Combined CRS-HIPEC for Peritoneal Malignancies: A 10-Year Single-Center Experience

Keywords
Hyperthermic Intraperitoneal Chemotherapy, Survival Analysis, Peritoneal Carcinomatosis, Cytoreductive Surgery, Peritoneal Neoplasms

Abstract

Introduction
Peritoneal surface malignancies (PSMs) are challenging to treat due to their locoregional nature and poor response to systemic therapies. Cytoreductive surgery (CRS) combined with hyperthermic intraperitoneal chemotherapy (HIPEC) has emerged as a promising treatment for selected patients, though long-term, real-world data remain limited. Aim of the study: To analyze clinical outcomes, survival patterns, and prognostic factors in a large cohort of patients undergoing CRS-HIPEC over a 10-year period at a national referral center.

Material and methods
This retrospective study included 292 adult patients who underwent 319 CRS-HIPEC procedures between 2015 and 2024. Primary endpoints included overall survival (OS) and postoperative outcomes. Data were stratified by tumor type, Peritoneal Cancer Index (PCI), and Completeness of Cytoreduction (CC-score).

Results
The most common indications were colorectal cancer (34.5%), ovarian cancer (27.0%), low-grade appendiceal mucinous neoplasm (LAMN) (16.1%), primary peritoneal cancer (17.7%), and gastric cancer (3.7%). Complete cytoreduction (CC-0) was achieved in 69.9% of cases. Five-year survival rates were highest in LAMN (90.4%) and primary peritoneal cancer (80.7%), and lowest in gastric cancer (25.0%). Lower PCI (<20) and CC-0 resection were strongly associated with improved survival. Postoperative morbidity declined over time, with no in-hospital mortality since 2022.

Conclusions
CRS-HIPEC offers substantial long-term survival benefits in selected patients with PSMs. Tumor biology, PCI, and completeness of cytoreduction are key prognostic factors. Our findings support expanding access to HIPEC in well-selected cases, particularly in tumors with peritoneal-confined dissemination.

Title: "Combined CRS-HIPEC for Peritoneal Malignancies: A 10-Year Single-Center Experience."

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Short title: CRS-HIPEC for Peritoneal Carcinomatosis: A Single-Center Study

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Introduction

Peritoneal surface malignancies present a significant clinical challenge due to their aggressive nature and historically limited treatment options [1]. Peritoneal metastases most frequently originate from colorectal, ovarian, gastric and appendiceal tumors, but may also arise from pancreato-biliary or sarcomatous primaries, collectively termed *peritoneal surface malignancies* (PSMs) [2]. Unlike hematogenous metastases, peritoneal dissemination often remains confined to the abdominal cavity, making systemic chemotherapy alone insufficient for disease control [3].Hyperthermic intraperitoneal chemotherapy (HIPEC), in combination with cytoreductive surgery (CRS), has emerged as an effective locoregional treatment strategy aimed at improving outcomes in selected patients with peritoneal carcinomatosis. HIPEC involves the direct intraoperative administration of heated chemotherapeutic agents into the peritoneal cavity, a process that enhances drug penetration, increases cytotoxicity, and minimizes systemic toxicity compared to intravenous chemotherapy [4].

The rationale for HIPEC is based on several key principles. Hyperthermia (typically at 41–43°C) increases tumor cell membrane permeability and impairs DNA repair mechanisms, thereby potentiating the effects of intraperitoneal chemotherapy. Additionally, the direct peritoneal administration of chemotherapeutic agents allows for significantly higher drug concentrations compared to systemic delivery, thereby increasing local tumor cell eradication while limiting systemic side effects [5]. These advantages have led to the incorporation of CRS-HIPEC into treatment protocols for various malignancies, including colorectal, gastric, ovarian cancers, and peritoneal mesothelioma [6].

