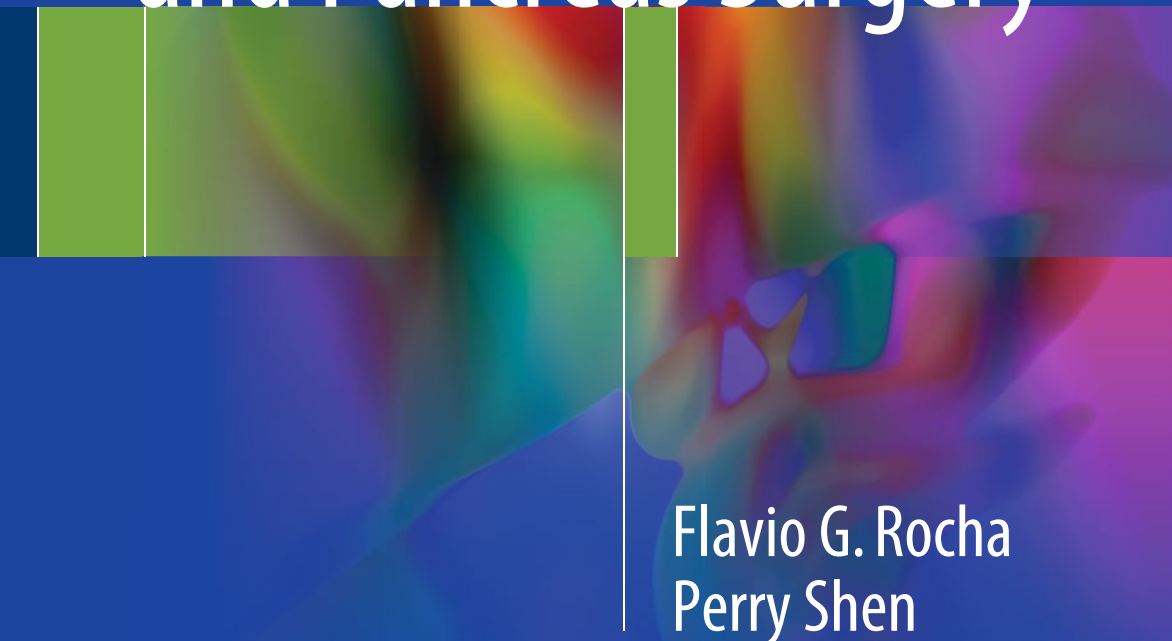
Optimizing Outcomes for Liver and Pancreas Surgery



Flavio G. Rocha
Perry Shen
Editors

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Editors
Flavio G. Rocha
Virginia Mason Medical Center
Seattle, WA, USA

Perry Shen
Wake Forest Baptist Health
Winston-Salem, NC, USA

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Preface

Hepatopancreatobiliary (HPB) surgery has developed as a discrete specialty within general surgery, surgical oncology, and transplantation. This is mainly due to the complexity of the diagnosis, work-up, and treatment of benign and malignant HPB disease. HPB surgeons now must master both the multidisciplinary management and the technical aspects of liver and pancreas surgery. While there are several excellent surgical textbooks and atlases in the market, a book describing a practical approach to the preoperative, intraoperative, and postoperative care of HPB patients was needed. Given the recent implementation of enhanced recovery pathways and value-added healthcare, we felt a real-world perspective on the critical aspects of HPB surgery would be of benefit to the practicing surgeon. Therefore, we assembled a panel of expert surgeons in their respective realms of liver and pancreas surgery to outline their approach to commonly encountered situations within their field. It is our sincere hope that this book will serve as a guide to residents, fellows, and even experienced HPB surgeons to improve their patient outcomes.

Seattle, WA, USA — Flavio G. Rocha
Winston-Salem, NC, USA — Perry Shen

Contents

Contributors

Peter J. Allen, MD Department of Surgery, Memorial Sloan Kettering Cancer Center, New York, NY, USA

Thomas A. Aloia, MD Department of Surgical Oncology, The University of Texas MD Anderson Cancer Center, Houston, TX, USA

Fabio Bagante, MD Department of Surgery, The Ohio State University Comprehensive Cancer Center, Columbus, OH, USA

Department of Surgery, University of Verona, Verona, Italy

William C. Chapman, MD, FACS Division of Transplant Surgery, Department of Surgery, Washington University in St. Louis, St. Louis, MO, USA

Clancy J. Clark, MD Wake Forest Baptist Health, Winston-Salem, NC, USA

Jordan M. Cloyd, MD Department of Surgery, The Ohio State University Medical Center, Columbus, OH, USA

