vidri, R. J., Blakely, A. M., Kulkarni, S. S., Vaghjiani, R. G., & Heffernan, D. S. (2015). American College of Surgeons National Surgical Quality Improvement Program as a quality-measurement tool for advanced cancer patients. *Annals of Palliative Medicine*, *4*(4).

Voldby, A. W., Boolsen, A. W., Aaen, A. A., Burcharth, J., Ekeløf, S., Loprete, R., Jønck, S., Eskandarani, H. A., Thygesen, L. C., Møller, A. M., & Brandstrup, B. (2022). Complications and Their Association with Mortality Following Emergency Gastrointestinal Surgery—An Observational Study. *Journal of Gastrointestinal Surgery*, *26*(9), 1930–1941. https://doi.org/10.1007/s11605-021-05240-6

Walter, D., van Boeckel, P. G. A., Groenen, M. J., Weusten, B. L. A. M., Witteman, B. J., Tan, G., Brink, M. A., Nicolai, J., Tan, A. C., Alderliesten, J., Venneman, N. G., Laleman, W., Jansen, J. M., Bodelier, A., Wolters, F. L., van der Waaij, L. A., Breumelhof, R., Peters, F. T. M., Scheffer, R. C. H., … Siersema, P. D.

(2015). Cost Efficacy of Metal Stents for Palliation of Extrahepatic Bile Duct Obstruction in a Randomized Controlled Trial. *Gastroenterology*, *149*(1), 130–138. https://doi.org/10.1053/j.gastro.2015.03.012

Wang, H., Yang, R., Xu, J., Fang, K., Abdelrahim, M., & Chang, L. (2021). Sarcopenia as a predictor of postoperative risk of complications, mortality and length of stay following gastrointestinal oncological surgery. *The Annals of The Royal College of Surgeons of England*, *103*(9), 630–637. https://doi.org/10.1308/rcsann.2021.0082

Wiggins, T., Markar, S. R., & Harris, A. (2015). Laparoscopic adhesiolysis for acute small bowel obstruction: Systematic review and pooled analysis. *Surgical Endoscopy*, *29*(12), 3432–3442. https://doi.org/10.1007/s00464-015-4114-0

Williams, G. R., Manjunath, S. H., Butala, A. A., & Jones, J. A. (2021). Palliative Radiotherapy for Advanced Cancers: Indications and Outcomes. *Surgical Oncology Clinics of North America*, *30*(3), 563–580. https://doi.org/10.1016/j.soc.2021.02.007

Wong, J. S. M., Lim, D. Y. Z., Lek, S. M., Chia, C. S., Tan, G. H. C., Ong, C.-A. J., & Teo, M. C. C. (2022b). Palliative Gastrointestinal Surgery in Patients With Advanced Peritoneal Carcinomatosis: Clinical Experience and Development of a Predictive Model for Surgical Outcomes. *Frontiers in Oncology*, *11*, 811743. https://doi.org/10.3389/fonc.2021.811743

Wong, J. S. M., Ng, I. A. T., Juan, W. K. D., Ong, W. S., Yang, G. M., Finkelstein, E. A., Gandhi, M., Ong, C.-A. J., Seo, C. J., Zhu, H.-Y., & Chia, C. S. (2022a). Trajectories of Patient-Reported Outcomes After Palliative Gastrointestinal Surgery in Advanced Cancer: Is Good Quality of Life Sustainable? *Annals of Surgery Open: Perspectives of Surgical History, Education, and Clinical Approaches*, *3*(4), e206. https://doi.org/10.1097/AS9.0000000000000206

Yagi, S., Ida, S., Namikawa, K., Hayami, M., Makuuchi, R., Kumagai, K., Ohashi, M., Sano, T., & Nunobe, S. (2023). Clinical outcomes of palliative treatment for gastric bleeding from incurable gastric cancer. *Surgery Today*, *53*(3), 360–368. https://doi.org/10.1007/s00595-022-02567-8

Yamao, K., Kitano, M., Kayahara, T., Ishida, E., Yamamoto, H., Minaga, K., Yamashita, Y., Nakajima, J., Asada, M., Okabe, Y., Osaki, Y., Chiba, Y., Imai, H., & Kudo, M. (2016). Factors predicting through-the-scope gastroduodenal stenting outcomes in patients with gastric outlet obstruction: A large multicenter retrospective study in West Japan. *Gastrointestinal Endoscopy*, *84*(5), 757-763.e6. https://doi.org/10.1016/j.gie.2016.03.1498

Yefimova, M., Aslakson, R. A., Yang, L., Garcia, A., Boothroyd, D., Gale, R. C., Giannitrapani, K., Morris, A. M., Johanning, J. M., Shreve, S., Wachterman, M. W., & Lorenz, K. A. (2020). Palliative Care and End-of-Life Outcomes

Following High-risk Surgery. *JAMA Surgery*, *155*(2), 138. https://doi.org/10.1001/jamasurg.2019.5083

Young, C. J., De-Loyde, K. J., Young, J. M., Solomon, M. J., Chew, E. H., Byrne, C. M., Salkeld, G., & Faragher, I. G. (2015). Improving Quality of Life for People with Incurable Large-Bowel Obstruction: Randomized Control Trial of Colonic Stent Insertion. *Diseases of the Colon and Rectum*, *58*(9), 838–849. https://doi.org/10.1097/DCR.0000000000000431

Yu, J., Jung, J., Park, S. R., Ryu, M.-H., Park, J.-H., Kim, J. H., & Yoon, S. M. (2021). Role of palliative radiotherapy in bleeding control in patients with unresectable advanced gastric cancer. *BMC Cancer*, *21*(1), 413. https://doi.org/10.1186/s12885-021-08145-4

Yukimoto, T., Morisaki, T., Komukai, S., Yoshida, H., Yamaguchi, D., Tsuruoka, N., Miyahara, K., Sakata, Y., Shibasaki, S., Tsunada, S., Noda, T., Yunotani, S., & Fujimoto, K. (2018). The Palliative Effect of Endoscopic Uncovered Self-expandable Metallic Stent Placement Versus Gastrojejunostomy on Malignant Gastric Outlet Obstruction: A Pilot Study with a Retrospective Chart Review in Saga, Japan. *Internal Medicine*, *57*(11), 1517–1521. https://doi.org/10.2169/internalmedicine.0171-17

Zhang, W., Chen, J., Zhang, W., & Xu, M. (2024). Advances in Endoscopic Ultrasound in Pancreatic Cancer Screening, Diagnosis, and Palliative Care. *Biomedicines*, *13*(1), 76. https://doi.org/10.3390/biomedicines13010076

Zhao, X., Dong, J., Jiang, K., Huang, X., & Zhang, W. (2015). Comparison of percutaneous transhepatic biliary drainage and endoscopic biliary drainage in the management of malignant biliary tract obstruction: A meta-analysis. *Digestive Endoscopy*, *27*(1), 137–145. https://doi.org/10.1111/den.12320

Zhou, H., Jin, Y., Wang, J., Chen, G., Chen, J., & Yu, S. (2023). Comparison of short-term surgical outcomes and long-term survival between emergency and elective surgery for colorectal cancer: A systematic review and meta-analysis. *International Journal of Colorectal Disease*, *38*(1), 1–13. https://doi.org/10.1007/s00384-023-04334-8

Zhou, Q., An, Y., Liu, T., Liu, Z., Li, R., Wang, C., Zhou, F., Liu, C., & Zhu, K. (2022). Prognosis of patients with hepatocellular carcinoma and portal vein tumor thrombus treated with combination of transarterial chemoembolization and palliative thermal ablation. *International Journal of Hyperthermia*, *39*(1), 97–107. https://doi.org/10.1080/02656736.2021.2021303

Zimmermann, C., Swami, N., Krzyzanowska, M., Hannon, B., Leighl, N., Oza, A., Moore, M., Rydall, A., Rodin, G., Tannock, I., Donner, A., & Lo, C. (2014). Early palliative care for patients with advanced cancer: A cluster-randomised

controlled trial. *The Lancet*, *383*(9930), 1721–1730. https://doi.org/10.1016/S0140-6736(13)62416-2

11 ORIGINAL PUBLICATIONS

PUBLICATION

I

Scoring Systems May be Effective in Predicting Mortality Associated with Palliative Emergency Gastrointestinal Surgery: A Retrospective Observational Study.

Laitamäki M, Alamylläri I, Kalliomäki M, Laukkarinen J, Ukkonen M, Junttila E.

Scoring World J Surg. 2021 Sep;45(9):2694-2702.

World J Surg (2021) 45:2694–2702
https://doi.org/10.1007/s00268-021-06170-9

World Journal of Surgery

ORIGINAL SCIENTIFIC REPORT

Scoring Systems May be Effective in Predicting Mortality Associated with Palliative Emergency Gastrointestinal Surgery: A Retrospective Observational Study

M. Laitamäki[1] · I. Alamylläri[2] · M. Kalliomäki[3] · J. Laukkarinen[1,2] · M. Ukkonen[1,2] · E. Junttila[3]

Accepted: 24 April 2021 / Published online: 31 May 2021

Abstract

Background Palliative emergency gastrointestinal surgery is associated with significant morbidity and mortality and weighing up the benefits and harms during the decision-making may be challenging. There are very few studies on surgery in palliative patient population. The aim of this retrospective study was to evaluate morbidity and mortality after palliative emergency gastrointestinal surgery and the usability of scoring systems in predicting the outcome.

Methods Consecutive adult patients undergoing palliative emergency surgery at a tertiary hospital during the period 2015 to 2016 were included. Pre- and post-operative functional status, morbidity and mortality of patients were assessed. The predictive value of the American Society of Anesthesiologists (ASA) classification, the American College of Surgeons National Surgical Quality Improvement Program Surgical Risk Calculator (ACS NSQIP SRC) and Palliative index (PI) in estimating morbidity and mortality were determined.

Results A total of 93 patients (age 69 [28–92] years, 51% female) were included. Typical indications for surgery were bowel obstruction (52%) and securing food intake (30%). Pre-operatively two patients (2.2%) were totally dependent in daily activities, while post-operatively the respective share was 34% at discharge from hospital. The incidence of post-operative complications was 37% and 14% died during the hospital stay. One-, three-month and one-year mortality rates were 41%, 63% and 87%, respectively. While ASA score, PI score and ACS NSQIP did not predict post-operative morbidity, both ASA score and ACS NSQIP SRC predicted post-operative mortality.

Conclusions Palliative emergency laparotomy is associated with significant post-operative mortality and morbidity. Scorings, such as ASA score and ACS NSQIP SRC predict mortality in this patient population.

Introduction

Palliative surgery aims to alleviate symptoms and improve quality of life in patients with incurable diseases. Intra-abdominally this often refers to obstruction or perforation in the gastrointestinal tract. Severe pain, nausea or constipation, inability to eat, or imminent bowel-ischemia may necessitate emergency surgery. In such situations, operations such as gastrointestinal bypass, bowel resection, intestinal anastomosis or various types of stoma are most commonly performed. [1–3]. Such palliative emergency interventions pose a challenge in terms of fast decision-making with these already fragile patients. Data on the

✉ M. Ukkonen
mika.ukkonen@fimnet.fi

[1] Department of Gastroenterology and Alimentary Tract Surgery, Tampere University Hospital, Tampere, Finland

[2] Faculty of Medicine and Health Technology, Tampere University, Tampere, Finland

[3] Department of Anaesthesiology and Intensive Care Medicine, Tampere University Hospital, Tampere, Finland

post-operative recovery of these patients and the benefits of these interventions are scarce. Many studies focus on one type of cancer, or one procedure, while extensive studies on palliative patients in general do not exist and only few papers focus on emergency operations.