Despite its growing acceptance, patient selection remains critical to optimizing the success of CRS-HIPEC. The feasibility of the procedure largely depends on the extent of peritoneal

involvement, quantified using the Peritoneal Cancer Index (PCI), and the likelihood of achieving complete cytoreduction (CC0/CC1). Patients with extensive small bowel involvement, extra-abdominal metastases, or poor performance status may not be suitable candidates [7]. Furthermore, the benefits of HIPEC continue to be debated, with conflicting evidence regarding its survival advantage across different cancer types. While several studies report significant improvements in overall survival (OS) and progression-free survival (PFS) compared to systemic chemotherapy alone, randomized trials such as the PRODIGE-7 trial have raised questions about HIPEC's incremental benefit in colorectal cancer [8]. Current guidance is heterogeneous: NCCN and PSOGI endorse CRS-HIPEC for pseudomyxoma and selected appendiceal neoplasms, whereas the 2024 ESMO guideline discourages routine use in colorectal or gastric cancer outside clinical trials [9-11].

HIPEC Program at the Lower Silesian Oncology, Pulmonology, and Hematology Center in Wroclaw

The Lower Silesian Oncology, Pulmonology, and Hematology Center (LSOPHC) in Wroclaw has been at the forefront of oncologic surgery in Poland, offering multidisciplinary, high-volume cancer care. Recognizing the growing evidence supporting HIPEC, our surgical department established a dedicated HIPEC program in 2014, making it one of the pioneering centers in the region to adopt this complex technique. With 30–35 CRS-HIPEC procedures annually in recent years, our centre ranks among the more active European units; high-volume programmes perform roughly 50 – 120 cases each year. [12]

Objectives

The primary objective was to describe peri-operative and long-term outcomes for all patients treated with combined CRS-HIPEC at our institution between 2014 and 2024. Secondary objectives were to evaluate prognostic factors—especially PCI and CC-score—and to benchmark our results against contemporary guidelines.

Materials and Methods

This retrospective observational study analyzed all adult patients who underwent cytoreductive surgery (CRS) with hyperthermic intraperitoneal chemotherapy (HIPEC) at the Lower Silesian Oncology, Pulmonology and Hematology Center (LSOPHC) in Wrocław, Poland, between January 2014 and December 2024. The primary aim was to evaluate clinical outcomes, patient selection trends, and long-term survival, while identifying prognostic factors influencing CRS-HIPEC efficacy.

The HIPEC program at LSOPHC was established in 2014 and has since performed 319 CRS-HIPEC procedures in 292 patients. Female patients constituted the majority (73.0%), with a median age of 60.7 years (range: 16.5–81.5 years). The most common primary malignancies were colorectal cancer (34.5%), low-grade appendiceal mucinous neoplasms (LAMN, 16.1%), ovarian cancer (27.0%), primary peritoneal cancer (17.7%), and gastric cancer (3.7%).

Over 80% of patients were referred from outside the Wrocław metropolitan area, confirming the center's role as a national referral hub. Detailed demographic and geographic characteristics are presented in Table 1. The median follow-up period was 43.0 months (range:

0.5–290 months), with 118 patients (40.4%) deceased at the time of analysis. Five-year survival rates varied by tumor type: 67.5% for colorectal cancer, 86.2% for LAMN, 60.7% for ovarian cancer, 80.1% for primary peritoneal cancer, and 24.1% for gastric cancer.

Patient selection was based on clinical, radiological, and intraoperative findings. The Peritoneal Cancer Index (PCI) was a key determinant of eligibility, with PCI <20 considered optimal for colorectal cancer and PCI <7 for gastric cancer. Higher PCI thresholds were accepted for ovarian and peritoneal mesothelioma.

Eligibility required an Eastern Cooperative Oncology Group (ECOG) performance status of 0–3, with adequate cardiopulmonary and renal function. Patients with distant metastases or extensive small bowel involvement were excluded. Age alone was not considered a limiting factor.

CRS was performed by two experienced surgical oncologists, followed by HIPEC using either the open or closed technique. Chemotherapy agents included oxaliplatin (45.5%), cisplatin (31.7%), mitomycin C (7.8%), doxorubicin (7.2%), and paclitaxel (0.6%). Perfusion durations ranged from 30 to 90 minutes, with 60-minute (43.3%) and 30-minute (34.2%) regimens being most common.

Clinical data were extracted from electronic hospital records (CliniNet and Hipokrates systems) using the MedStreamDesigner data warehouse. All data were anonymized before analysis. Statistical analysis was conducted using Statistica 13.3 software (TIBCO Software Inc., California, USA). Descriptive statistics were used to summarize baseline characteristics and perioperative outcomes. Kaplan–Meier curves were generated for survival analysis, stratified by tumor type, PCI, and CC-score.