Camilo Correa-Gallego, MD Memorial Sloan Kettering Cancer Center, New York, NY, USA

Ryan W. Day, MD Department of Surgery, Mayo Clinic Hospital in Arizona, Phoenix, AZ, USA

Mary Fischer, MD Department of Anesthesiology and Critical Care, Memorial Sloan Kettering Cancer Center, New York, NY, USA

Kathryn Fowler, MD Mallinckrodt Institute of Radiology, Washington University in St. Louis, St. Louis, MO, USA

Jan Grendar, MD Liver and Pancreas Surgery, Portland Providence Cancer Institute, Portland, OR, USA

Paul D. Hansen, MD The Oregon Clinic, Providence Portland Cancer Center, Portland, OR, USA

Justin T. Huntington, MD, MS Department of Surgery, The Ohio State University Wexner Medical Center, Columbus, OH, USA

William R. Jarnagin, MD Memorial Sloan Kettering Cancer Center, New York, NY, USA

Daniel J. Kagedan Division of General Surgery, Department of Surgery, University of Toronto, Toronto, ON, Canada

Institute of Health Policy, Management, and Evaluation, University of Toronto, Toronto, ON, Canada

Matthew H.G. Katz, MD Department of Surgical Oncology, The University of Texas MD Anderson Cancer Center, Houston, TX, USA

Adeel S. Khan, MD, FACS Division of Transplant Surgery, Department of Surgery, Washington University in St. Louis, St Louis, MO, USA

Robert C.G. Martin II, MD PhD FACS Department of Surgery, Division of Surgical Oncology, University of Louisville, Louisville, KY, USA

Division of Surgical Oncology, Upper Gastrointestinal and Hepato-Pancreatico-Biliary Clinic, University of Louisville, Louisville, KY, USA

Grant McKenzie, BS Department of Surgery, Division of Surgical Oncology, University of Louisville, Louisville, KY, USA

Timothy M. Pawlik, MD, MPH, PhD Department of Surgery, The Ohio State University Comprehensive Cancer Center, Columbus, OH, USA

Priya M. Puri, BA Department of Surgery, University of Pennsylvania Perelman School of Medicine, Philadelphia, PA, USA

Carl R. Schmidt, MD, MS Department of Surgery, The Ohio State University Wexner Medical Center, Columbus, OH, USA

Gaya Spolverato, MD Department of Surgery, The Ohio State University Comprehensive Cancer Center, Columbus, OH, USA

Department of Surgery, University of Verona, Verona, Italy

Iswanto Sucandy, MD Digestive Health Institute, Florida Hospital Tampa, Tampa, FL, USA

Allan Tsung, MD Division of Hepatobiliary and Pancreatic Surgery, University of Pittsburgh Medical Center, Pittsburgh, PA, USA

Charles M. Vollmer Jr., MD Department of Surgery, University of Pennsylvania Perelman School of Medicine, Philadelphia, PA, USA

Alice C. Wei Department of Surgery, Princess Margaret Cancer Centre, University Health Network, Toronto, ON, Canada

Department of Surgery, Toronto General Hospital, University Health Network, Toronto, ON, Canada

Division of General Surgery, Department of Surgery, University of Toronto, Toronto, ON, Canada

Institute of Health Policy, Management, and Evaluation, University of Toronto, Toronto, ON, Canada

Fitness Assessment and Optimization for Hepatopancreatobiliary Surgery

1

Grant McKenzie and Robert C.G. Martin II

Background

In the United States, as the large baby boomer population cohort continues to age, the number of patients presenting with hepatopancreatobiliary (HPB) malignancies has and will continue to rise into the foreseeable future. The US Census Bureau projects that the number of adults aged 65 and older is expected to increase from 46 million in 2014, to 74 million by 2030 [1]. The median age for cancer diagnosis is 66 years, making advanced age an increased risk factor for development of HPB carcinomas [2]. In agreement, cancer incidences for both liver and pancreatic cancers are expected to increase from 2010 to 2030 by 59% (liver) and 55% (pancreas), respectively [3]. Thus, in the upcoming decades, substantial healthcare resources and attention will be devoted to treating HPB malignancies.

