

DE LEESTAFEL

APRIL 2020

Een Maandelijks Selectie van Wetenschappelijke GE-nieuws

Coloproctologie

Poliklinische colorectaal resecties?

Identification of patients eligible for discharge within 48 h of colorectal resection. F Grass et al. BJS, April 2020 – Volume 107 – Issue 5, pages 546-551.

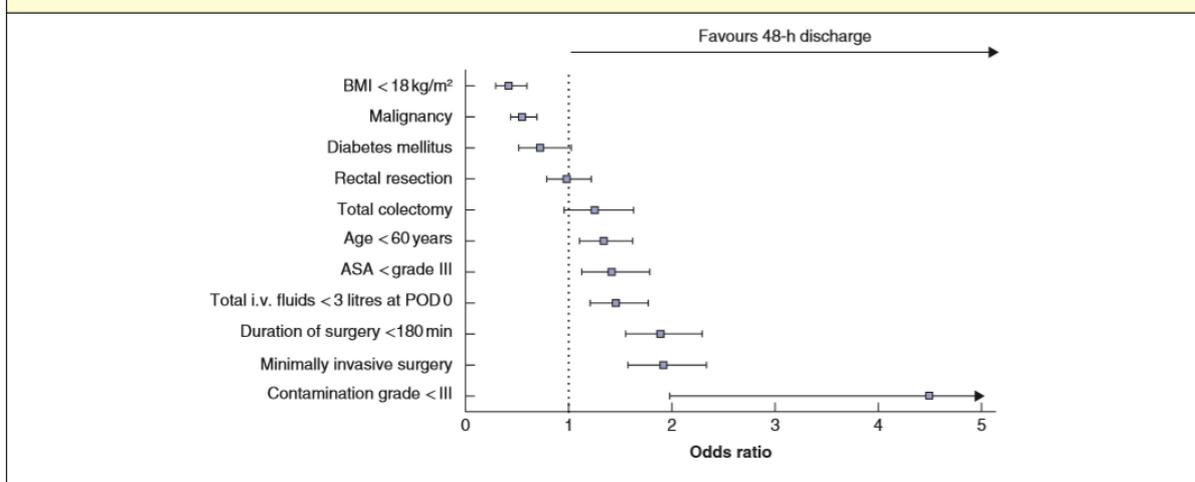
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BACKGROUND: This study aimed to identify patients eligible for a 48-h stay after colorectal resection, to provide guidance for early discharge planning.

METHODS: A bi-institutional retrospective cohort study was undertaken of consecutive patients undergoing major elective colorectal resection for benign or malignant pathology within a comprehensive enhanced recovery pathway between 2011 and 2017. Overall and severe (Clavien-Dindo grade IIIb or above) postoperative complication and readmission rates were compared between patients who were discharged within 48 h and those who had hospital stay of 48 h or more. Multinomial logistic regression analysis was performed to ascertain significant factors associated with a short hospital stay (less than 48 h).

RESULTS: In total, 686 of 5122 patients (13.4 per cent) were discharged within 48 h. Independent factors favouring a short hospital stay were age below 60 years (odds ratio (OR) 1.34; $P = 0.002$), ASA grade less than III (OR 1.42; $P = 0.003$), restrictive fluid management (less than 3000 ml on day of surgery: OR 1.46; $P < 0.001$), duration of surgery less than 180 min (OR 1.89; $P < 0.001$), minimally invasive approach (OR 1.92; $P < 0.001$) and wound contamination grade below III (OR 4.50; $P < 0.001$), whereas cancer diagnosis (OR 0.55; $P < 0.001$) and malnutrition (BMI below 18 kg/m²: OR 0.42; $P = 0.008$) decreased the likelihood of early discharge. Patients with a 48-h stay had fewer overall (10.8 per cent versus 30.6 per cent in those with a longer stay; $P < 0.001$) and fewer severe (2.6 versus 10.2 per cent respectively; $P < 0.001$) complications, and a lower readmission rate (9.0 versus 11.8 per cent; $P = 0.035$).

Fig. 2 Multivariable analysis of significant factors associated with discharge within 48 h of index surgery



Odds ratios are shown with 95 per cent confidence intervals. i.v., Intravenous; POD, postoperative day.

CONCLUSION: Early discharge of selected patients is safe and does not increase postoperative morbidity or readmission rates. In these patients, outpatient colorectal surgery should be feasible on a large scale with logistical optimization.

Prehabilitatie of postoperatieve rehabilitatie?

Effect of Multimodal Prehabilitation vs Postoperative Rehabilitation on 30-Day Postoperative Complications for Frail Patients Undergoing Resection of Colorectal Cancer: A Randomized Clinical Trial. F Carli et al. *JAMA Surg.* 2020;155(3):233-242.

Pubmed ID: 31968063.

Importance: Research supports use of prehabilitation to optimize physical status before and after colorectal cancer resection, but its effect on postoperative complications remains unclear. Frail patients are a target for prehabilitation interventions owing to increased risk for poor postoperative outcomes.