Surgical risk scores are developed for predicting the benefits and harms of the planned operation. One of the most commonly used scoring systems for predicting perioperative risks is the American Society of Anesthesiologists Physical Status Classification System (ASA) [4, 5]. Other frequently used risk scoring systems include the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) Surgical Risk Calculator (https://riskcalculator.facs.org/RiskCalculator) and the Palliative Index (PI) [6, 7]. ACS NSQIP is operated by means of a calculator into which 20 pre-operative patient predictors and the planned procedure are entered. The calculator predicts the risk of 18 different postoperative outcomes within 30 days following surgery while also presenting the average risk for each outcome for the given operation to compare with the patient's risk [6]. No research has been presented on the risk scoring focusing on palliative procedures. The Palliative index (PI) is simple indicator published by Roses et al. [7]. In 2014 to predict outcomes in cancer patients undergoing emergency abdominal surgery.

The aims of the present study were to evaluate the incidence, indications and type of palliative emergency laparotomies, combined with the post-operative morbidity, motality and outcomes of these patients. The predictive value of surgical risk scores (ASA, ACS NSQIP surgical risk score and PI) were also assessed.

Methods

This was a retrospective study of palliative intra-abdominal emergency operations performed in tertiary hospital, Tampere University Hospital, Finland in the period January 1, 2015 to December 31, 2016**.** The study was conducted according to the Helsinki Declaration. In compliance with the principles of the local ethics committee, exemption from consent was obtained as the data had already been collected for clinical purposes. Medical records of all emergency intra-abdominal surgeries performed during the study period were reviewed. Eligible patients were identified by searching the surgical database (URANUS; CGI Inc, Montreal, Quebec, Canada) for all those patients who had undergone laparotomy. Finally, patients with either planned palliative intra-abdominal surgery or those converted to this during the operation were included in this study as described in Fig. 1.

Patient data were collected from the Tampere University Hospital surgical database and the medical records. Recorded patient characteristics were age, sex, comorbidities, type of malignancy, ASA classification and indication for the operation. The best functional status in daily activities during the previous 30 days pre-operatively was assessed and classified into three: "independent", "partially dependent", and "totally dependent", as in ACS NSQIP surgical risk score. The same three-step classification for functional status as before was used to evaluate functional recovery at discharge from hospital. Post-operative recovery variables recorded were length of stay in the postoperative care unit (PACU) and morbidity. Complications were defined and graded according to the Clavien-Dindo (C-D) classification [8]. Length of stay (LOS) in the hospital and readmissions to hospital were recorded. Hospital mortality, overall mortality and survival time were noted. Mortality was extracted from the Population Register Center. In addition, patient data was gathered for the ACS NSQIP surgical risk calculator [6].

Summary measurements were expressed as means with standard deviations or as medians with 25th–75th percentile unless otherwise stated. Continuous variables were analyzed using Student's t-test or Mann–Whitney U-test, the latter for non-normally distributed data. Chi-square or Fisher's exact test was used for categorical variables. Two-tailed p values were reported, and a p value < 0.05 was deemed statistically significant. The association between risk scores and morbidity was assessed comparing the probability of a serious complication with the complications classified as C-D classes 3–4, and the risk score probability of any complication with all complications included in the data. The associations between risk scores and mortality were assessed against mortality in hospital, within 14 and 30 days of discharge and in the first year thereafter. ASA class was divided into tripartite ASA 1–2, 3 and 4–5 to ensure sufficiently equal groups for comparison. ROC curves were used to visualize the performance of ASA, ACS NSQIP and the palliative index for 14, 30, 90 and 360-day mortality and morbidity. To evaluate the resolution of the test area under curve (AUC) was calculated. Statistical analyses were performed using SPSS Statistics version 22 for Windows (IBM Corp, Armonk, NY, USA).

Results

A total of 93 patients (median age 69 [28–92] years, 51% female) were included in the study. 89 of patients had a malignant disease, three patients had acute mesenteric ischemia and one patient had complications after vascular surgery. Post-operative 90 days mortality was 63%. Age,

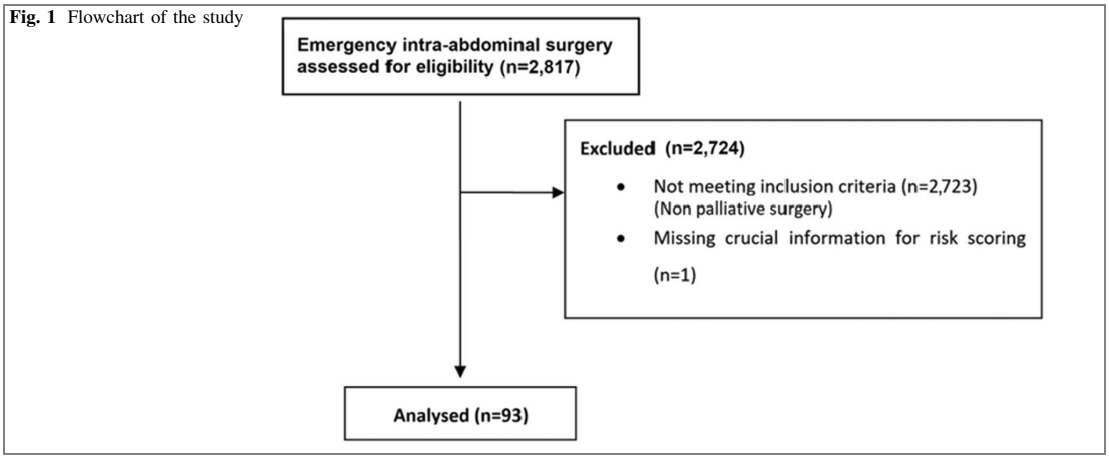


Fig. 1 Flowchart of the study

ASA classification and coronary artery disease were associated in 90-day mortality with the statistical significance ($p < 0.05$). Pre-operatively 65% of patients were independent in daily activities, 33% were partially independent and 2.2% were totally dependent of help in daily activities. The most common indication for surgery was bowel occlusion (52%) and securing food intake (30%, including gastrojejunostomies and gastrostomas). The majority of patients (88%) had significant concomitant conditions (ASA classes III or more). Co-existing diseases were slightly more common among patients who died within 90 days (69% vs. 31%, $p = 0.094$). Pre-operatively planned operations were successfully performed on 76 (82%) patients, for 17 (18%) patients the surgery plan had to be changed during surgery and the original goal was not achieved. Sixty-five (70%) patients underwent emergency surgery which was known palliative pre-operatively and a further 28 (30%) patients were emergency surgery patients whose operation became palliative during surgery for a variety of reasons. Demographic data on the study population are presented in Table 1.

Data collected post-operatively are presented in Table 2. Median post-anaesthesia care unit (PACU) time was 3 h 20 min (IQR 2:32–5:17) and three patients required ICU care post-operatively. Thirty-four patients (37%) suffered from postoperative complications (C–D I–II 10%, III: 13%, IV: 0%, V: 14%). Median length of post-operative hospital stay was five (range 0–23) days. Seven (7.5%) patients required reoperation, four of them had fascial rupture, one required explorative laparotomy, one had a problem with gastrostoma and one had stoma prolapse. There were 25 hospital readmissions (27%); the most typical reason to hospital readmission was high temperature or other symptoms of infection. Post-operatively at the time of discharge from hospital 11 (12%) patients were independent in daily activities, 36 (39%) were partially independent and 32 (34%) of patients were totally dependent. The 14-day, 30-day, 90-day and 1-year mortality rates were 22%, 41%, 63% and 87%, respectively.

Table 3 presents the predictive values of ACS NSQIP, ASA classification and Palliative Index for post-operative morbidity and mortality. There was no statistically significant association between ACS NSQIP and any C-D class ($p = 0.136$) or serious complications (C–D 3–4) ($p = 0.578$). Nor was there any significant association between ASA and morbidity ($p = 0.221$) or C–D 3–4 morbidity ($p = 0.547$). Palliative Index was not associated with post-operative morbidity ($p = 0.490$), serious morbidity (C–D 3–4) ($p = 0.904$), or mortality. Both ACS NSQIP and ASA predicted mortality at 14 days, 30 days, 90 days and one year (Table 3).

Figure 2 presents the ROC curves and Table 4 shows AUC values. The 14-day, 30-day, 90-day and 1-year ROC curves and area under curve (AUC) show that ACS NSQIP and ASA were reliable variables in the classification of mortality. ACS NSQIP AUC values are over 0.7, which reflects good classification. Instead, morbidity ROC curves show that ASA classification, ACS NSQIP and Palliative Index are not good at predicting complications. PI ROC curves and AUC show that PI is not good for classifying morbidity or mortality in this data.

Discussion

The data on post-operative recovery from emergency palliative surgery is limited. According to our study results, emergency laparotomy is associated with significant short-term mortality in this study population; 22% patients died within two weeks of surgery and 63% died in 90 days. Risk

Table 1 Demographic, operation-related data and post-operative 90-day mortality of the study population, (n = 93)

Variable	All patients	Died within 90-days		p value
		Yes	No	
Population n (%)	93 (100)	59 (63)	34 (37)	
Age, median (min–max)	69 (28–92)	71 (47–89)	63 (28–92)	0.004
Female, n (%)	47 (51)	27 (57%)	20 (43%)	0.322
Comorbidities, n (%)	67 (72)	46 (69%)	21 (31%)	0.094
Diabetes	24 (26)	18 (%)	6 (%)	0.223
Hypertension	48 (52)	34 (71%)	14 (29%)	0.082
Heart failure	7 (7.5)	5 (71%)	2 (29%)	0.707
COPD	7 (7.5)	6 (86%)	1 (14%)	0.249
Coronary artery disease	11 (12)	10 (91%)	1 (9.1%)	0.048
Malignancy, n (%)	89 (96)	55 (62%)	34 (38%)	0.121
Colorectal	33 (25)	20 (61%)	13 (39%)	0.674
Upper gastrointestinal tract	18 (19)	8 (44%)	10 (56%)	0.062
Hepatic or pancreatic	14 (15)	12 (86%)	2 (14%)	0.075
Breast or gynaecological	15 (16)	8 (53%)	7 (47%)	0.394
Other	9 (10)	7 (78%)	2 (22%)	0.478
Pre-operative functional ability, n (%)				
Independent	60 (65%)	34 (57%)	26(43%)	0.067
Partially dependent	31 (33%)	23 (74%)	8 (26%)	0.128
Totally dependent	2 (2.2%)	2 (100%)	0 (0%)	0.531
ASA physiological status, n (%)				
1–2	11 (12)	3 (27%)	8 (73%)	0.016
3–5	82 (88)	56 (68%)	26 (32%)	0.016
Indications to surgery, n (%)				
Occlusion	48 (52)	28 (58%)	20 (42%)	0.291
Securing food intake	28 (30)	16 (57%)	12 (43%)	0.408
Perforation	6 (6.5)	6 (100%)	0 (0%)	0.082
Explorative operation	4 (4.3)	4 (100%)	0 (0%)	0.293
Other	7 (7.5)	5 (71%)	2 (29%)	1.000
Planned palliative operation n (%)	65 (70)	42 (65%)	23 (35%)	0.495

COPD, chronic obstructive pulmonary disease; ASA, American Society of Anesthesiologists classification

scores such as ASA and ACS NSQIP do predict mortality in this study population.