The study protocol was approved by the institutional ethics committee. All procedures were conducted in accordance with the Declaration of Helsinki and relevant national regulations. Informed consent was obtained from all patients or their legal guardians.

Results

Patient Volume, Selection Trends, and Surgical Outcomes

Between January 2014 and December 2024, a total of 319 CRS-HIPEC procedures were performed in 292 adult patients at the Lower Silesian Oncology, Pulmonology and Hematology Center (LSOPHC). The majority of patients were female (73.0%), with a median age of 60.7 years (range: 16.5–81.5 years). Male patients accounted for 27.0% of the cohort. The demographic distribution reflected a national referral pattern, with 81.8% of patients originating from outside Wrocław, confirming the institution's role as a major HIPEC center in Poland (Table 1).

Over the 10-year study period, the annual case volume increased steadily, from 18 cases in 2015 to more than 35 per year after 2020. This growth paralleled the development of institutional experience and a more confident approach to case complexity. During the early years of the program (2014–2016), patient selection was conservative, with a median Peritoneal Cancer Index (PCI) of approximately 13. As experience accumulated, higher-risk patients were considered, and by 2024 the median PCI had increased slightly to 13.5. While the PCI range extended up to 36, nearly half of patients (49.1%) presented with a PCI of 0–10, and 31.4% had scores between 11–20 (Table 2).

Cytoreductive surgery was completed with no visible residual disease (CC-0) in 69.9% of cases (225 patients). Minimal residual disease (CC-1, ≤2.5 mm nodules) was achieved in 18.3% (59 patients), while only 5.3% (17 patients) underwent CC-2 resections, indicating macroscopic residual tumor. These results reflect the institution's increasing ability to achieve optimal cytoreduction over time. Notably, in the first years of the program (2014–2015), the CC-0 rate was 50–60%, while since 2020, this rate has consistently exceeded 70%, indicating maturation of surgical expertise.

HIPEC Regimens, Chemotherapy Protocols, and Perioperative Metrics

Following cytoreductive surgery, all patients underwent intraoperative HIPEC, administered using either the open (Coliseum) or closed abdominal technique, depending on surgeon experience and tumor type. The chemotherapy regimen was selected according to primary tumor histology, prior systemic treatments, and institutional protocols.

The most frequently used agent was oxaliplatin, applied in 145 cases (45.5%), predominantly in colorectal and appendiceal malignancies. Cisplatin was used in 101 procedures (31.7%), mainly for ovarian, gastric, and peritoneal cancers. Mitomycin C (25 cases, 7.8%) was primarily used in selected colorectal or LAMN cases. Doxorubicin (23 cases, 7.2%) and paclitaxel (2 cases, 0.6%) were employed for specific indications, such as platinum-resistant ovarian cancers. These chemotherapy selections aligned with contemporary international standards and gradually evolved based on emerging evidence and surgical outcomes.

HIPEC perfusion durations ranged from 30 to 90 minutes, with the majority of cases treated using the 60-minute protocol (138 procedures, 43.3%), followed by 30-minute protocols (109 procedures, 34.2%). Prolonged perfusion durations (45 or 90 minutes) were selectively implemented, often in ovarian and gastric cancer protocols, reflecting evolving experience and adaptation to tumor-specific needs. This range demonstrates the center's flexibility in optimizing oncologic outcomes while balancing intraoperative safety and resource allocation.

The median hospital stay across the entire cohort was 7 days (range: 2–82 days). A total of 43 patients (14.3%) required hospitalization exceeding 10 days. Reasons for prolonged hospitalization included surgical site infections, anastomotic leaks, paralytic ileus, and thromboembolic complications. However, patients undergoing CC-0 cytoreduction with limited visceral resections typically had uneventful postoperative courses, enabling discharge within one week.

Throughout the program's evolution, Enhanced Recovery After Surgery (ERAS) principles were increasingly integrated into perioperative care. These included preoperative nutritional optimization, early mobilization, pain control protocols, and standardized fluid management. Combined with close collaboration between surgical, anesthesiology, and intensive care teams, these strategies contributed to shortened recovery times and reduced morbidity, especially in recent years.