Objective: To assess the extent to which a prehabilitation program affects 30-day postoperative complications in frail patients undergoing colorectal cancer resection compared with postoperative rehabilitation.

Design, Setting, and Participants: This single-blind, parallel-arm, superiority randomized clinical trial recruited patients undergoing colorectal cancer resection from September 7, 2015, through June 19, 2019. Patients were followed up for 4 weeks before surgery and 4 weeks after surgery at 2 university-affiliated tertiary hospitals. A total of 418 patients 65 years or older were assessed for eligibility. Of these, 298 patients were excluded (not frail [n = 290], unable to exercise [n = 3], and planned neoadjuvant treatment [n = 5]), and 120 frail patients (Fried Frailty Index, ≥ 2) were randomized. Ten patients were excluded after randomization because they refused surgery (n = 3), died before surgery (n = 3), had no cancer (n = 1), had surgery without bowel resection (n = 1), or were switched to palliative care (n = 2). Hence, 110 patients were included in the intention-to-treat analysis (55 in the prehabilitation [Prehab] and 55 in the rehabilitation [Rehab] groups). Data were analyzed from July 25 through August 21, 2019.

Interventions: Multimodal program involving exercise, nutritional, and psychological interventions initiated before (Prehab group) or after (Rehab group) surgery. All patients were treated within a standardized enhanced recovery pathway.

Table 2. Postoperative Outcomes in the Prehab vs Rehab Groups

Outcome	Prehab Group		Rehab Group		Adjusted Estimate (95% CI) ^a	P Value
	No. of Patients	Data	No. of Patients	Data		
Comprehensive Complication Index ^b						
Mean (SD)	55	12.7 (21.5)	55	15.7 (25.3)	MD, -3.2 (-11.8 to 5.3)	.45
Median (IQR)	55	0 (0 to 12.2)	55	0 (0 to 29.6)		
Complications, No. (%) ^b						
Overall	55	25 (45.5)	55	25 (45.5)	OR, 0.9 (0.4 to 2.2)	.90
Severe	55	7 (12.7)	55	11 (20.0)	OR, 0.5 (0.1 to 1.6)	.23
Primary LOS, median (IQR), d	55	4 (3 to 8)	55	4 (3 to 8)	HR, 19.2 (-2.9 to 2.2)	.80
Total LOS, median (IQR), d ^b	55	4 (3 to 8)	55	5 (3 to 9)	MD, -5.8 (-17.3 to 5.8)	.32
Emergency department visit, No. (%) ^b	55	3 (5.5)	55	6 (10.9)	OR, 0.3 (0.1 to 1.9)	.21
Hospital readmission, No. (%) ^b	55	2 (3.6)	55	5 (9.1)	OR, 0.3 (0.03 to 1.9)	.18

Abbreviations: HR, hazard ratio; IQR, interquartile range; LOS, length of stay; MD, mean difference; OR, odds ratio; Prehab, prehabilitation; Rehab, rehabilitation.

^a Coefficients were derived with imputation of missing data and adjustment for confounders, including recruitment site (fixed-effect), age, sex, American Society of Anesthesiologists score, colon vs rectal surgery, minimally invasive

vs open surgery, baseline 6-minute walk test, body mass index, and Fried Frailty Index (2-3 vs 4-5). No data were missing for the variables described, so imputation was conducted only for adjustment variables. The multiple imputation model is described in eMethods 3 in Supplement 2.

^b Measured at 30 days.

Main Outcomes and Measures: The primary outcome included the Comprehensive Complications Index measured at 30 days after surgery. Secondary outcomes were 30-day overall and severe

complications, primary and total length of hospital stay, 30-day emergency department visits and hospital readmissions, recovery of walking capacity, and patient-reported outcome measures.

Results: Of 110 patients randomized, mean (SD) age was 78 (7) years; 52 (47.3%) were men and 58 (52.7%) were women; 31 (28.2%) had rectal cancer; and 87 (79.1%) underwent minimally invasive surgery. There was no between-group difference in the primary outcome measure, 30-day Comprehensive Complications Index (adjusted mean difference, -3.2; 95% CI, -11.8 to 5.3; $P = .45$). Secondary outcome measures were also not different between groups.

Conclusions and Relevance: In frail patients undergoing colorectal cancer resection (predominantly minimally invasive) within an enhanced recovery pathway, a multimodal prehabilitation program did not affect postoperative outcomes. Alternative strategies should be considered to optimize treatment of frail patients preoperatively.

Trial Registration: ClinicalTrials.gov identifier: NCT02502760.

UPPER GI

Prognostic nutritional index als voorspeller voor survival bij oesophaguscarcinoom

Prognostic Nutritional Index, Tumor-infiltrating Lymphocytes, and Prognosis in Patients with Esophageal Cancer. K Okadome et al. *Annals of Surgery*, April 2020 - Volume 271 - Issue 4 – p693-700.

Pubmed ID: 30308614.

OBJECTIVE: To determine whether prognostic nutritional index (PNI) affects clinical outcome through local immunity in esophageal cancers.