According to the literature, patients undergoing palliative intra-abdominal surgery are often aged over 60 and the indication for surgery is, for example, perforation, obstruction, or internal bleeding caused by a malignity. [3, 9, 10] Our results corroborate these earlier reports. In the study, short-term mortality was considerably high and patients were extremely vulnerable, so the need for surgical treatment in this patient group needs to be considered even more carefully than normally. The conditions indicating surgery are often painful and difficult, if not unbearable, for the patient to cope with. Thus, surgical treatment may often seem a necessity. In the choice between surgery and non-operative management, it is often very difficult to evaluate the benefits, harms and other options for palliative surgery, especially for those who are not familiar with non-operative palliative care. Treatment decisions in emergency surgery are often made outside office hours and are based on subjective assessments made by on-call surgeons and anaesthetists. Clinicians should ascertain their patient's' advance care plan. Multidisciplinary teams including specialists in palliative care would be beneficial but are not possible outside daytime working hours their availability is limited.

In addition to multidisciplinary teams, surgical risk scores can be helpful in weighing up the benefits and harms of a procedure. In this study, both ASA score and ACS NSQIP predicted mortality among surgically treated patients, while Palliative Index did not predict mortality or

Table 2 Post-operative outcomes among patients undergoing palliative surgery

Variable	
PACU time, h:min (med, IQR, max)	3:20 (2:32–5:17, 22:35)
Post-operative ICU care, n (%)	3 (3.2)
Surgical morbidity, n (%)	34 (37)
Clavien-Dindo I-II	9 (10)
Clavien-Dindo III	12 (13)
Clavien-Dindo V (in-hospital mortality)	13 (14)
Reoperation (%)	7 (7.5)
Location for follow-up treatment, n (%)	
Home, independently	12 (13)
Home, with home nursing	6 (6.5)
Residential care home	2 (2.2)
Primary health care ward	30 (32)
Other hospital ward	30 (32)
Hospital Readmission, n (%)	24 (26)
Functional ability at discharge, n (%)	
Independent	11 (12)
Partially dependent	36 (39)
Totally dependent	32 (34)
Hospital LOS, days (med, IQR)	5 days (3–7.5)
Post op lifetime, days, (med, IQR, max)	46 (16.5–178; 971)
Mortality, n (%)	
14 days	20 (22)
30 days	38 (41)
90 days	59 (63)
1 year	81 (87)

PACU time, post-anaesthesia care unit; Post-operative ICU care, post-operative intensive care unit care, Hospital LOS length of stay

morbidity. Nevertheless, these scores may provide support for surgical decision-making and informed consent. ACS NSQIP predicts the risk of 18 different post-operative outcomes within 30 days following surgery while also providing the average risk for each outcome for the given operation to compare with the risk to the patient [5]. However, while in this study both ASA scores and ACS NSQIP statistically significantly predicted mortality, they did not predict morbidity. ASA was included in this research in order to ascertain the condition of the patients prior to surgery, and to assess the predictive value of the classification in terms of post-operative mortality and morbidity. The classification alone rarely works as an indicator for operative risk as it only takes systemic diseases into account, but with other patient or operation-related factors, classification may be used as a tool in predicting post-operative risks [6].

Earlier studies have stated that there may be fewer complications related to less invasive operations, such as laparoscopic surgery than open surgery in palliative patient groups. Therefore, laparotomy should be always considered with particular care and if possible, perform less invasive operation [9, 11, 12]. However, several other factors also influence morbidity, such as ascites, diabetes, dependency in daily life, increased white cell count, type of cancer as well as how widely it has spread and obstruction located in the small intestine [13–15]. Better survival could be expected of patients with obstruction in the large intestine and who were able to eat solids at the time of discharge [13]. For instance, Burgess et al. [16] found in their research of acute laparotomies that ACS NSQIP SRC predicted most complications accurately while Parkin et al. [17] concluded that ACS NSQIP SRC was only successful in predicting mortality. Also, Collard et al. [18] showed that ACS NSQIP SRC is accurate in predicting mortality, morbidity, and serious morbidity in emergency bowel obstruction patients. [19]

Earlier studies have reported post-operative survival to vary from a few days to several years, the median usually being less than a year in palliative patient group [10, 13, 20–22]. Over one in five patients in our study population died within two weeks of surgery, and nearly 90% of patients died within one year. The pre-existing condition of a palliative patient causes an increased risk of post-operative morbidity and mortality, especially in terms of systemic complications such as pneumonia and cardiopulmonary complications.[23] While most patients with metathesized malignancies are known to have short life expectancy, we emphasize quality of life over morbidity and mortality. In this study, only two patients were totally dependent in daily activities pre-operatively but after operation over one third were totally dependent on supportive care. Palliative patients arrive at the emergency room in poor general condition, which makes post-operative recovery challenging. Nevertheless, complications are also highly undesirable in palliative group of patients. It is possible that we surgeons are overly optimistic about the results to be achieved by performing palliative surgery. More research on post-operative quality of life and alternative non-operative care is definitely required.

Based on this study, authors recommend including NSQIP in clinical work to one of the assessments tools when evaluating palliative patients' eligibility for operation. Another significant change in the treatment of palliative patients in Tampere University Hospital Department of Gastroenterology and Alimentary Tract Surgery was the involvement of palliative team in the treatment of palliative patient group after this study from the beginning of 2017.

The study had some limitations. First, the study was a single-center retrospective study. However, all the

Table 3 ACS NSQIP, ASA and Palliative index class predictive values

	No		Yes		
	Median	Q_1–Q_3	Median	Q_1–Q_3	*p* value
Morbidity *					
ACS NSQIP	33.7	12.8–76.1	38.4	23.4–551.9	0.136
ASA class	3	2–5	3	2–5	0.221
Palliative index	3	2–5	3	3–5	0.490
Clavien-Dindo 3–4					
ACS NSQIP	31.8	9.9–69.1	31.8	16.3–44.8	0.578
ASA class	3	2–5	3	2–5	0.547
Palliative index	3	2–5	3	3–5	0.904
14-day mortality					
ACS NSQIP	20.1	0.7–78.8	32.8	14.3–91.2	0.004
ASA class	3	2–5	4	3–5	0.002
Palliative index	3	2–5	3.5	3–5	0.142
30-day mortality					
ACS NSQIP	18.3	0.7–78.8	31.3	14.3–91.2	0.001
ASA class	3	2–5	3	2–5	0.005
Palliative index	3	2–5	3	3–5	0.812
90-day mortality					
ACS NSQIP	15	0.7–65.9	31	4.9–91.2	< 0.001
ASA class	3	2–5	3	2–4	0.003
Palliative index	3	3–5	3	3–5	0.763
1-year mortality					
ACS NSQIP	11.9	0.7–40.5	25.3	2.8–91.2	0.006
ASA class	3	2–5	3	2–4	0.002
Palliative index	3	2–5	3	3–5	0.648

ASA american society of anesthesiologists classification, *ACS NSQIP* American college of surgeons national surgical quality improvement program surgical risk calculator

*Clavien-Dindo I-IVb morbidity

variables used in this study, such as those used in scoring systems (including ASA score), were registered during the hospital stay before the surgery. Second, there may have been some patient selection bias, as some of the most morbid patients may not have undergone surgery. The choice between operative and non-operative care was often based on subjective assessment often made by the surgeon and anaesthesiologist on call. After this study we have included multidisciplinary palliative teams into decision-making process, unfortunately this works only during office hours when these are available. It should be noted, however, that only in two-third of cases the surgery was pre-operative planned palliative operation and in the remaining one-third palliative approach was selected during the surgery. We were not able to get data of hospital readmissions to other hospitals than Tampere university hospital which limited the accuracy of this information; however, all the emergency cases within the hospital district are admitted to the study hospital. The most significant strengths of the study were the comprehensive post-operative details, including complete follow-up obtained from national registries. However, accurate data on causes of death was lacking from some patients.

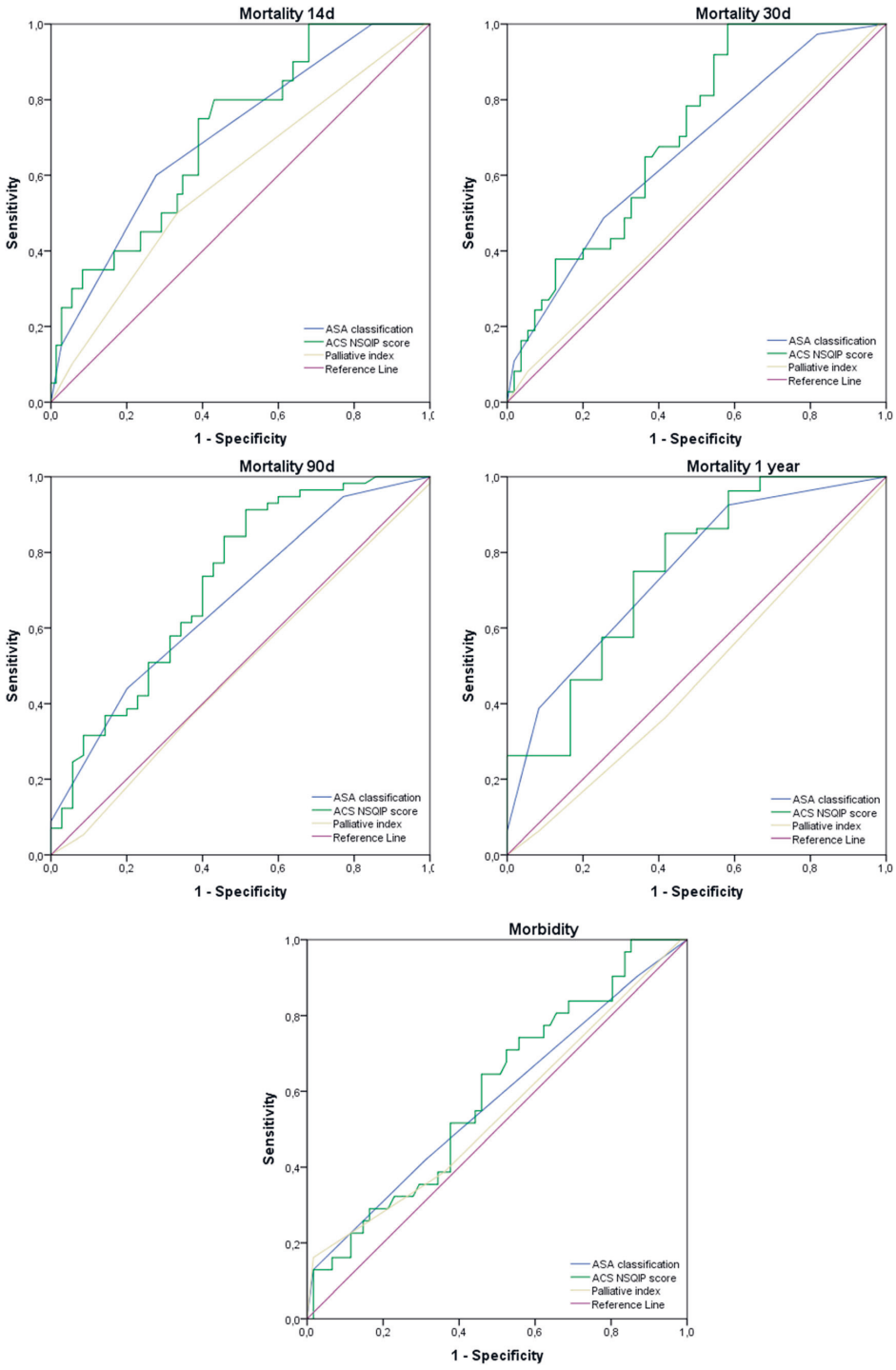


Fig. 2 ROC curves

Table 4 ROC AUC values

	ASA	ACS NSQIP	Palliative index
14-day mortality	.704	.710	.590
30-day mortality	.662	.707	.517
90-day mortality	.671	.718	.487
1-year mortality	.748	.749	.467
Morbidity	.575	.595	.544

ASA american society of anesthesiologists classification; *ACS NSQIP* american college of surgeons national surgical quality improvement program surgical risk calculator

Conclusion

According to this study, palliative intra-abdominal emergency surgery is associated with significant short-term mortality. Risk scores, such as ACS NSQIP and ASA score, predict higher mortality and are useful in this patient population when planning surgical treatments. We recommend a multidisciplinary approach and, whenever feasible, making an advance care plan at least for those patients with high risk of mortality. In the most morbid and vulnerable high-risk patients, an alternative non-operative approach should be considered.