Surgical resection continues to remain the preferred curative treatment option for HPB neoplasms. However, older patients with HPB disease are often frail and have multiple comorbidities alongside their primary malignancy, thus making aggressive surgical resections high risk for these patients. For frail and elderly patients undergoing elective procedures, perioperative care must be afforded special attention in order to decrease incidences of severe morbidity and mortality. While postoperative care is a mainstay of focus for surgical patients, preoperative assessment is often afforded less attention within the field of HPB surgery. By the use of standardized

G. McKenzie, BS
Department of Surgery, Division of Surgical Oncology, University of Louisville, Louisville, KY, USA

R.C.G. Martin II, MD, PhD, FACS (✉)
Department of Surgery, Division of Surgical Oncology, University of Louisville, Louisville, KY, USA

Division of Surgical Oncology, Upper Gastrointestinal and Hepato-Pancreatico-Biliary Clinic, University of Louisville, Louisville, KY, USA
e-mail: Robert.Martin@louisville.edu

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patient assessments, clinicians are able to obtain a more accurate representation of a patient's true health status, thus making it possible to identify surgical patient populations with higher risks of postoperative morbidity, mortality, increased length of hospital stay, and increased risk of being discharged to skilled nursing facilities. The aim of this chapter is to highlight current approaches to the assessment of vulnerable HPB surgical patients and elucidate ways to preoperatively optimize and treat these patients to improve surgical outcomes within the field.

Patient Assessment

Comprehensive Geriatric Assessments

The use of a patient's biological age as an indicator of their health status is not accurate in predicting postoperative complications; thus, advanced age alone should not be considered contraindicative of major HPB surgeries [4–6]. However, elderly patients have been shown to have increased 30-day morbidity and mortality when undergoing pancreatic or hepatic resections [7, 8]. As a result, more detailed and accurate measurement tools are needed to assess elderly patient health status. This may be achieved by the utilization of a comprehensive geriatric assessment (CGA). A CGA is a multidimensional diagnostic tool used to assess the medical, functional, and psychosocial status of elderly patients at risk for functional declines [9]. Such assessments give clinicians a more detailed status of a patient's health and help identify vulnerable patients at risk for poor surgical outcomes. Overall elements should include, but are not limited to, assessment of a patient's physical health, mental health, nutritional status, functional status, socioeconomic status, and environmental factors. A table of commonly used tests within a CGA is shown in Table 1.1.

While a CGA is meant to be an all-encompassing view of elderly patient health, performing a complete CGA preoperatively for all elderly patients would be an immense drain on both healthcare human and monetary resources. Depending on a CGA's components, a complete assessment can range anywhere from 30–40 min all while being performed by an experienced assessor, such as a geriatrician, physician assistant, or trained nurse [36]. In recent decades, researchers have focused on developing screening tools to help identify at-risk patients who would benefit from undergoing a CGA while filtering patients who are deemed fit. As a result, clinicians and researchers across many disciplines have been looking at which CGA components are most indicative of patient fitness levels, with hopes of identifying specific tests or metrics that best identify vulnerable individuals who may require a complete CGA. This simplistic model can be utilized in practice in a manner that is both quick and efficient, while reducing cost and resource utilization that otherwise may be wasted on screening low-risk individuals.

Functional Assessment

The functional status of patients, defined by the American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) as behaviors

Table 1.1 Sample of common components of geriatric assessments

Assessment condition	Assessment test used
Functional status	ADL [10] IADL [11]
Performance status	ECOG [12] SPPB [13]
Mobility	6MWT [14] TUG [15]
Frailty assessment	BFI [16] GFI [17] VES-13 [18] Fried's criteria [19]
Mental status	MMSE [20] BOMC [21] CDT [22] Mini-Cog [23] MoCA [24]
Mood/depression	GDS [25]
Nutritional assessment	MNA [26] SNAQ [27] NRS-2002 [28] G8 [29]
Polypharmacy	*N* of daily oral medications [30]
Social support	MOS-SSS [31]
Risk assessment	ASA [32]
Comorbidities	CCI [33] CIRS-G [34] Satariano's index [35]