BACKGROUND: PNI is an indicator of nutritional status and systemic immune competence, and has attracted attention as a prognostic biomarker. Tumor-infiltrating lymphocytes (TILs) are a specific histological feature of human cancers, reflecting an individual's immunological tumor response.

METHODS: Using a nonbiased database of 337 curatively resected esophageal cancers, we evaluated the relationship between PNI, TILs status, CD8 expression by immunohistochemical staining, and clinical outcome.

RESULTS: Compared with PNI-high cases ($n = 220$), PNI-low cases ($n = 117$) showed significantly worse overall survival (log-rank $P < 0.001$; hazard ratio: 2.23; 95% confidence interval: 1.56-3.18; $P < 0.001$; multivariate hazard ratio: 1.67; 95% confidence interval: 1.14-2.44; $P = 0.008$). The TILs status was also significantly correlated with overall survival ($P < 0.001$). In addition, PNI was significantly associated with TILs status ($P < 0.001$) and the CD8-positive cell count ($P = 0.041$). A significant relationship between the peripheral blood lymphocyte count and TILs status was also observed ($P < 0.001$).

CONCLUSIONS: PNI and TILs score expression were associated with clinical outcome in esophageal cancer, supporting their roles as prognostic biomarkers. Considering the relationship between PNI and TILs, nutritional status and systemic immune competence may influence patient prognosis through local immune response.

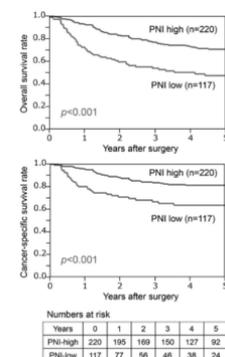


FIGURE 1. Kaplan-Meier curves for overall survival and cancer-specific survival in esophageal cancer patients according to PNI.

Succes-rate antireflux chirurgie in Engeland 40%

Reintervention After Antireflux Surgery for Gastroesophageal Reflux Disease in England. SR Markar et al. Annals of Surgery, April 2020 - Volume 271 - Issue 4 – p709-715.

Pubmed ID: 30499807.

BACKGROUND: After antireflux surgery, highly variable rates of recurrent gastroesophageal reflux disease (GERD) have been reported.

OBJECTIVE: To identify the occurrence and risk factors of recurrent GERD requiring surgical reintervention or medication.

METHODS: The Hospital Episode Statistics database was used to identify adults in England receiving primary antireflux surgery for GERD in 2000 to 2012 with follow-up through 2014, and the outcome was surgical reintervention. In a subset of participants, the Clinical Practice Research Datalink was additionally used to assess proton pump inhibitor therapy for at least 6 months (medical reintervention). Risk factors were assessed using multivariable Cox regression providing adjusted hazard ratios (HRs) with 95% confidence intervals (95% CIs).

RESULTS: Among 22,377 patients who underwent primary antireflux surgery in the Hospital Episode Statistics dataset, 811 (3.6%) had surgical reintervention, with risk factors being age 41 to 60 years (HR = 1.22, 95% CI 1.03-1.44), female sex (HR = 1.5; 95% CI 1.3-1.74), white ethnicity (HR = 1.71, 95% CI 1.06-2.77), and low hospital annual volume of antireflux surgery (HR = 1.32, 95% CI 1.04-1.67). Among 2005 patients who underwent primary antireflux surgery in the Clinical Practice Research Datalink dataset, 189 (9.4%) had surgical reintervention and 1192 (59.5%) used proton pump inhibitor therapy, with risk factors for the combined outcome being age >60 years (HR = 2.38, 95% CI 1.81-3.13) and preoperative psychiatric morbidity (HR = 1.58, 95% CI 1.25-1.99).