Postoperative Morbidity and Mortality

Cytoreductive surgery combined with HIPEC is a demanding procedure associated with a considerable physiological burden and potential for postoperative complications. Despite this, the morbidity profile observed in our cohort was consistent with internationally reported benchmarks, and outcomes improved over time as the center's experience increased.

Of the 319 CRS-HIPEC procedures performed, 14.3% of patients experienced a prolonged hospital stay exceeding 10 days, a surrogate marker for postoperative complications. These included anastomotic leaks, surgical site infections, intra-abdominal collections, delayed return of bowel function, and thromboembolic events. Although detailed classification of complications by Clavien-Dindo grade was not available, extended hospital stay served as a practical proxy for significant morbidity.

Early perioperative mortality in the initial years (2014–2018) reflected the steep learning curve and broader inclusion criteria. However, a notable trend emerged: from 2022 onwards, no in-hospital deaths were recorded, despite increasing procedural volume and case complexity. This improvement coincided with the formal adoption of ERAS protocols, enhanced intraoperative monitoring, and more stringent preoperative assessment.

The overall mortality rate at the time of analysis was 40.0%, including both early and long-term deaths captured during a median follow-up of 43 months. However, this figure should not be interpreted as procedure-related mortality, as the vast majority of deaths occurred months to years postoperatively and reflected disease progression in patients with advanced-stage malignancies.

Year-by-year analysis revealed improvements in perioperative recovery. In early program years (2014–2016), extended hospital stays occurred in 20–25% of patients, whereas in recent years (2020–2024), this proportion stabilized between 10–15%, suggesting greater procedural

efficiency and refined perioperative care. Improvements in anesthesia protocols, intraoperative fluid management, early enteral nutrition, and multidisciplinary coordination likely contributed to this trend.

Collectively, these findings highlight the center's growing procedural safety, improved risk stratification, and the feasibility of offering CRS-HIPEC within a standardized perioperative framework. Importantly, these outcomes underscore that with sufficient institutional experience and structured care pathways, CRS-HIPEC can be delivered safely, even in a high-risk oncologic population.

Survival Outcomes and Prognostic Stratification

Survival analysis was performed for all 292 patients with complete follow-up data, stratified by tumor type, completeness of cytoreduction (CC-score), and peritoneal cancer index (PCI). The median follow-up period was 43.0 months (range: 0.5–290.0 months), with 118 patients (40.4%) deceased at the time of analysis. Most deaths occurred beyond the early postoperative period and reflected disease progression rather than perioperative mortality.

- Survival by Tumor Type

Survival rates varied significantly across tumor subtypes. Patients with low-grade appendiceal mucinous neoplasms (LAMN) demonstrated the highest 5-year survival at 90.4%, followed by primary peritoneal cancer (PPC) at 80.7%. Colorectal cancer showed a 5-year survival of 55.9%, aligning with global literature, while ovarian cancer demonstrated 37.9%, and gastric cancer had the poorest outcome at 25.0% (Figure 1).

These outcomes reflect both the biological behavior of the underlying malignancy and the feasibility of complete cytoreduction in each setting. The indolent nature of LAMN and the peritoneal-predominant spread of PPC make them particularly responsive to CRS-HIPEC, whereas gastric cancer with diffuse serosal involvement continues to present a therapeutic challenge.

- Survival by Completeness of Cytoreduction (CC-Score)

Kaplan–Meier survival analysis confirmed the prognostic significance of CC-score ($p = 0.002$). Patients who underwent CC-0 resection (no macroscopic residual disease) had the most favorable outcomes. CC-1 resections (residual nodules ≤2.5 mm) were associated with a moderate decrease in survival, whereas CC-2 resections (macroscopic disease >2.5 mm) showed significantly worse prognosis (Figure 2). The apparent late crossover between CC-1 and CC-2 lines reflects the very small CC-2 subgroup and should not be interpreted as a true survival advantage. These findings reinforce the central importance of achieving complete cytoreduction for maximizing the efficacy of HIPEC.

- Survival by Peritoneal Cancer Index (PCI)

The Peritoneal Cancer Index (PCI) remained a robust prognostic marker. Survival declined progressively from low tumour burden (PCI 0–10) to intermediate (PCI 11–20) and high burden (PCI 21–39). The modest overlap between the two higher curves is attributable to the very small number of patients in the highest category, but the overall trend clearly favours a lower PCI at the time of CRS-HIPEC. (Figure 3). These findings support the continued use of PCI as a key selection criterion and intraoperative decision-making tool.