Abbreviations: *6MWT* 6-minute walk test, *ADL* activities of daily living, *ASA* American Society of Anesthesiologists, *BFI* brief fatigue inventory, *BOMC* Blessed Orientation-Memory-Concentration, *CCI* Charlson comorbidity index, *CDT* clock-drawing test, *CIRS-G* cumulative illness rating scale-geriatrics, *ECOG* Eastern Cooperative Oncology Group, *G8* geriatric 8, *GDS* Geriatric Depression Scale, *GFI* Groningen Frailty Index, *IADL* instrumental activities of daily living, *MMSE* mini mental state examination, *MNA* mini nutritional assessment, *MoCA* Montreal Cognitive Assessment, *MOS-SSS* Medical Outcomes Study social support survey, *NRS-2002* nutritional risk screening-2002, *SPPB* short physical performance battery tests, *SNAQ* short nutritional assessment questionnaire, *TUG* timed get-up-and-go, *VES-13* Vulnerable Elders Survey-13

needed to maintain daily activities during the 30 days prior to surgery, has long been assessed by simple screening tools such as activities of daily living (ADL) and instrumental activities of daily living (IADL) to gauge the degree of a patient's independence. In patients undergoing hepatic resections and pancreaticoduodenectomy, impaired functional status was highly predictive of postoperative complications and mortality [7, 8, 37]. The timed get-up-and-go (TUG) test is another simple clinical tool used to quantify functional mobility of patients. Abnormal TUG assessment times (≥20 s) have been correlated to increased postoperative morbidity in oncogeriatric surgical patients undergoing elective procedures [38]. The six-minute walk test (6MWT), which measures the distance a patient is able to walk in 6 min, is a metric of functional walking capacity. In patients undergoing colorectal resections, older age, poorer physical status, open surgery, and increased postoperative complications were associated with decreased 6MWT distances [39]. This finding

supports the use of the 6MWT as an indirect measure of postoperative recovery. Cardiopulmonary exercise testing (CPET) is also used to predict postoperative outcomes in patients. In a study of patients aged 65 and older undergoing pancreaticoduodenectomy deemed as high risk, abnormal CPET results were predictive of early postoperative death and poor long-term survival for patients [40].

A patient's functional status may be affected by many different interacting domains. One clinically relevant domain, frailty, can be defined as a clinical syndrome in which three or more of the following criteria are met for a given patient: unintentional weight loss of >10 lbs within the previous year, self-reported exhaustion, weakness measured by grip strength, slow walking speed, and low levels of physical activity [19]. It is hypothesized that the mechanism through which frailty manifests is by decreasing the physiological and functional reserves of patients, thereby affecting one's ability to overcome major insults to the body, such as surgery. Surgical patients who fall into the classification of frail have been shown to have increased postoperative complications, length of hospital stay, and discharge to skilled nursing facilities [41]. For patients undergoing elective abdominal surgical procedures, patients identified as frail have recently been shown to have increased 1-year mortality and poorer surgical outcomes [42]. Several clinical screening tools for assessing frailty scores clinically have been developed, such as the Groningen Frailty Index (GFI), Vulnerable Elders Survey-13 (VES-13), and Fried's frailty criteria assessment.

Many clinicians also rely on morphometric data for assessing patient frailty status. Sarcopenia, which clinically manifests as a loss of skeletal muscle mass, strength, and decreased physical performance, is also associated with poor clinical outcomes [43]. Sarcopenia can be preoperatively assessed morphometrically by CT-based measurements for patients undergoing surgery for HPB neoplasms by use of abdominal cross-sectional muscle area, and its presence has been associated with poorer surgical outcomes [44, 45]. The use of advanced imaging technologies allows clinicians to quickly identify sarcopenia in patients that otherwise would be difficult to assess morphometrically, such as in the case of sarcopenic obese patients. In the future, radiologic imaging may become a normal part of preoperative assessment and risk stratification for patients undergoing major elective procedures [46].

Nutritional Assessment

There are a variety of nutritional status metrics that are available for predicting risk of surgical complications. Some of the more commonly used parameters include weight loss, serum protein levels, immunocompetence, and anthropometric indicators [47]. Malnutrition in patients undergoing gastrointestinal surgery has been shown to be associated with increased morbidity, and nutritional assessment scores correlate with severity of postoperative complications and length of hospital stay [48]. Several nutritional status screening assessment tools exist for clinical use, including the mini nutritional assessment examination (MNA), short nutritional assessment questionnaire (SNAQ), nutritional risk screening-2002 (NRS-2002),

and geriatric 8 (G8) assessment. While no screening assessment has proven to be markedly superior above others, the NRS-2002 is favored for assessment in surgical patients and most validated in terms of predictive value [49]. In a direct comparison to the MNA assessment and serum proteins, the NRS-2002 assessment identified more elderly patients with or at risk of malnutrition [50]. The NRS-2002 screening system uses a combination of assessing patient nutrition along with quantifying the severity of disease to give a summed score of nutritional risk [28].