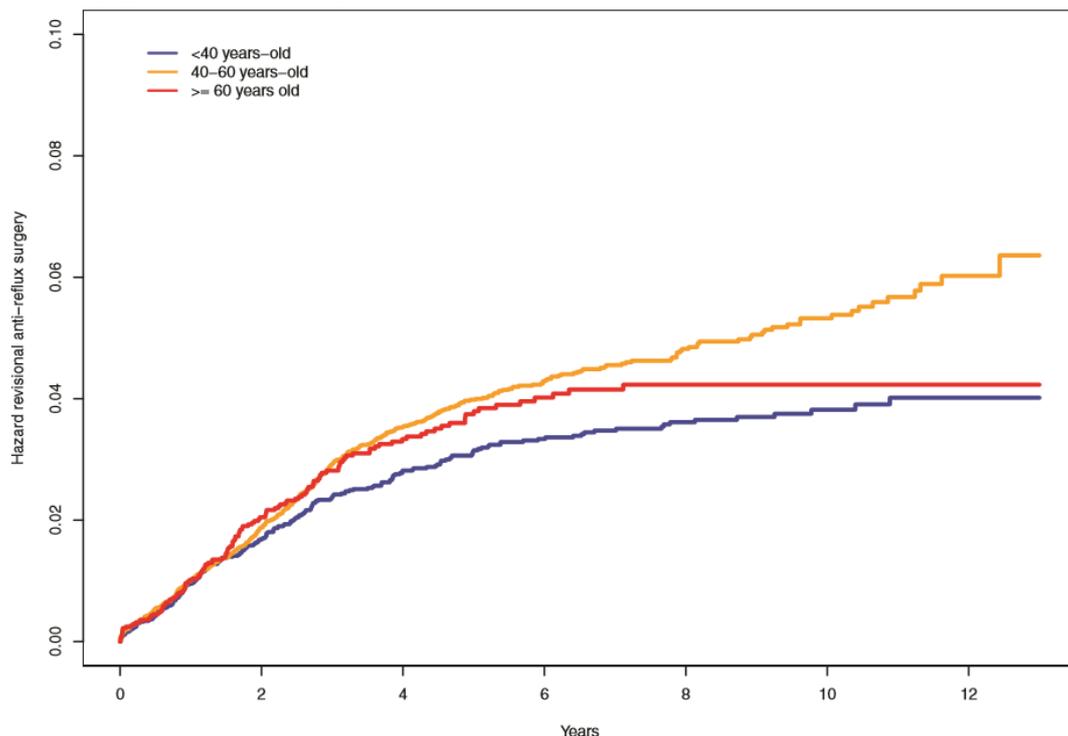


FIGURE 1. Kaplan–Meier curve demonstrating patient age in relation to surgical reintervention following primary antireflux surgery.

CONCLUSION: At least 3.6% of patients may require surgical reintervention and 59.5% medical therapy following antireflux surgery in England. The influence of patient characteristics and hospital volume highlights the need for patient selection and surgical experience in successful antireflux surgery.

HPB

Normalisatie van CA19.9 na neoadjuvante therapie voor pancreascarcinoom

Importance of Normalization of CA19-9 Levels Following Neoadjuvant Therapy in Patients With Localized Pancreatic Cancer. S. Tsai et al; *Annals of Surgery*, April 2020 - Volume 271 - Issue 4 – p740-747.

Pubmed ID: 30312198.

OBJECTIVE: Carbohydrate antigen 19-9 (CA19-9) is a prognostic marker for patients with pancreatic cancer (PC), but its value as a treatment biomarker is unclear.

SUMMARY BACKGROUND DATA: Although CA19-9 is an established prognostic marker for patients with PC, it is unclear how CA19-9 monitoring should be used to guide multimodality treatment and what level of change in CA19-9 constitutes a meaningful treatment response.

METHODS: CA19-9 measurements at diagnosis (pretx), after completion of all planned neoadjuvant therapy (preop), and after surgery (postop) were analyzed in patients with localized PC who had an elevated CA19-9 (≥ 35 U/dL) at diagnosis. Patients were classified by: 1) quartiles of pretx CA19-9 (Q1-4); 2) proportional changes in CA19-9 (Δ CA19-9) after the completion of neoadjuvant therapy; 3) normalization (CA19-9 < 35 U/dL) of preop CA19-9; and 4) normalization of postop CA19-9.

RESULTS: Among 131 patients, the median overall survival (OS) was 30 months; 68 months for the 33 patients in Q1 of pretx CA19-9 (< 80 U/dL) compared with 25 months for the 98 patients in Q2-4 ($P = 0.03$). For the 98 patients in Q2-4, preop CA19-9 declined (from pretx) in 86 (88%), but there was no association between the magnitude of Δ CA19-9 and OS ($P = 0.77$). Median OS of the 98 patients who did ($n = 29$) or did not ($n = 69$) normalize their preop CA19-9 were 46 and 23 months, respectively ($P = 0.02$). Of the 69 patients with an elevated preop CA19-9, 32 (46%) normalized their postop CA19-9. Failure to normalize preop or postop CA19-9 was associated with a 2.77-fold and 4.03-fold increased risk of death, respectively ($P < 0.003$) as compared with patients with normal preop CA19-9.

CONCLUSIONS: Following neoadjuvant therapy, normalization of CA19-9, rather than the magnitude of change, is the strongest prognostic marker for long-term survival.