Funding This study was conducted without external funding.

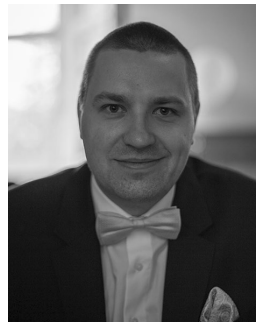
Declarations

Conflict of interest All the authors declare they have no conflicts of interest.

References

1. Buettner S, Wilson A, Margonis GA, Gani F, Ethun CG, Poultsides GA et al (2016) Assessing trends in palliative surgery for extrahepatic biliary malignancies: a 15-year multicenter study. J Gastrointest Surg 20:1444–1452
2. Smith BR, Stabile BE (2007) Gastric adenocarcinoma: reduction of perioperative mortality by avoidance of nontherapeutic laparotomy. J Gastrointest Surg 11:127–132
3. Gonzalez R, Gonzalez R, Smith C, Smith C, Ritter E, Ritter E et al (2005) Laparoscopic palliative surgery for complicated colorectal cancer. Surg Endosc 19(1):43–46
4. Doyle DJ, Goyal A, Bansal P, Garmon EH (2021) American society of anesthesiologists classification. StatPearls Publishing LLC, StatPearlsTreasure Island
5. American Society of Anesthesiologists (2016) ASA physical status classification system. Cited 2020 Jul 30 https://www.asahq.org/standards-and-guidelines/asa-physical-status-classification-system
6. American College of Surgeons (2020). ACS NSQIP surgical risk calculator. Cited 2020 Jul 30 https://riskcalculator.facs.org/RiskCalculator/about.html
7. Roses RE, Tzeng CD, Ross MI, Fournier KF, Abbott DE, You YN (2014) The Palliative index: predicting outcomes of emergent surgery in patients with cancer. J Palliat Med 17(1):37–42
8. Clavien PA, Barkun J, de Oliveira ML, Vauthey JN, Dindo D, Schulick RD et al (2009) The clavien-dindo classification of surgical complications: five-year experience. Ann Surg 250(2):187–196
9. Akagi T, Inomata M, Kitano S, Hida K, Sakai Y, Hasegawa S et al (2013) Multicenter study of short- and long-term outcomes of laparoscopic palliative resection for incurable, symptomatic stage IV colorectal cancer in japan. J Gastrointest Surg 17(4):776–783
10. Maeda Y, Shinohara T, Katayama T, Minagawa N, Sunahara M, Nagatsu A et al (2017) A laparoscopic approach is associated with a decreased incidence of SSI in patients undergoing palliative surgery for malignant bowel obstruction. Int J Surg 42:90–94
11. Nishigori H, Ito M, Nishizawa Y, Kohyama A, Koda T, Nakajima K et al (2012) Laparoscopic surgery for palliative resection of the primary tumor in incurable stage IV colorectal cancer. Surg Endosc 26(11):3201–3206
12. Scheidbach H, Scheidbach H, Ptok H, Ptok H, Schubert D, Schubert D et al (2009) Palliative stoma creation: comparison of laparoscopic vs conventional procedures. Langenbecks Arch Surg 394(2):371–374
13. Blair SL, Chu DZ, Schwarz RE (2001) Outcome of palliative operations for malignant bowel obstruction in patients with peritoneal carcinomatosis from nongynecological cancer. Ann Surg Oncol 8(8):632–637
14. Bartlett EK, Wachtel H, Fraker DL, Vollmer CM, Drebin JA, Kelz RR et al (2014) Surgical palliation for pancreatic malignancy: practice patterns and predictors of morbidity and mortality. J Gastrointest Surg Off J Soc Surg Aliment Tract 18(7):1292–1298
15. Doglietto GB, Pacelli F, Caprino P, Sgadari A, Crucitti F (2000) Surgery: independent prognostic factor in curable and far advanced gastric cancer. World J Surg 24(4):459–464
16. Burgess JR, Smith B, Britt R, Weireter L, Polk T (2016) Predicting postoperative complications for acute care surgery patients using the ACS NSQIP surgical risk calculator. Am Surg 83(7):733–738
17. Parkin CJ, Moritz P, Kirkland O, Doane M, Glover A (2020) Utility of the american college of surgeons national surgical quality improvement program surgical risk calculator in predicting mortality in an Australian acute surgical unit. ANZ J Surg 90(5):746–751
18. Collard MK, Moszkowicz D, Clause-Verdreau AC, Beauchet A, Cudennec T, Vychnevskaia K et al (2018) Postoperative morbidity and mortality for malignant colon obstruction: the american college of surgeon calculator reliability. J Surg Res 226:112–121

19. Golden DL, Ata A, Kusupati V, Jenkel T, Khakoo NS, Taguma K et al (2019) Predicting postoperative complications after acute care surgery: How accurate is the ACS NSQIP surgical risk calculator? Am Surg 85(4):335–341
20. Bouvet M, Gamagami RA, Gilpin EA, Romeo O, Sasson A, Easter DW, Moossa AR (2000) Factors influencing survival after resection for periampullary neoplasms. Am J Surg 180(1):13–17
21. Eguchi H, Yada K, Shibata K, Matsumoto T, Etoh T, Yasuda K et al (2012) Laparoscopic stomach-partitioning gastrojejunostomy is an effective palliative procedure to improve quality of life in patients with malignant gastroduodenal outlet obstruction. Asian J Endosc Surg 5(4):153–156
22. Kohan G, Ocampo CG, Zandalazini HI, Klappenbach R, Yazyi F, Ditulio O et al (2015) Laparoscopic hepaticojejunostomy and gastrojejunostomy for palliative treatment of pancreatic head cancer in 48 patients. Surg Endosc 29(7):1970–1975



M. Laitamäki obtained his medical degree from University of Oulu, Finland. He is completing his surgical residency in gastrointestinal surgery at Tampere University. His current research focuses on surgical palliative care, for which he will be obtaining a PhD.

PUBLICATION

II

Palliative gastrointestinal surgical oncology outcomes after palliative care consultation: A retrospective observational study.

Laitamäki M, Piili RP, Laukkarinen J, Ukkonen M.

BMJ Support Pallia Care. 2023 Feb 28, 2022.

The impact of palliative care consultation on outcomes of gastrointestinal palliative surgery, a retrospective observational study

Short-title: Palliative care consultation in gastrointestinal surgery

Matti Laitamäki, MD [1]; Reetta P. Piili, PhD. [2,3]; Johanna Laukkarinen, Prof.[1,2]; Mika Ukkonen, PhD [1,2]

[1]Department of Gastroenterology and Alimentary Tract Surgery, Tampere University Hospital, Finland; [2]Faculty of Medicine and Health Technology, Tampere University, Finland; [3]Palliative Care Centre, Department of Oncology, Tampere University Hospital, Tampere, Finland.

This study was conducted without external funding.

All the authors declare they have no conflicts of interest.

Original article.

Correspondence to: Matti Laitamäki, MD

Department of Gastroenterology and Alimentary Tract Surgery

Tampere University Hospital

Elämänaukio, Kuntokatu 2, 33520 Tampere

Telephone: +358 3 311 66161

Email: matti.laitamaki@fimnet.fi

Abstract

Objectives: Palliative surgery aims to relieve patients' symptoms and improve quality of life with surgical interventions. While multidisciplinary approach has been found beneficial for critically ill patients, limited evidence supports this approach in palliative surgery. Here we sought to study whether palliative care consultations can improve outcomes among patients undergoing palliative surgery.

Methods: Consecutive patients undergoing palliative care at gastro-surgical wards in a tertiary Finnish university hospital during a two-year study period were included. Outcomes of those undergoing surgery with or without palliative care consultation were compared. The main outcome measures were patients' functional status, postoperative morbidity, and mortality.

Results: A total of 312 patients were included, of whom 173 underwent surgery, 77 endoscopic care and 62 were treated conservatively. Of the operated patients, 24 underwent multidisciplinary assessment while among the rest the treatment decision was based on the surgeons' assessment. Multidisciplinary assessment was associated with a clinically significantly reduced morbidity (8.3% vs. 23%, p=0.111), in-hospital mortality (8.3% vs. 17%, p=0.051) and rate of hospital readmissions (8.3% vs. 21%, p=0.052). There was no difference in median survival 49 (2–440) vs. 45 (1–971) days (p=0.949). Of those undergoing conservative care, 44% could have undergone surgery.

Conclusions: The aim of the palliative surgery is to relieve symptoms among patients with no hope of being cured. While the involvement of the palliative care consultation into the surgical decision-making is likely to reduce unnecessary operations, it is likely to be even more important in improving quality of end-of-life care.

Key messages:

1. What is already known: Palliative surgery has been associated with high mortality and morbidity. Multidisciplinary approach helps with treatment of terminally ill patients.

2. What this study adds: Impact of the palliative care consultation in the preoperative assessment of the palliative gastrosurgical patient.

3. How this study might affect research, practice or policy: Strengthens the cooperation of surgeons and palliative physicians in the treatment of this gastosurgical palliative patients.

Introduction

Palliative surgery aims to relieve patients' symptoms and improve quality of life with surgical interventions. Earlier studies have reported high mortality and morbidity associated with palliative surgery [1-4]. While Palliative surgery has been shown associated with high mortality and morbidity. Multidisciplinary approach has benefits with treatment of terminally ill patients.palliative surgery is aiming to improve quality of end-of-life with surgical interventions, palliative care as a whole is an approach that improves the quality of life of patients and their families, through the prevention and relief of suffering, both physical and psychosocial and communication about the goals of care, which reflects also to the bereavement of the closest ones [5-7].

The benefits of multidisciplinary approach for terminally ill patients have been reported earlier [8]. If integrated timely, multidisciplinary palliative care approach may guide clinical decision-making in alignment with patients' preferences [6]. However, evidence supporting this approach in palliative surgery remains limited.

Consequently, the purpose of this study was to clarify the effect of a palliative care consultation on the outcomes of palliative surgery in gastro-surgical wards. The hypothesis is that under the influence of the palliative care consultation the best possible treatment approach is selected for these patients more appropriately, which may in turn decrease short-term mortality and the rate of postoperative complications.

Materials and methods

In this retrospective study, each consecutive patient undergoing palliative care in gastro-surgical wards in Tampere University Hospital, Finland between 1 January 2015 and 31 December 2016 and between 1 January 2018 and 31 December 2019 were included. We sought to investigate whether multidisciplinary approach improved quality of palliative care among patients undergoing palliative surgery. Palliative care consultations were implemented into the standard practice in our gastro-surgical wards at the beginning of 2017. The palliative care consultation team consisted of consultants of palliative medicine and palliative care nurses. Teams were available only during office hours. Patients with no palliative indication were excluded. Patients

were also excluded if the treatment aimed to be curative and the palliative treatment decision was made later.

The outcomes of those undergoing surgery with or without palliative care consultation were compared. To reduce patient-selection bias, the control group consisted of consecutive patients undergoing palliative surgery without multidisciplinary assessment 1) after initiation of multidisciplinary teams (for example, if treatment decision was made by the surgeon outside office hours) and 2) those undergoing surgery before implementation of palliative care consultations. The outcomes of these two control populations were reported separately. Additionally, the outcomes of those undergoing endoscopic and conservative palliative care were reported as well.