Mental Status

An important component of preoperative assessment for patients is mental status and cognitive assessments. One condition that cognitive assessments screen for is risk of postoperative delirium, which is an acute decline in cognitive functioning. Delirium in many cases is preventable, and its presence has been shown to be associated with many adverse surgical outcomes including increased mortality, morbidity, and discharge to rehabilitation facilities [51–53]. Leading risk factors for delirium development include dementia, cognitive impairment, functional impairment, visual impairment, history of alcohol abuse, and advanced age [54]. Patients at risk of delirium can be assessed using screening tools such as the mini mental state examination (MMSE), the Mini-Cog assessment, and the Montreal Cognitive Assessment (MoCA).

Major depression is also associated with adverse surgical outcomes. Results from the preoperative assessment of cancer in the elderly (PACE) study showed that patients with abnormal scores on the Geriatric Depression Scale (GDS) were associated with an increased risk of 30-day postoperative morbidity [55]. Identifying patients experiencing depressive symptoms may not only improve surgical outcomes but also treat an underlying disorder that often goes undiagnosed and untreated in many elderly patients.

Other Considerations

Aside from physical and cognitive assessments, there are many other domains to preoperative patient assessment that must be evaluated. With oncogeriatric patients, polypharmacy must be addressed. With advanced age and disease status comes decreased physiological capacity to metabolize and eliminate toxins; thus drug interactions can be exacerbated in patients with compromised hepatic and renal functions. It is important to evaluate and discontinue nonessential medications preoperatively to minimize the risk of any adverse drug interactions [56]. For patients undergoing intra-abdominal and HPB procedures, polypharmacy has been associated with increased length of hospital stay and risk of major postoperative complications [57, 58].

Social support is another variable that should be assessed preoperatively for patients. For geriatric patients, social support has been correlated to increased

mortality risk, independent of patient age [59]. Lack of social support has also been shown to correlate to increase 30-day postoperative morbidity for elderly patients undergoing major abdominal cancer surgery [58]. Thus, preoperative assessment for elderly and frail patients should encompass a multisystem and multidisciplinary approach to maximize outcomes for these high-risk patients.

HPB Patient Assessment in Current Literature

As of yet, there is no consensus screening tool that adequately identifies vulnerable oncogeriatric surgical patients in place of a CGA nor is there consensus within the field of HPB surgery as to which components of a CGA should be used for surgical risk assessment. Several studies have shown that in patients undergoing oncogeriatric surgical procedures, CGA components can predict patients at risk for increased postoperative morbidity, mortality, complications, length of hospital stay, and risk of discharge to a skilled nursing facility [36, 38, 41, 53, 57, 58, 60–71]. However, many of these studies include a heterogeneous patient population, with only a small subset undergoing HPB surgical procedures.

Badgwell et al. (2013) attempted to prospectively record CGA variables that identified factors associated with increased perioperative risk and resource utilization in 111 elderly patients undergoing major abdominal cancer surgery. Within the study population, of 30% of patients underwent HPB surgical procedures. Variables that were found to correlate with discharge to a skilled nursing facility included weight loss ≥10% within 6 months preoperatively, American Society of Anesthesiologist (ASA) risk assessment score of ≥2, and Eastern Cooperative Oncology Group (ECOG) performance score of ≥2. Variables associated with prolonged hospital stay were weight loss ≥10%, presence of polypharmacy, and distant metastatic disease [57].

Dale et al. (2014) used CGA components to identify patients in elevated clinical risk categories undergoing pancreaticoduodenectomy. In a study population of 76 patients, researchers found that patient self-reported exhaustion was associated with major postoperative complications, surgical intensive care unit admission, and increased length of hospital stay. Scores on short physical performance battery (SPPB) tests of <10 and patient age were correlated with a discharge to a skilled nursing facility, and older age was also correlated to lower likelihood of hospital readmission [60].

Huisman et al. (2014) attempted to determine the predictive value of the timed get-up-and-go (TUG) test versus the American Society of Anesthesiologists (ASA) classification for quantifying oncogeriatric surgical patient risk assessment. Of the 263 patients undergoing elective surgery for solid abdominal tumors, 28 (10.6%) of patients underwent HPB surgical procedures. For patients with high TUG times of >20s, the risk of patients to develop major postoperative complications (Clavien-Dindo grade 3 to 5) was 50%, as opposed to 13.6% of patients with normal TUG times. For patients with abnormal ASA scores of ≥3, 24.8% of patients experienced major postoperative complications. Thus, twice as many surgical patients at risk of postoperative complications were identified using the TUG than when using the ASA classification [38].