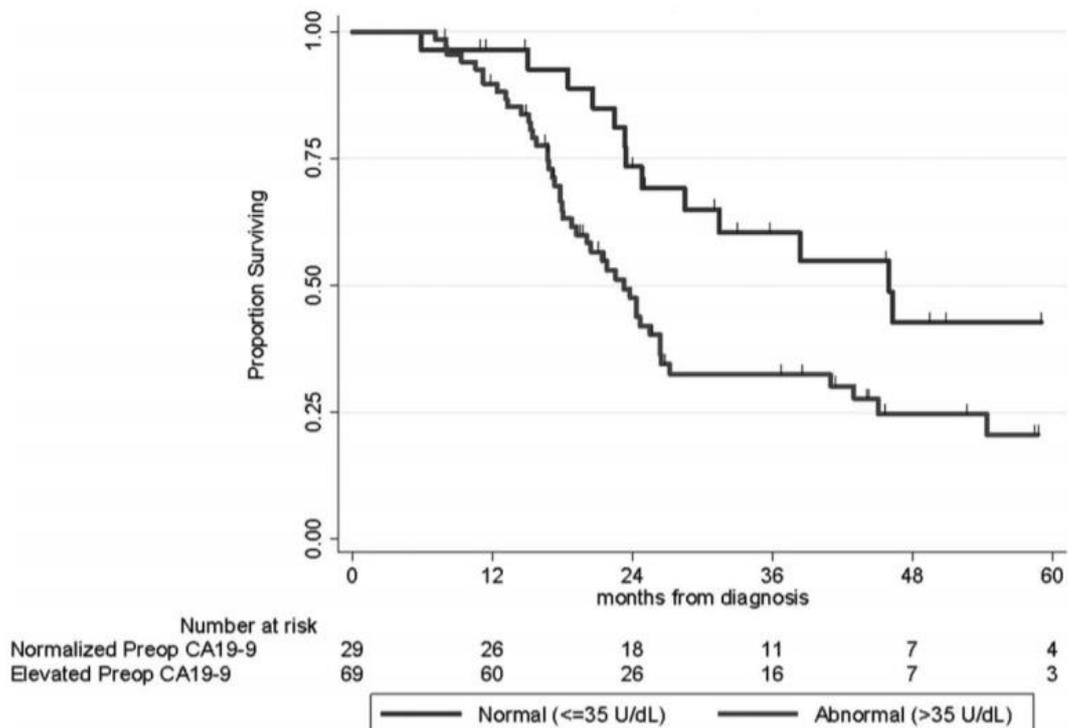


FIGURE 3. Overall survival by preop CA19-9 (normal vs. elevated) among patients with pretx CA19-9 ≥ 80 U/mL ($n = 98$).

Profylactische salpingectomie bij electieve lap chol

Prophylactic salpingectomy for prevention of ovarian cancer at the time of elective laparoscopic cholecystectomy. G. Tomasch et al. *BJS*, April 2020 – Volume 107 – Issue 5, pages 519-524.

Pubmed ID: 32129898.

BACKGROUND: Most serous ovarian cancers are now understood to originate in the fallopian tubes. Removing the tubes (salpingectomy) likely reduces the risk of developing high-grade serous ovarian cancer. Numerous gynaecological societies now recommend prophylactic (or opportunistic) salpingectomy at the time of gynaecological surgery in appropriate women, and this is widely done. Salpingectomy at the time of non-gynaecological surgery has not been explored and may present an opportunity for primary prevention of ovarian cancer.

METHODS: This study investigated whether prophylactic salpingectomy with the intention of reducing the risk of developing ovarian cancer would be accepted and could be accomplished at the time of elective laparoscopic cholecystectomy. Women aged at least 45 years scheduled for elective laparoscopic cholecystectomy were recruited. They were counselled and offered prophylactic bilateral salpingectomy at the time of cholecystectomy. Outcome measures were rate of accomplishment of salpingectomy, time and procedural steps needed for salpingectomy, and complications.

RESULTS: A total of 105 patients were included in the study. The rate of acceptance of salpingectomy was approximately 60 per cent. Salpingectomy was performed in 98 of 105 laparoscopic cholecystectomies (93.3 per cent) and not accomplished because of poor visibility or adhesions in seven (6.7 per cent). Median additional operating time was 13 (range 4-45) min. There were no complications attributable to salpingectomy. One patient presented with ovarian cancer 28 months after prophylactic salpingectomy; histological re-evaluation of the tubes showed a previously undetected, focal serous tubal intraepithelial carcinoma.

CONCLUSION: Prophylactic salpingectomy can be done during elective laparoscopic cholecystectomy.

Table 1 Surgical data for 105 patients in whom salpingectomy was attempted at the time of laparoscopic cholecystectomy	
Laparoscopic cholecystectomy	No. of patients (n = 105)
No. of ports	
Multiple	102
Single	3
Instrument used for cholecystectomy	
Monopolar coagulation	51
Bipolar coagulation	49
Vessel sealing	2
Ultrasonic energy	3
Different modality used for salpingectomy or new device needed	32
Total duration of operation (min)*	67 (2–137)
Operating time for salpingectomy only (min)*	13 (4–45)
No. of trocars repositioned	
0	89
1	13
2	1
3	0
Unclear	2
Previous scars used (e.g. appendicectomy)	3
No. of new trocars used	
0	83
1	15
2	1
3	0
Unclear	6
Salpingectomy completed as planned	
Yes	98
No	7
Surgeon performing salpingectomy	
General surgeon	79
Gynaecologist	19
Both	7
Duration of postoperative hospital stay (days)*	2 (1–13)

LEVERCHIRURGIE

“Real Texas” Experience: 3707 leverresecties in 18 jaar

Comprehensive Complication Index Validates Improved Outcomes Over Time Despite Increased Complexity in 3707 Consecutive Hepatectomies. J.M. Cloyd et al; *Annals of Surgery*, April 2020 - Volume 271 - Issue 4 – p724-731.