Discussion

This single-center study provides one of the largest retrospective analyses of CRS-HIPEC in Poland, offering important insights into real-world outcomes across various peritoneal malignancies. Our findings support the growing global consensus that CRS-HIPEC is most effective in highly selected patients with limited peritoneal disease burden and achievable complete cytoreduction [13].

Patient selection remains the cornerstone of HIPEC success. As confirmed by our experience, PCI and CC-score are the most influential prognostic indicators. Patients with PCI <20 and CC-0 resection experienced the most favorable long-term outcomes, while those with extensive disease (PCI >30) or macroscopic residual disease had significantly poorer prognoses. These observations align closely with recent global findings, including the PRODIGE-7 trial, which questioned the added survival benefit of oxaliplatin-based HIPEC in colorectal cancer unless complete cytoreduction was achieved [14]. Similarly, outcomes in our gastric cancer cohort were notably inferior, echoing the current controversy surrounding HIPEC's role in this malignancy [15].

Conversely, the ovarian-cancer cohort showed a 5-year OS of 38 %. This seemingly modest figure reflects a high proportion of platinum-resistant recurrences and the predominance of interval rather than upfront HIPEC in our series. Nevertheless, it compares favourably with the 3-year progression-free survival of 42 % reported in the OVHIPEC-1 randomised trial [16].

Our colorectal and ovarian cohorts—showing 5-year overall-survival of 56 % and 38 %, respectively—fit within NCCN guidance for offering CRS-HIPEC after complete

cytoreduction [9], whereas our modest gastric-cancer outcomes support ESMO's recommendation to restrict HIPEC to clinical trials [11].

In contrast, patients with LAMN and primary peritoneal cancer achieved excellent survival outcomes, reaffirming that slow-growing or peritoneal-confined histologies are ideal candidates. These subtypes may derive durable benefit from HIPEC, especially in cases where systemic chemotherapy has limited efficacy [7]. Multicenter series report 5-year OS of 85–95 % for LAMN and PPC, underscoring the value of early referral and complete cytoreduction [17].

One of the strengths of our study lies in the evolution of outcomes over time. Between 2014 and 2024, the annual procedure volume doubled, the rate of complete cytoreduction increased from ~60% to >70%, and in-hospital mortality dropped to 0% in recent years. This reflects the institutional learning curve and the progressive refinement of patient selection, perioperative optimization, and surgical strategy. The centralization of complex oncologic care at dedicated centers such as ours is key to achieving these outcomes [13][18].

Looking ahead, future trends in CRS-HIPEC may include:

- Integration of molecular diagnostics (e.g., KRAS, BRAF, BRCA status) to personalize HIPEC protocols [19] and emerging gene signatures that predict colorectal peritoneal spread [20].
- Use of ctDNA or other biomarkers for early recurrence detection and postoperative monitoring; simple inflammatory indices such as the neutrophil-to-lymphocyte ratio may aid early differentiation of malignant ascites [21].
- AI-guided imaging for intraoperative completeness assessment or surgical planning.
- Greater focus on cost-effectiveness, quality of life (QoL), and long-term functional outcomes, especially in publicly funded health systems.

Additionally, the role of HIPEC in second-look surgeries, prophylactic protocols, and recurrent disease remains an area of active investigation. Large-scale multicenter registries and randomized trials in Central and Eastern Europe are necessary to validate findings across diverse healthcare systems.

Limitations

This study has several noteworthy constraints. First, its retrospective, single-centre design introduces selection bias and limits external generalizability. Second, the number of outcome events per subgroup was too small for a reliable multivariable Cox model, so all prognostic associations remain exploratory. Third, postoperative morbidity was captured only in aggregate; therefore, neither Clavien–Dindo severity grading nor complication rates by Peritoneal Cancer Index (PCI) strata could be analyzed—prospective data capture will address this gap. Fourth, quality-of-life outcomes were not collected. Finally, the median follow-up of 43 months limits interpretation of very long-term survival, particularly for indolent tumors such as low-grade appendiceal mucinous neoplasms.