Patient data was collected from the hospital electronic medical records and hospital surgical database. Patient characteristics were recorded, and they included for example age, sex, comorbidities, type of malignancy, preoperative functional ability, and indication for the surgery. The main outcomes were postoperative morbidity and in-hospital mortality. Postoperative complications were defined and classified according to Clavien-Dindo classification of surgical complications [9]. The secondary outcome measures were the rate of reoperations, the length of hospital stay, postoperative functional ability and long-term mortality.

Statistical analyses were performed using SPSS Statistics version 22 for Windows (IBM Corp, Armonk, NY, USA). The summary measurements were expressed as means with standard deviations or as medians with minimum and maximum values unless stated otherwise. Continuous variables were analysed using Student's t-test or Mann–Whitney U-test, the latter for non-normally distributed data. Chi-square or Fisher's exact test was used for categorical variables. Two-tailed p-values were reported and a p-value < 0.05 was deemed statistically significant.

The study was conducted according to the requirements of the Helsinki Declaration. In compliance with the principles of the local ethics committee, exemption from consent was obtained as the data had already been collected for clinical purposes.

Results

The patient flowchart is shown in Figure 1. A total of 312 palliative patients were included, of which 173 (55%) underwent surgery, 77 (25%) endoscopy and 62 (20%) conservative care. Of the operated patients, 24 (14%) received palliative care consultation. The control group consisted of 149 patients (48%), of which 62% were operated before and 38% after implementation of palliative care consultations practice into gastro-surgical wards. The patient demographics are presented in Table 1. Patients undergoing conservative or endoscopic care had more often significant comorbidities than those undergoing surgery (86%, 78% and 63%, $p<0.001$, respectively).

The operation-related characteristics are shown in Table 2. The most common indication of surgery was bowel obstruction and the most common indication for endoscopic or conservative care was biliary obstruction. Ninety-three percent of operations were urgent/emergency operations and the seven percent elective. When comparing the two time periods included in the study, the number of exploratory surgeries decreased from 36% to 18%.

The postoperative outcomes of the patients are shown in Table 3. There was a trend towards lower operation-related morbidity (8.3% vs. 23%, $p=0.111$), in-hospital mortality (8.3% vs. 25%, $p=0.051$) and rate of hospital readmissions (8.3% vs. 13%, $p=0.052$) among those receiving palliative care consultation. However, there was no significant difference in median survival 49 (2–440) vs. 45 (1–971) days ($p=0.949$), as shown in Figure 2. Compared to surgery, the 90-day and 1-year mortality rates were 54% and 91% among patients undergoing endoscopic care and 83% and 98% among patients undergoing conservative care. None of the operated patients assessed by palliative care consultation team were totally dependent of help in daily activities before surgery, compared to three (2.0%) of the control patients. The respective share was 24% and 36% after surgery ($p=0.264$).

Of those undergoing conservative palliative care, 44% (21/48) could have been treated with surgery based on patient records. The palliative care consultation team was involved in the decision-making to abstain from

surgery in eight cases (17%), while the surgeon made the decision in the remaining 13 cases (27%). Almost every time the decision to abstain from surgery was based on the poor general condition of the patient.

Discussion

The core principle of palliative surgery is to reduce suffering through surgery. While evidence supports palliative care in terminally ill patients [8, 10, 11], there is limited evidence supporting a multidisciplinary approach in palliative surgery. In this study, we compared the outcomes of patients undergoing palliative surgery with or without palliative care consultation. While we report a lower risk of adverse events during hospital stay among those receiving multidisciplinary assessment, the long-term outcomes were similar in both groups.

There are limited results on the outcomes of palliative surgery, probably because the outcomes are poor regardless of which approach is chosen. Recently, we reported 37% morbidity and 41% mortality associated with emergency palliative surgery [4]. Furthermore, functional outcomes after surgery were poor as well [4]. In this study, we sought to study whether these traditional surgery-associated outcomes would improve if palliative patients underwent multidisciplinary assessment. Earlier studies have found team-based models beneficial for end-of-life patients, and it has been proposed that multidisciplinary teams should focus on high-risk patients [8]. Surgical mortality reflects both the intrinsic risks of the operation and the underlying morbidity of patient. The main goal for palliative surgery, as already stated, is to improve the quality of end-of-life. We consider that reduction in short-term mortality in our study reflects the patient selection. The surgery itself produces suffering for the patient, and operating a palliative patient always requires very careful consideration. After the implementation of multidisciplinary approach, conservative approach instead of surgery was found to be eligible for a higher number of patients.

As stated in earlier studies, palliative care aims not only to improve these traditional surgical quality outcomes, but it has benefits on symptomatic and psychosocial support, communication about goals and risks of care, and the experiences of the patients and their closest ones at the end of patient's life [5, 6]. The surgeon is the best professional to assess the patient's operability together with the anaesthesiologist, but

the involvement of a palliative care consultation team improves the quality of whole perioperative care and may highlight the patient's preferences about the goals of care. Finally, the authors would like to also emphasize importance of educational factors, as there is significant educational value of multidisciplinary approach for both surgeons and palliative care consultation team members as well.

There are some limitations. This was a retrospective single centre study. There was some certain patient selection bias between groups, which cannot be avoided with this study setup. Although the study was retrospective, the follow up data was comprehensive. Palliative care consultations were available only during office hours. Consequently, palliative care consultation teams assessed some patients prior to the surgery. This might explain the slightly worse outcome among those undergoing surgery without palliative care consultation. It is likely, however, that many of these patients required immediate surgery (e.g., because of bowel perforation) and could not wait for a multidisciplinary assessment until office hours. Patients requiring urgent but not immediate surgery are usually able to wait until being assessed by palliative care consultation team.

Conclusions

According to our study, the involvement of the palliative care consultation team into surgical decision-making improves the short-term outcomes such as in-hospital mortality and morbidity. We also emphasize that the routine use of multidisciplinary approach is likely to improve the quality of end-of-life among this fragile group of patients.

Table 1. Demographic data

Variable		Surgery (n=173) with multidisciplinary assessment			Endoscopy	Conservative
		No Before PTs [1]	**No** After PTs [2]	**Yes**		
Number of patients, n (%)		93 (30)	56 (18)	24 (7.7)	77 (25)	62 (20)
Age, median (min-max)		69 (28-92)	72 (33-92)	67 (41-98)	71 (38-97)	79 (48-91)
Female, n (%)		47 (51)	20 (36)	11 (46)	34 (44)	35 (57)
BMI, median (min-max) [3]		24 (13-41)	24 (14-39)	24 (17-35)	24 (16-42)	27 (17-65)
Smoking, n (%)		16 (17)	9 (16)	3 (13)	12 (16)	9 (15)
Comorbidities, n (%)		70 (75)	38 (68)	12 (50)	60 (78)	53 (86)
	Diabetes	24 (26)	11 (20)	4 (17)	21 (27)	22 (36)
	Hypertension	49 (53)	22 (39)	6 (25)	38 (49)	29 (47)
	Atrial fibrillation	10 (11)	5 (8.9)	2 (8.3)	14 (18)	18 (29)
	COPD [4]	7 (7.5)	2 (3.6)	1 (4.2)	4 (5.2)	4 (6.5)
	Alzheimer	4 (4.3)	2 (3.6)	1 (4.2)	6 (7.8)	11 (18)
	Coronary artery disease	11 (12)	8 (14)	1 (4.2)	9 (12)	16 (26)
	Heart failure	7 (7.5)	2 (3.6)	2 (8.3)	6 (7.8)	10 (16)
Malignancy, n (%)		89 (96)	46 (82)	22 (92)	74 (96)	51 (82)
	Colorectal	34 (37)	16 (29)	9 (38)	7 (9.1)	14 (23)
	Pancreaticobiliary	13 (14)	6 (11)	3 (13)	33 (43)	20 (32)
	Gastric	12 (13)	7 (13)	4 (17)	8 (10)	2 (3.2)
	Oesophagus	2 (2.2)	1 (1.8)	1 (4.2)	12 (16)	0 (0.0)
	Gynaecological	25 (27)	14 (25)	5 (21)	13 (17)	11 (18)
	Other malignancy	3 (3.2)	2 (3.6)	0 (0.0)	1 (1.3)	4 (6.5)
Preoperative findings						
	Advanced cancer, n (%)	82 (88)	42 (75)	21 (88)	63 (82)	48 (68)
	Peritoneal carcinosis, n (%)	0 (0.0)	22 (39)	10 (42)	4 (5.2)	11 (18)
	Ascites, n (%)	40 (43)	13 (23)	6 (25)	3 (3.9)	4 (6.5)
Preoperative functional ability, n (%)						
	Independent in daily activities	60 (65)	39 (70)	17 (71)	62 (81)	36 (58)
	Partially dependent in daily activities	31 (33)	16 (29)	7 (29)	14 (18)	23 (37)
	Totally dependent in daily activities	2 (2.2)	1 (1.8)	0 (0.0)	1 (1.3)	3 (4.8)

[1] Patients undergoing surgery without palliative care consultation (before implementation of palliative care consultation teams)

[2] Patients undergoing surgery without palliative care consultation after implementation of palliative care consultation teams (e.g. outside office hours)

[3] BMI, Body mass index

[4] COPD, chronic obstructive pulmonary disease

Table 2. Surgery-related characteristics

Variable		**Surgery (n=173)** with multidisciplinary assessment		
		No Before PTs [1]	**No** After PTs [2]	**Yes**
Number of patients		93 (30)	56 (18)	24 (7.7)
Indication, n (%)				
	Intestinal occlusion	48 (52)	36 (64)	22 (92)
	Intestinal perforation	6 (6.5)	14 (25)	0 (0.0)
	Other	39 (42)	6 (11)	2 (9.1)
Operation, n (%)				
	Exploratory surgery	33 (36)	11 (20)	3 (13)
	Colostomy or ileostomy	21 (23)	21 (38)	7 (30)
	Adhesiolysis	1 (1.1)	4 (7.1)	1 (4.3)
	Bowel resection	9 (9.7)	13 (23)	7 (30)
	Gastrojejunostoma	17 (18)	2 (3.6)	3 (13)
	Percutaneous gastrostomy	3 (3.2)	0 (0.0)	0 (0.0)
	Other	9 (9.7)	5 (8.9)	2 (8.7)
ASA physiological status, n (%)				
	I-II	11 (12)	7 (13)	2 (8.3)
	III-V	82 (88)	49 (88)	22 (92)
Planned palliative operation, n (%)		65 (70)	29 (52)	21 (88)
Emergency operation, n (%)		93 (100)	47 (84)	21 (88)

[1] Patients undergoing surgery without palliative care consultation before implementation of palliative care consultation teams

[2] Patients undergoing surgery without palliative care consultation after implementation of palliative care consultation teams (e.g. outside office hours)

Table 3. Outcome of palliative care among patients treated in gastro-surgical wards (n=312)