Pubmed ID: 30339628.

OBJECTIVE: The aim of this study was to evaluate trends over time in perioperative outcomes for patients undergoing hepatectomy.

BACKGROUND: As perioperative care and surgical technique for hepatectomy have improved, the indications for and complexity of liver resections have evolved. However, the resulting effect on the short-term outcomes over time has not been well described.

METHODS: Consecutive patients undergoing hepatectomy during 1998 to 2015 at 1 institution were analyzed. Perioperative outcomes, including the comprehensive complication index (CCI), were compared between patients who underwent hepatectomy in the eras 1998 to 2003, 2004 to 2009, and 2010 to 2015.

RESULTS: The study included 3707 hepatic resections. The number of hepatectomies increased in each era (794 in 1998 to 2003, 1402 in 2004 to 2009, and 1511 in 2010 to 2015). Technical complexity increased over time as evidenced by increases in the rates of major hepatectomy (20%, 23%, 30%, $P < 0.0001$), 2-stage hepatectomy (0%, 3%, 4%, $P < 0.001$), need for portal vein embolization (5%, 9%, 9%, $P = 0.001$), preoperative chemotherapy for colorectal liver metastases (70%, 82%, 89%, $P < 0.001$) and median operative time (180, 175, 225 minutes, $P < 0.001$). Significant decreases over time were observed in median blood loss (300, 250, 200 mL, $P < 0.001$), transfusion rate (19%, 15%, 5%, $P < 0.001$), median length of hospitalization (7, 7, 6 days, $P < 0.001$), rates of CCI ≥ 26.2 (20%, 22%, 16%, $P < 0.001$) and 90-day mortality (3.1%, 2.6%, 1.3%, $P < 0.01$). On multivariable analysis, hepatectomy in the most recent era 2010 to 2015 was associated with a lower incidence of CCI ≥ 26.2 (odds ratio 0.7, 95% confidence interval 0.6-0.8, $P < 0.0001$).

CONCLUSION: Despite increases in complexity over an 18-year period, continued improvements in surgical technique and perioperative outcomes yielded a resultant decrease in CCI in the most current era.

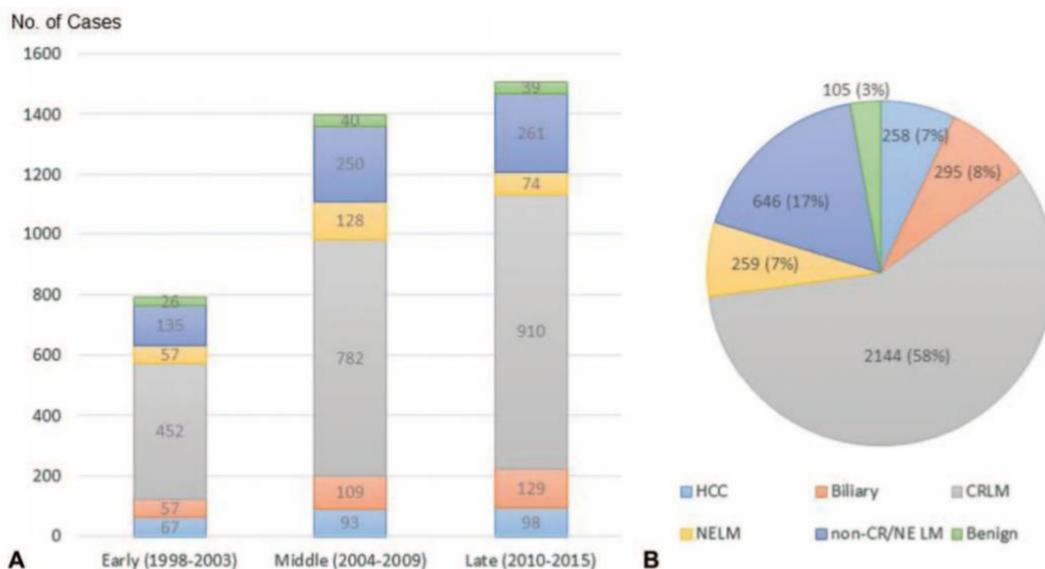


FIGURE 1. Number of hepatic resections performed for various tumor types and benign disease during 1998–2015 (A) by successive 6-year time period and (B) overall. The total number of hepatic resections performed was 3707. HCC indicates hepatocellular carcinoma; CRLM, colorectal liver metastasis; NELM, neuroendocrine liver metastasis; non-CR/NE LM, noncolorectal, non-neuroendocrine liver metastasis.

BARIATRISCHE CHIRURGIE

Vaker reïnterventies en ziekenhuisopnames na Roux-en-Y gastric bypass?

Interventions and Operations 5 Years After Bariatric Surgery in a Cohort From the US National Patient-Centered Clinical Research Network Bariatric Study. A. Courcoulas et al. *JAMA Surg.* 2020;155(3):194-204.

Pubmed ID: 31940024.

IMPORTANCE: Additional data comparing longer-term problems associated with various bariatric surgical procedures are needed for shared decision-making.

OBJECTIVE: To compare the risks of intervention, operation, endoscopy, hospitalization, and mortality up to 5 years after 2 bariatric surgical procedures.

DESIGN, SETTING, AND PARTICIPANTS: Adults who underwent Roux-en-Y gastric bypass (RYGB) or sleeve gastrectomy (SG) between January 1, 2005, and September 30, 2015, within the National Patient-Centered Clinical Research Network. Data from 33 560 adults at 10 centers within 4 clinical data research networks were included in this cohort study. Information was extracted from electronic health records using a common data model and linked to insurance claims and mortality indices. Analyses were conducted from January 2018 through October 2019.

EXPOSURES: Bariatric surgical procedures.

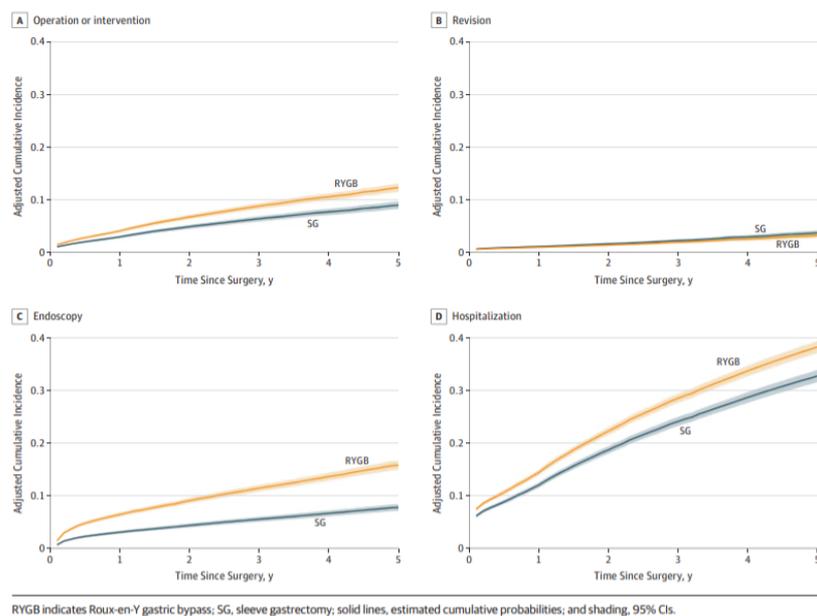
MAIN OUTCOMES AND MEASURES: The primary outcome was time until operation or intervention. Secondary outcomes included endoscopy, hospitalization, and mortality rates.

RESULTS: Of 33 560 adults, 18 056 (54%) underwent RYGB, and 15 504 (46%) underwent SG. The median (interquartile range) follow-up for operation or intervention was 3.4 (1.6-5.0) years for RYGB and 2.2 (0.9-3.6) years for SG. The overall mean (SD) patient age was 45.0 (11.5) years, and the overall mean (SD) patient body mass index was 49.1 (7.9). The cohort was composed predominantly of women (80%) and white individuals (66%), with 26% of Hispanic ethnicity. Operation or intervention was less likely for SG than for RYGB (hazard ratio, 0.72; 95% CI, 0.65-0.79; $P < .001$).

The estimated, adjusted cumulative incidence rates of operation or intervention at 5 years were 8.94% (95% CI, 8.23%-9.65%) for SG and 12.27% (95% CI, 11.49%-13.05%) for RYGB. Hospitalization was less likely for SG than for RYGB (hazard ratio, 0.82; 95% CI, 0.78-0.87; $P < .001$), and the 5-year adjusted cumulative incidence rates were 32.79% (95% CI, 31.62%-33.94%) for SG and 38.33% (95% CI, 37.17%-39.46%) for RYGB. Endoscopy was less likely for SG than for RYGB (hazard ratio, 0.47; 95% CI, 0.43-0.52; $P < .001$), and the adjusted cumulative incidence rates at 5 years were 7.80% (95% CI, 7.15%-8.43%) for SG and 15.83% (95% CI, 14.94%-16.71%) for RYGB. There were no differences in all-cause mortality between SG and RYGB.

CONCLUSIONS AND RELEVANCE: Interventions, operations, and hospitalizations were relatively common after bariatric surgical procedures and were more often associated with RYGB than SG.

Figure. Cumulative Incidence Rates of Operation or Intervention, Revision, Endoscopy, and Hospitalization



OVERIGE

“The 100” meest geciteerde papers in *Annals of Surgery*

The 100 Most Cited Papers in the History of the American Surgical Association. J.P. Landreneau et al; *Annals of Surgery*, April 2020 - Volume 271 - Issue 4 – p663-670.

Pubmed ID: 31663970.

Objective: The aim of this study was to determine characteristics of the most cited publications in the history of the American Surgical Association (ASA).