Variable		Surgery (n=173) with multidisciplinary assessment			Endoscopy	Conservative
		No Before PTs [1]	**No** After PTs [2]	**Yes**		
Number of patients		93 (30)	56 (18)	24 (7.7)	77 (25)	62 (20)
Admission to ICU, n (%) [3]		3 (3.2)	2 (3.6)	0 (0.0)	0 (0.0)	0 (0.0)
Morbidity CD, n (%) [4]		21 (23)	13 (23)	2 (8.3)	27 (35)	3 (4.8)
	Minor CD I-II	9 (9.7)	0 (0.0)	1 (4.2)	1 (1.3)	0 (0.0)
	Major CD III-IV	12 (13)	13 (23)	1 (4.2)	26 (34)	3 (4.8)
Re-operation, n (%)		13 (14)	13 (23)	1 (4.2)	27 (35)	4 (6.5)
In-hospital mortality, n (%)		11 (12)	14 (25)	2 (8.3)	12 (16)	12 (20)
LOS, days, median, (min-max) [5]		5 (1-22)	7 (2-32)	6 (2-14)	2 (0-34)	3 (0-11)
Readmissions, n (%)		24 (26)	7 (13)	2 (8.3)	19 (25)	4 (6.4)
Postoperative Functional ability, n (%)						
	Independent in daily activities	11 (14)	3 (7.1)	2 (9.5)	21 (32)	4 (7.8)
	Partially dependent in daily activities	36 (46)	27 (64)	14 (67)	37 (57)	30 (59)
	Totally dependent in daily activities	32 (41)	12 (29)	5 (24)	7 (11)	17 (33)
Location for follow up treatment, n (%)						
	Home, independently	12 (13)	3 (5.4)	1 (4.2)	19 (25)	3 (4.8)
	Home, with home care	6 (6.5)	3 (5.4)	2 (8.3)	3 (3.9)	2 (3.2)
	Primary health care ward	30 (32)	21 (38)	9 (38)	28 (36)	25 (40)
	Other hospital	30 (32)	6 (11)	5 (21)	11 (14)	9 (15)
	Residential care	2 (2.2)	0 (0.0)	0 (0.0)	1 (1.3)	5 (8.1)
	Palliative care ward	0 (0.0)	6 (11)	2 (8.3)	2 (2.6)	4 (6.5)
	Other department in study hospital	0 (0.0)	2 (3.6)	2(8.3)	2 (2.6)	3 (4.8)
Survival, days, median, (min-max)		46 (1-971)	33 (2-507)	49 (2-440)	76 (2-804)	15 (1-370)
Mortality, n (%)						
	14 days	20 (22)	20 (37)	5 (21)	14 (18)	29 (48)
	30 days	38 (41)	26 (48)	10 (42)	26 (34)	40 (67)
	90 days	59 (63)	41 (76)	17 (71)	41 (54)	50 (83)
	1 year	81 (87)	50 (93)	22 (92)	69 (91)	59 (98)

[1] Patients undergoing surgery without palliative care consultation before implementation of palliative care consultation teams

[2] Patients undergoing surgery without palliative care consultation after implementation of palliative care consultation teams (e.g. outside office hours)

[3] ICU, Intensive care unit

[4] CD, Clavien-Dindo classification of surgical complications

[5] LOS, length of hospital stay

Contributorship statement

Matti Laitamäki: planning the research, data collection, data analysis, drafting and writing the article and approval of the final version of article.

Reetta Piili: planning the research, critical revision, and final approval of the article.

Johanna Laukkarinen: planning the research, critical revision, and final approval of the article.

Mika Ukkonen: planning the research, data analysis, drafting the article, and final approval of the article.

All authors of the article take full responsibility for the completed article and the publication decision.

References

1. Smith BR, Stabile BE. Gastric adenocarcinoma: reduction of perioperative mortality by avoidance of nontherapeutic laparotomy. J. Gastrointest. Surg. 2007;11:127-132

2. Gonzalez R, Smith CD, Ritter EM, Mason E, Duncan T, Ramshaw BJ. Laparoscopic palliative surgery for complicated colorectal cancer. Surg. Endosc. 2005;19:43-46

3. Miner TJ, Cohen J, Charpentier K, McPhillips J, Marvell L, Cioffi WG. The palliative triangle: improved patient selection and outcomes associated with palliative operations. Arch. Surg. 2011;146:517-522

4. Laitamaki M, Alamyllari I, Kalliomaki M, Laukkarinen J, Ukkonen M, Junttila E. Scoring Systems May be Effective in Predicting Mortality Associated with Palliative Emergency Gastrointestinal Surgery: A Retrospective Observational Study. World J. Surg. 2021;45:2694-2702

5. Kelley AS, Morrison RS. Palliative care for the seriously ill. N Engl J Med. 2015;373(8):747-755. doi:10.1056/NEJMra1404684

6. Bakitas MA, Tosteson TD, Li Z, et al. Early versus delayed initiation of concurrent palliative oncology care: patient outcomes in the ENABLE III randomized controlled trial. J Clin Oncol. 2015;33(13):1438-1445. doi:10.1200/JCO.2014.58.6362

7. World Health organization. WHO definition of palliative care, Geneva. 2002.. Updated 2002. Accessed 11.6., 2022.

8. Yefimova M, Aslakson RA, Yang L, Garcia A, Boothroyd D, Gale RC, Giannitrapani K, Morris AM, Johanning JM, Shreve S, Wachterman MW, Lorenz KA. Palliative Care and End-of-Life Outcomes Following High-risk Surgery JAMA Surg 2020 Feb 1;155(2):138-146. doi: 10.1001/jamasurg.2019.5083.

9. Clavien PA, Barkun J, de Oliveira ML, et al. The Clavien-Dindo classification of surgical complications: five-year experience. Ann. Surg. 2009;250:187-196

10. Verwijmeren L, Peelen LM, van Klei WA, Daeter EJ, van Dongen EPA, Noordzij PG. Anaesthesia geriatric evaluation to guide patient selection for preoperative multidisciplinary team care in cardiac surgery. Br J Anaesth. 2020 Feb 14;S0007-0912(20)30014-3. doi: 10.1016/j.bja.2019.12.042. Online ahead of print.

11. Kasivisvanathan R, Jhanji S, McLeod A, Baikady R, Wigmore T, Gruber P. High risk multi-disciplinary process for major cancer surgery. Br J Anaesth. 2015.

PUBLICATION

III

Endoscopic duodenal stenting is efficient, but has higher rate of reoperations than gastrojejunostomy in palliative treatment for gastric outlet obstruction.

Laitamäki M, Tyrväinen T, Lehto JT, Laukkarinen J, Ukkonen M.

Langenbecks Arch Surg. 2022 Sep 407(6):2509-2515

Langenbeck's Archives of Surgery (2022) 407:2509–2515
https://doi.org/10.1007/s00423-022-02565-x

ORIGINAL ARTICLE

Endoscopic duodenal stenting is efficient, but has higher rate of reoperations than gastrojejunostomy in palliative treatment for gastric outlet obstruction

Matti Laitamäki[1,2] · Tuula Tyrväinen[1,2] · Juho T. Lehto[2,3] · Johanna Laukkarinen[1,2] · Mika Ukkonen[1,2]

Received: 8 February 2022 / Accepted: 17 May 2022 / Published online: 1 June 2022

Abstract

Background Surgical gastrojejunostomy has traditionally been the palliative treatment of choice for patients with advanced malignancies and gastric outlet obstruction syndrome. Recently, palliative endoscopic duodenal stenting has increased in popularity. We report outcomes after gastrojejunostomy and duodenal stenting when used for palliative indications.

Methods Consecutive patients undergoing palliative gastrojejunostomy or palliative endoscopic duodenal stenting in a Finnish tertiary referral center between January 2015 and December 2020 were included. The postoperative outcomes of these two palliative interventions were compared. The main outcome measures were mortality and morbidity, rate of reoperations, postoperative oral intake ability, and length of hospital stay.

Results A total of 88 patients, 46 (52%) patients underwent palliative gastrojejunostomy and 42 (48%) duodenal stenting. All patients had malignant disease, most typically hepatopancreatic cancer. Nineteen (44%) patients in duodenal stenting group and 4 (8.7%) patients in gastrojejunostomy group required subsequent interventions due to persisting or progressing symptoms ($p < 0.001$). Median delay until first oral intake was 2 days (1–24) after gastrojejunostomy and 0 days (0–3) after stenting ($p < 0.001$). Postoperative morbidity was 30% after gastrojejunostomy and 45% after stenting ($p < 0.001$). Median length of hospital stay was 7 days (1–27) after surgery and 5 days (0–20) after endoscopy ($p < 0.001$).

Conclusions Patients undergoing endoscopic duodenal stenting are more able to initiate rapid oral intake and have shorter hospital stay. On the other hand, there are significantly more reoperations in stenting group. If the patient's life expectancy is short, we recommend stenting, but for patients whose life expectancy is longer, gastrojejunostomy could be a better procedure, for the reasons mentioned above.

Keywords Palliative care · Palliative surgery · Gastric outlet obstruction · Duodenal stenting · Gastrojejunostomy

Introduction

Gastric outlet obstruction (GOO) is a constrictive process of the duodenum often associated with advanced gastrointestinal malignancies. [1, 2] Open surgical gastrojejunostomy (GJ) has traditionally been the treatment of choice for patients with advanced malignancies. Although considered a relatively simple procedure, it is associated with significant morbidity and mortality. Less invasive techniques, such as laparoscopic GJ and endoscopic duodenal stenting with self-expanding metal stents (SEMS), have recently increased in popularity. [1–3] While earlier studies have reported lower morbidity associated with endoscopy, long-term functional outcomes are reportedly better after surgery [4, 5]. As patients with advanced and incurable cancer are often particularly frail, the advantages of endoscopy have included that endoscopic procedures can be performed in sedation, in contrast to GJ, which requires general anesthesia. [6]

While some earlier studies have been presented, there is only scant data comparing outcomes of different treatment modalities. Consequently, the aim of this study was

✉ Matti Laitamäki
matti.laitamaki@fimnet.fi

[1] Department of Gastroenterology and Alimentary Tract Surgery, Tampere University Hospital, Kuntokatu 2, 33520 ElämänaukioTampere, Finland

[2] Faculty of Medicine and Health Technology, Tampere University, Tampere, Finland

[3] Palliative Care Centre and Department of Oncology, Tampere University Hospital, Tampere, Finland

to compare the short- and long-term outcomes of GJ and stenting in the palliative care of GOO. [1, 4, 7, 8].

Materials and methods

The study is based on retrospective data. Each consecutive patient who underwent palliative GJ or SEMS for malignant GOO in Tampere University Hospital, Finland from January 1, 2015 to December 31, 2020 was included in study**.** A total of 74 endoscopic duodenal stentings were performed during follow-up, of which 32 were excluded because operation sought curative and in 42 were palliative procedures. At the same time, 70 gastrojejunostomies were performed at Tampere University Hospital, of which 46 were palliative procedures as shown in Fig. 1. Patients' medical records were reviewed. Only those undergoing the procedure for a palliative indication were included. Patients receiving neoadjuvant therapies after stenting or patients with GOO due to benign causes, such as pancreatitis, were excluded. The type of procedure was selected based on the judgment of an experienced clinician.

Patients were identified by retrieving all cases associated with the Nordic Medico-Statistical Committee classification of surgical procedures (version 1.13) codes. The study population included all patients requiring surgical or endoscopic treatment for malignant GOO in a catchment area of over 500,000 inhabitants as well as some referred patients, when the hospital catchment area exceed one million inhabitants.

Patient data was collected from the Tampere University Hospital surgical database and the medical records. Patient characteristics were recorded, and included age, sex, comorbidities, type of malignancy, preoperative functional ability, preoperative Gastric Outlet Obstruction Scoring System (GOOSS), and indication for the procedure. Main outcomes were postoperative morbidity (according to Clavien-Dindo classification of surgical complications) [9], reoperations, postoperative GOOSS, postoperative oral intake ability, postoperative length of hospital stay, follow-up treatment location, and mortality. GOOSS is one of the most frequently used scoring systems for patients with GOO. GOOSS was originally developed by Adler in 2002. Its ranges 0–3 (0: no oral intake at all, 1: liquids oral intake, 2: soft foods oral intake, 3: normal food oral intake). [10]

Patients underwent either surgery or endoscopic procedures. Both laparoscopic and open surgical techniques were used. GJ was performed by using side-to-side loop anastomosis technique. For endoscopic procedures, the study hospital offered two different self-expanding stent options for duodenal stenting, namely uncovered metal stents (Olympus Hanarostent®) and duodenal stents (Boston scientific Wallflex®). Several size options were available for both stents, which were selected according to the clinician's assessment.