Summary Background Data: The *Annals of Surgery* has served as the journal of record for the ASA since 1928, with a special issue each year dedicated to papers presented before the ASA Annual Meeting. **Methods:** The top 100 most cited ASA publications in the *Annals of Surgery* were identified from the Scopus database and evaluated for key characteristics.

Results: The 100 most cited papers from the ASA were published between 1955 and 2010 with an average of 609 citations (range: 333-2304) and are included among the 322 most cited papers in the *Annals of Surgery*. The most common subjects of study included clinical cancer (n = 43), gastrointestinal (n = 13), cardiothoracic/vascular (n = 9), and transplant (n = 9). Ninety-three institutions were included lead by Johns Hopkins University (n = 9), University of Pittsburgh (n = 8), Memorial Sloan-Kettering (n = 7), John Wayne Cancer Institute (n = 7), University of Texas (n = 7), and 5 each from Brigham and Women's Hospital, Mayo Clinic, and University of Chicago. The majority of manuscripts came from the United States (n = 85), followed by Canada (n = 7), Germany (n = 5), and Italy (n = 5). Study design included randomized controlled trials (n = 19), retrospective matched cohort studies (n = 11), retrospective nonmatched studies (n = 46), and other (n = 24).

Conclusions: The top 100 most cited publications from the ASA are highly impactful, landmark studies representing a diverse array of subject matter, investigators, study design, institutions, and countries. These influential publications have immensely advanced surgical science over the decades and should serve as inspiration for all surgeons and surgical investigators.

TABLE 1. The Top 100 Most-Cited American Surgical Association Conferences Papers Published in the *Annals of Surgery*

Rank	First Author	Year	Title	Citations
1	Fong et al	1999	Clinical score for predicting recurrence after hepatic resection for metastatic colorectal cancer: Analysis of 1001 consecutive cases	2304
2	Giuliano et al	1994	Lymphatic mapping and sentinel lymphadenectomy for breast cancer	2218
3	Pories et al	1995	Who would have thought it? An operation proves to be the most effective therapy for adult-onset diabetes mellitus	1633
4	N. Seymour	2002	Virtual reality training improves operating room performance results of a randomized, double-blinded study	1540
5	C. Yeo	1997	Six hundred fifty consecutive pancreaticoduodenectomies in the 1990s: Pathology, complications, and outcomes	1505
6	W. Jarnagin	2002	Improvement in perioperative outcome after hepatic resection: Analysis of 1,803 consecutive cases over the past decade	1118
7	Khuri et al	1998	The Department of Veterans Affairs' NSQIP: The first national, validated, outcome-based, risk-adjusted, and peer-controlled program for the measurement and enhancement of the quality of surgical care	1051
8	Schauer et al	2000	Outcomes after laparoscopic Roux-en-Y gastric bypass for morbid obesity	1035
9	R. Adam	2004	Rescue surgery for unresectable colorectal liver metastases downstaged by chemotherapy: A model to predict long-term survival	1016
10	J. Siewert	1998	Relevant prognostic factors in gastric cancer: Ten-year results of the German Gastric Cancer Study	912
11	N. Christou	2004	Surgery decreases long-term mortality, morbidity, and health care use in morbidly obese patients	899
12	S. Rosenberg et al	1989	Experience with the use of high-dose interleukin-2 in the treatment of 652 cancer patients	872
13	Schauer et al	2003	Effect of Laparoscopic Roux-En Y Gastric Bypass on Type 2 Diabetes Mellitus	841
14	H. Bismuth	1996	Resection of nonresectable liver metastases from colorectal cancer after neoadjuvant chemotherapy	828
15	J. Burke	1981	Successful use of a physiologically acceptable artificial skin in the treatment of extensive burn injury	826
16	W. Jarnagin	2001	Staging, resectability, and outcome in 225 patients with hilar cholangiocarcinoma	815
17	A. Giuliano	1995	Improved axillary staging of breast cancer with sentinel lymphadenectomy	793
18	S. Rosenberg	1982	The treatment of soft-tissue sarcomas of the extremities. Prospective randomized evaluations of (1) limb-sparing surgery plus radiation therapy compared with amputation and (2) the role of adjuvant chemotherapy	793
19	A. Nakeeb	1996	Cholangiocarcinoma: A spectrum of intrahepatic, perihilar, and distal tumors	791
20	J. Burger	2004	Long-term follow-up of a randomized controlled trial of suture versus mesh repair of incisional hernia	789
21	N. Nguyen	2001	Laparoscopic versus open gastric bypass: A randomized study of outcomes, quality of life, and costs	781
22	R. Turnbull Jr.	1967	Cancer of the colon: the influence of the no-touch isolation technic on survival rates.	713
23	H. Akiyama	1994	Radical lymph node dissection for cancer of the thoracic esophagus	700
24	A. Giuliano	2010	Locoregional recurrence after sentinel lymph node dissection with or without axillary dissection in patients with sentinel lymph node metastases: The American college of surgeons oncology group z0011 randomized trial	689
25	J. Holcomb	2008	Increased plasma and platelet to red blood cell ratios improves outcome in 466 massively transfused civilian trauma patients	686