Statistical analyses were performed using SPSS Statistics version 22 for Windows (IBM Corp, Armonk, NY, USA). Summary measurements were expressed as means with standard deviations or as medians with minimum and maximum values unless otherwise stated. Continuous variables were analyzed using Student's *t*-test or Mann–Whitney *U*-test, the latter for non-normally distributed data. Chi-square or Fisher's exact test was used for categorical variables. Two-tailed *P* values were reported and a *P* value < 0.05 was deemed statistically significant.

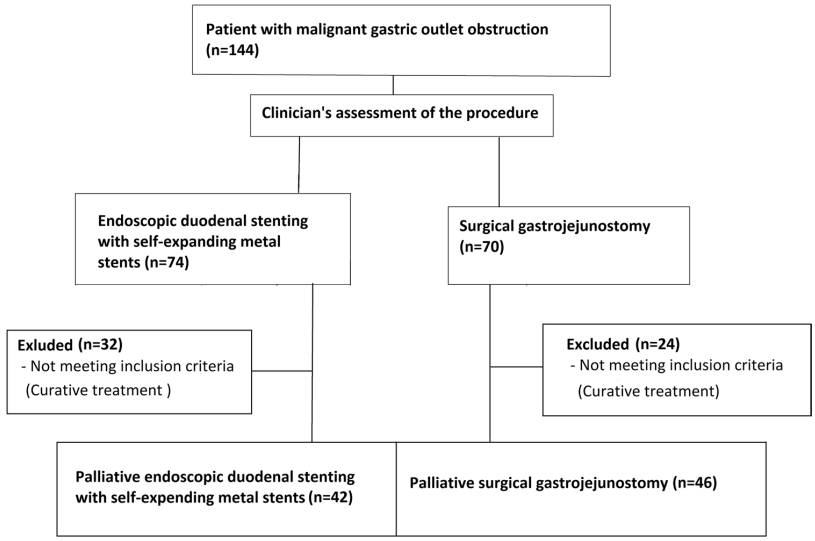


Fig. 1 Flowchart of the study

The study was conducted according to the requirements of the Helsinki declaration. In compliance with the principles of the local ethics committee, exemption from consent was obtained as the data had already been collected for clinical purposes.

Results

Forty-six patients (24 females, median age 66 years [47–92]) underwent GJ and 42 patients (16 females, median age 72 years [37–95]) SEMS placement. Median follow-up time was 76 days (3–972). Demographic characteristics were practically similar. Most of patients were diagnosed with hepatobiliary ($n=10$ in the GJ group and $n=2$ in the SEMS group) or pancreatic cancer ($n=16$ in the GJ group and $n=25$ in SEMS group) (59% in the GJ group and 62% in the SEMS group). Other malignities were in the SEMS group and in the GJ group: gastric ($n=7$ and $n=4$), duodenal ($n=3$ and $n=6$), colorectal ($n=1$ and $n=3$), other ($n=5$ and $n=6$). The share of patients with locally advanced cancer was 46% in the GJ group and 21% in the SEMS group ($p=0.006$) and 52% of GJ group patients and 60% SEMS group patients had distant metastases or peritoneal carcinosis ($p=0.006$). Twenty-four percent of the GJ group and 33% of the SEMS group had peritoneal carcinosis ($p=0.328$). Table 1 shows the main characteristics of the study population.

Seventy-one percent of SEMS patients received uncovered metal stents and 29% fully covered metal stents. Thirteen of GJ group had undergone stenting attempt, the most typical reason for failure was complete stenosis, i.e., stenting was not technically feasible. The mean interval from the first stenting to the second procedure was 9 days (0–313). A typical reason for the renewed stenting was gastric outlet obstruction. Two patients suffered from stenting associated perforation and required emergency laparotomy and gastrojejunostomy immediately after the operation.

Only one patient required postoperative ICU care. Nineteen patients (45%) in the SEMS group and four (8.7%) in GJ underwent reoperation. In the SEMS group, the most typical reoperation was re-stenting (21%) or gastrojejunostomy (21%). Most typical reason for reoperation was stent obstruction as the disease progressed or problems with gastric emptying even stent was open. Morbidity was 30% in the GJ group and 45% in the SEMS group ($p<0.001$). In-hospital mortality was 6.5% in the GJ group and 2.4 in SEMS group ($p=0.113$). Short-term hospital readmissions (in 3 months after procedure) were 7 (15%) in GJ group and 17 (41%) in SEMS group ($p=0.003$). There was no significant difference in postoperative GOOSS in the study population ($p=0.899$). Among GJ patients, the median delay to feeding initiation with liquids was 2 days (1–24) and less than 1 day (0–3) in the SEMS group. Patients in the GJ group received normal food after 6.5 days (1–10) and after 2 days (0–5) in SEMS group. Table 2 show postoperative outcomes.

Times to postoperative oral intake of the patient groups by Kaplan–Meier graphs are presented in Fig. 2. In the SEMS group, oral intake of fluids ($p<0.001$), soft foods ($p<0.001$), and normal food ($p=0.737$) was faster than in the GJ group.

Kaplan–Meier curves illustrating lengths of hospital stay are shown in Fig. 3 and mortality in Fig. 4. Median length of stay in the GJ group was 7 days (1–27) and in the SEMS group 5 days (0–20), $p=0.002$. The overall mortality rate during follow-up was 94% in the GJ group and 100% in the SEMS group ($p=0.092$). Median survival in the GJ group was 108 days (3–972) and 50 days (9–597) in the SEMS group ($p=0.016$).

Discussion

This study compared the two most commonly used methods for palliative relief of malignant GOO. Patients receiving SEMS were able to initiate oral intake more rapidly and had shorter hospital stay than those receiving with GJ but had higher rates of reoperations and mortality.

The goals of palliative care differ from those of curative care. Palliative care aims to prevent and alleviate physical, emotional, and mental suffering among patients dealing with advanced and incurable illness. [11–13] Such patients have limited expected life span, and it is easy to understand that rapid recovery, including initiation of oral intake and short hospital stay, are of the utmost importance. Our results were consistent with earlier findings; patients in the SEMS group recovered more rapidly and were able to initiate oral intake faster than those undergoing surgery. Stent insertion is a less invasive procedure, which may explain the faster alleviation of symptoms. [4, 6–8, 14] While symptoms were relieved in the majority of patients, a significant portion of our patients required further care at other health care facilities or in residential care. Only a few patients were able to return to their own homes. There was no significant difference between the GJ and SEMS groups in terms of follow-up care. Other important goals of palliative care include low morbidity. Patients are often in poor clinical condition due to multiple days of reduced food intake and weight loss. SEMS group had higher rate of reoperations. Complications were more common after SEMS, but almost every complication that lead to reoperation was related to slowed gastric emptying. Two patients underwent emergency surgery due to stent-associated perforation immediately after stenting and both were treated surgically with gastrojejunostomy. This is comparable to major early complications reported

Table 1 Demographic data of the study population

Variable	Gastrojejunostomy	Duodenal stenting	
Population *n* (%)	46 (52)	42 (48)	
Age, median (min–max)	66 (47–92)	72 (37–95)	0.085
Female, *n* (%)	24 (52)	16 (38)	0.185
BMI, median (min–max)	24 (17–57)	26 (18–44)	0.072
Smoking, *n* (%)	17 (37)	10 (24)	0.182
Comorbidities, *n* (%)	41 (89)	38 (91)	
Diabetes	17 (37)	14 (33)	0.144
Hypertension	31 (67)	25 (60)	0.443
Heart failure	1 (2.2)	4 (9.5)	0.137
COPD	4 (8.7)	3 (7.1)	0.788
Coronary artery disease	8 (17)	4 (9.5)	0.283
Hypothyroidism	4 (8.7)	5 (12)	0.620
Atrial fibrillation	3 (6.5)	11 (26)	0.012
Malignancy, *n* (%)			0.759
Hepatopancreatic	27 (59)	26 (62)	
Other	19 (41)	16 (38)	
Preoperative functional ability, *n* (%)			0.342
Independent in daily activities	31 (67)	23 (55)	
Partially dependent in daily activities	13 (28)	18 (43)	
Totally dependent in daily activities	2 (4.3)	1 (2.4)	
Advanced cancers, *n* (%)	45 (98)	34 (81)	0.006
Locally advanced	21 (46)	9 (21)	
Metastatic cancers	24 (52)	25 (60)	
Peritoneal carcinosis, *n* (%)	11 (24)	14 (33)	0.328
Ascites, *n* (%)	6 (13)	15 (36)	0.013
Preoperative chemotherapy	9 (20)	13 (31)	0.218
Steroid drugs preoperatively, *n* (%)	5 (11)	13 (31)	0.020
ASA physiological status, *n* (%)			
1–2	4 (8.7)	-	
3–5	42 (91)	-	
Preoperative vomiting, *n* (%)	36 (78)	33 (79)	0.972
Nasogastric tube preoperatively, *n* (%)	29 (63)	20 (49)	0.181
Laparoscopic operation, *n* (%)	6 (13)	-	
Preoperative GOOSS, *n* (%)			0.031
0	27 (59)	22 (52)	
1	7 (15)	12 (29)	
2	5 (12)	1 (2.2)	
3	3 (7.1)	11 (24)	
Stent model, *n* (%)			0.534
Uncovered metal stent	-	29 (71)	
Fully covered metal stent	-	12 (29)	

COPD, chronic obstructive pulmonary disease; *ASA physiological status*, American Society of Anesthesiologists classification; *Preoperative GOOSS*, preoperative Gastric Outlet Obstruction Scoring System

in earlier publications. However, in our study population, there was no bleeding after stenting, which is another typical early major complication. [5, 6, 15] There were no long-term complications associated with stenting, i.e., there were no cases with stent migration or late perforation. While mortality was significant in both patient populations, there were no procedure-associated deaths. Short-term readmissions (max 3 months) were more common among patients with SEMS.

The data were collected in a single high-volume tertiary care center with experienced endoscopists and surgeons performing all procedures. The most significant

Table 2 Postoperative outcomes

Variable	Gastrojejunostomy		Duodenal stenting	
Admission to ICU	0		1 (2.4)	0.293
Morbidity, *n* (%)	14 (30)		19 (45)	< 0.001
Minor (CD I–II)	8 (17)		0	
Major (CD III–IV)	6 (13)		19 (45)	
Reoperation (%)	4 (8.7)		19 (44)	< 0.001
Duodenal stenting	0		9 (21)	
Gastrojejunostomy	0		9 (21)	
Other	4 (8.7)		1 (2.4)	
In-hospital mortality, *n* (%)	3 (6.5)		1 (2.4)	0.352
Length of hospital stay, days (min–max)	7 (1–27)		5 (0–20)	< 0.001
Functional ability, *n* (%)				0.357
Independent in daily activities	12 (28)		9 (22)	
Partially dependent in daily activities	24 (56)		20 (49)	
Totally dependent in daily activities	7 (16)		12 (29)	
Short-term hospital readmission, *n* (%)	7(15)		17 (41)	0.003
Location for follow-up treatment, *n* (%)				0.959
Home, independently	9 (21)		8 (20)	
Home, with home care	5 (12)		4 (9.8)	
Residential care	0		1 (2.4)	
Community Hospital	9 (21)		12 (29)	
Secondary or tertiary care hospital	18 (42)		4 (32)	
Palliative care ward	2 (4.7)		3 (7.3)	
Postoperative survival, days, (median, min–max)	108 (3–972)		50 (9–597)	0.016
Mortality rates, *n* (%)	43 (94)		42 (100)	0.092
14 days	4 (9.5)		7 (17)	0.332
30 days	10 (24)		14 (33)	0.334
90 days	19 (45)		32 (76)	0.004
1 year	34 (81)		41 (98)	0.014
Postoperative GOOSS, *n* (%)				0.899
0	4 (9.3)		6 (15)	
1	9 (21)		8 (20)	
2	24 (56)		22 (54)	
3	6 (14)		5 (12)	
Days to oral intake median, (min–max)				
Liquids	2 (1–24) $n=40$	0 (0–3) $n=33$		< 0.001
Soft foods	4 (1–26) $n=29$	2 (1–6) $n=25$		< 0.001
Normal food	6.5 (1–10) $n=6$	2 (0–5) $n=6$		0.074
Days with nasogastric tube, median (min–max)	2 (0–10) $n=40$		1 (0–6) $n=7$	0.068
Postoperative vomiting, *n* (%)	12 (28)		13 (35)	0.487

CD, Clavien-Dindo classification; *GOOSS*, Gastric Outlet Obstruction Scoring System

strength of the present study was the inclusion of all patients undergoing palliative surgery within the second largest hospital district in Finland. The data was comprehensive and included follow-up data on all patients. In our hospital, stents were placed in with the patient under sedation. Patients did not receive general anesthesia unless it was absolutely necessary (e.g., due to fear related to endoscopy or co-operation difficulties). Therefore, we consider patients with more advanced disease and significant co-existing conditions might have undergone stenting instead of possible surgery. This may explain the poorer long-term outcome among SEMS patients, but as noted there were no procedure-related deaths. The relatively short survival among patients with advanced and incurable cancer is not exceptionally dismal. The biggest weakness in this study is the retrospective data, where

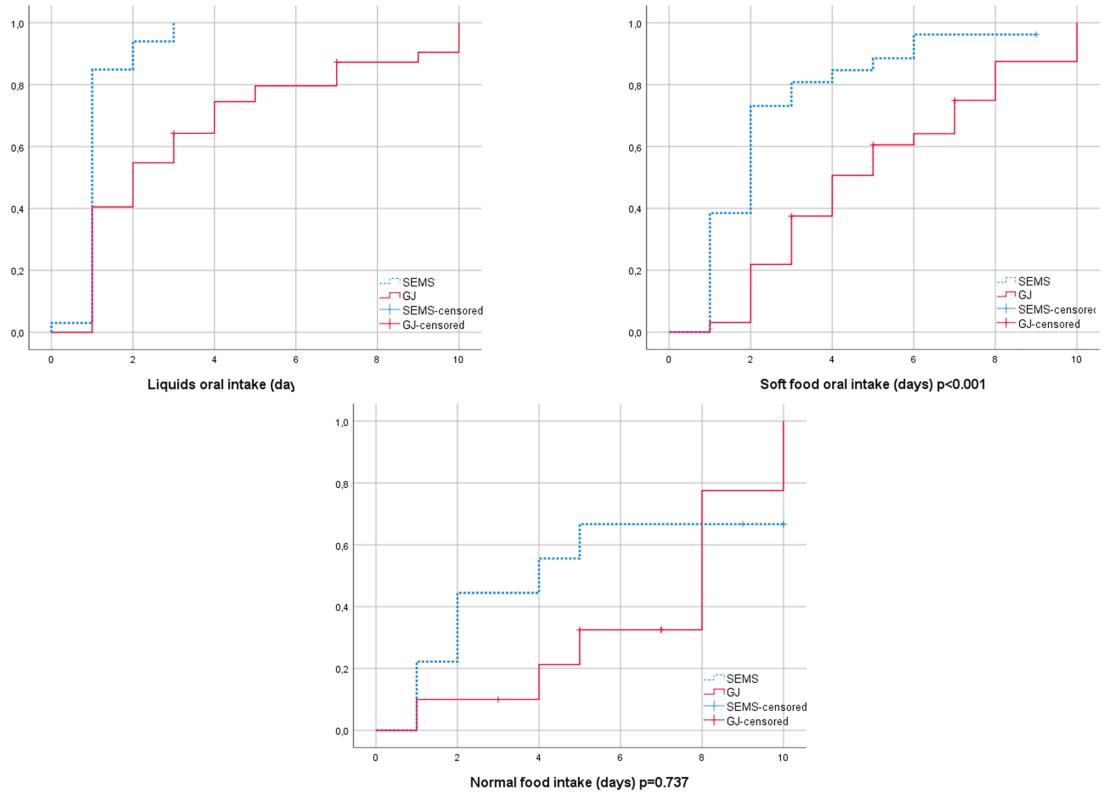


Fig. 2 Oral intake

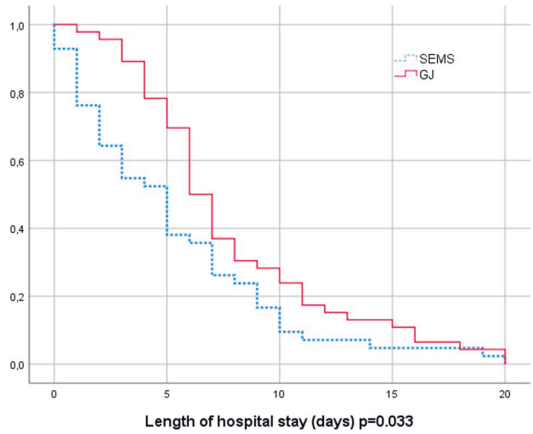


Fig. 3 Length of hospital stay

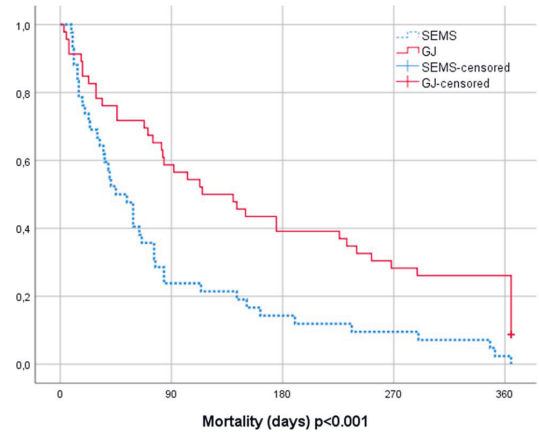


Fig. 4 Mortality

the clinician's view of patients is likely to cause selection bias.

Conclusion

The results of our study are similar to those of earlier studies. [1, 7] Patients undergoing endoscopic duodenal stenting are more able to initiate rapid oral intake and have shorter hospital stay. On the other hand, there are significantly more reoperations in stenting group. If the patient's life expectancy is short, we recommend stenting, but for patients whose life expectancy is longer, gastrojejunostomy could be a better procedure, for the reasons mentioned above. However, further qualitative research on the subject is needed, especially as new and interesting treatment options such as endoscopic ultrasound–guided gastrojejunostomy have been introduced for clinical use. Our study group have plans to conduct an RTC study on this challenging palliative topic in the future.

Declarations

Conflict of interest The authors declare no competing interests.

References

1. Upchurch E, Ragusa M, Cirocchi R (2018) Stent placement versus surgical palliation for adults with malignant gastric outlet obstruction. Cochrane Database Syst Rev 5:CD012506. https://doi.org/10.1002/14651858.CD012506.pub2
2. Potz BA, Miner TJ (2016) Surgical palliation of gastric outlet obstruction in advanced malignancy. World J Gastrointest Surg 8(8):545–555. http://lib.cqvip.com/qk/71421X/201608/7000175528.html. https://doi.org/10.4240/wjgs.v8.i8.545. Accessed 21 Dec 2021
3. Troncone et al (2020) Malignant gastric outlet obstruction: which is the best therapeutic option? World J Gastroenterol 26(16):1847–1860. https://doi.org/10.3748/wjg.v26.i16.1847
4. Troncone E, Fugazza A, Cappello A et al (2020) Malignant gastric outlet obstruction: which is the best therapeutic option? World journal of gastroenterology:WJG 26(16):1847–1860. https://www.ncbi.nlm.nih.gov/pubmed/32390697. https://doi.org/10.3748/wjg.v26.i16.1847. Accessed 21 Dec 2021
5. Ratone J, Caillol F, Zemmour C et al (2020) Outcomes of duodenal stenting: experience in a French tertiary center with 220 cases. Dig Liver Dis 52(1):51–56. https://doi.org/10.1016/j.dld.2019.06.025
6. Uemura S, Iwashita T, Iwata K et al (2018) Endoscopic duodenal stent versus surgical gastrojejunostomy for gastric outlet obstruction in patients with advanced pancreatic cancer. Pancreatol: Off J Int Assoc Pancreatol (IAP) 18(5):601–607. https://doi.org/10.1016/j.pan.2018.04.015
7. Jang S, Lee H, Min B et al (2017) Palliative gastrojejunostomy versus endoscopic stent placement for gastric outlet obstruction in patients with unresectable gastric cancer: a propensity score-matched analysis. Surg Endosc 31(10):4217–4223. https://www.ncbi.nlm.nih.gov/pubmed/28281127. https://doi.org/10.1007/s00464-017-5480-6. Accessed 19 Dec 2021
8. Fiori E, MD, Lamazza A, MD, DeMasi E, MD, DeCesare A, Schillaci A, MD, Sterpetti AV, MD (2013) Endoscopic stenting for gastric outlet obstruction in patients with unresectable antro pyloric cancer. Systematic review of the literature and final results of a prospective study. The point of view of a surgical group. Am J Surg 206(2):210–217. https://www.clinicalkey.es/playcontent/1-s2.0-S0002961013001943. https://doi.org/10.1016/j.amjsurg.2012.08.018. Accessed 21 Dec 2021
9. Clavien PA, Barkun J, de Oliveira ML et al (2009) The Clavien-Dindo classification of surgical complications: five-year experience. Ann Surg 250(2):187–196. https://doi.org/10.1097/SLA.0b013e3181b13ca2
10. Adler DG, Baron TH (2002) Endoscopic palliation of malignant gastric outlet obstruction using self-expanding metal stents: experience in 36 patients. Am J Gastroenterol 97(1):72–78. https://doi.org/10.1111/j.1572-0241.2002.05423.x
11. World health organization (2020) World health organization. who.int Web site. https://www.who.int/news-room/fact-sheets/detail/palliative-care. Accessed 16 June 2021
12. Mosenthal AC, Dunn GP (2019) Surgical palliative care. Oxford University Press, New York, NY
13. Dunn GP (2015) Surgery, palliative care, and the American College of Surgeons. Ann Palliat Med 4(1):5–9. https://doi.org/10.3978/j.issn.2224-5820.2015.01.03
14. Jeurnink SM, Steyerberg EW, van Hooft JE et al (2010) Surgical gastrojejunostomy or endoscopic stent placement for the palliation of malignant gastric outlet obstruction (SUSTENT study): a multicenter randomized trial. Gastrointestinal endoscopy. 71(3):490–499. https://www.clinicalkey.es/playcontent/1-s2.0-S0016510709025590. https://doi.org/10.1016/j.gie.2009.09.042. Accessed 19 Dec 2021
15. Keränen I, Kylänpää L, Udd M et al (2013) Gastric outlet obstruction in gastric cancer: a comparison of three palliative methods. J Surg Oncol 108(8):537–541. https://onlinelibrary.wiley.com/doi/abs/https://doi.org/10.1002/jso.23442

PUBLICATION

IV

Radiologically measured low psoas muscle area does not predict higher mortality in palliative patients undergoing gastrointestinal tract surgery.

Laitamäki M, Ukkonen M, Laukkarinen J.

Submitted 9.2.2025