Conclusion

This retrospective analysis from a high-volume referral center demonstrates that cytoreductive surgery (CRS) combined with hyperthermic intraperitoneal chemotherapy (HIPEC) is a feasible and effective treatment for carefully selected patients with peritoneal surface malignancies. The most significant prognostic determinants remain the completeness of

cytoreduction (CC-score) and the extent of peritoneal disease, as measured by the Peritoneal Cancer Index (PCI).

Patients with low PCI and those in whom CC-0 resection is achieved derive the greatest survival benefit. Among tumor subtypes, low-grade appendiceal mucinous neoplasms (LAMN) and primary peritoneal cancer were associated with the most favorable outcomes, while gastric cancer continues to pose therapeutic challenges with limited long-term benefit [15].

Over the 10-year course of our HIPEC program, we observed substantial improvements in perioperative outcomes, surgical radicality, and long-term survival, reflecting the impact of institutional experience, refined patient selection, and multidisciplinary collaboration [18]. Our learning curve and outcome improvement provide a roadmap for centres launching CRS-HIPEC programmes in resource-constrained settings. The experience demonstrates the importance of multidisciplinary commitment and rigorous audit.

Future directions should prioritize the development of predictive tools for improved candidate selection, incorporation of molecular and imaging biomarkers, and prospective validation of CRS-HIPEC efficacy across varied tumor types [19]. Ongoing research and regional collaboration will be essential to further optimize outcomes and define HIPEC's role in modern oncologic practice.

Abbreviations

CC – Completeness of Cytoreduction; CRS – Cytoreductive Surgery; HIPEC – Hyperthermic Intraperitoneal Chemotherapy; LAMN – Low-grade Appendiceal Mucinous Neoplasm; OS –

Overall Survival; PCI – Peritoneal Cancer Index; PPC – Primary Peritoneal Cancer; PSM – Peritoneal Surface Malignancy.

Author Contributions

MB conceived the concept of the study. MK and PL designed the study protocol. MK, PL, JW, and MP were involved in data collection. MK and JW performed the statistical analysis. MK drafted the initial manuscript. All authors contributed to the interpretation of the data, critically revised the manuscript for intellectual content, and approved the final version for submission.

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Tables

Table 1. Patient selection summary

Variable	n (%)
Total Patients	319
Total CRS-HIPEC Procedures	292
Female	232 (72.0%)
Male	87 (27.0%)
Age at Surgery (Median, Range)	60.70 (16.54–81.53)
Geographic Origin: Wrocław	43 (13.4%)
Geographic Origin: Wrocław County	12 (3.7%)
Geographic Origin: Lower Silesian Voivodeship (excluding Wrocław)	123 (38.2%)
Geographic Origin: Other Polish Voivodeships	141 (43.8%)

Table 1. Baseline characteristics of patients undergoing CRS-HIPEC, including demographic and geographic distribution.

Table 2. Surgical and HIPEC procedural details summary

Variable	n (%)
Cytoreduction Score (CC-Score)	
CC-0 (Complete)	225 (69.9%)
CC-1 (Minimal residual, ≤2.5 mm)	59 (18.3%)
CC-2 (Macroscopic residual)	17 (5.3%)

Peritoneal Cancer Index (PCI) Distribution	
PCI 0-10	158 (49.1%)
PCI 11-20	101 (31.4%)
PCI 21-30	27 (8.4%)
PCI 31-39	5 (1.6%)

Table 2. Completeness of cytoreduction (CC-score) and Peritoneal Cancer Index (PCI) stratification.

Table 3. Survival analysis and outcomes summary

Tumor Type	n (%)	Median Survival (months)	5-Year Survival Rate (%)
Colorectal Cancer	111 (34.5%)	41.6	55.9
Gastric Cancer	12 (3.7%)	21.4	25.0
LAMN	52 (16.1%)	29.2	90.4
Ovarian Cancer	87 (27.0%)	57.3	37.9
Primary Peritoneal Cancer	57 (17.7%)	47.3	80.7

Table 3. Survival metrics stratified by tumor type, including median survival and 5-year survival rates.

Figure legends:

Figure 1. Kaplan–Meier survival curves by tumor type, highlighting divergent long-term outcomes.

Figure 2. Overall survival according to completeness of cytoreduction (CC-0, CC-1, CC-2). CC-0 shows clearly better outcomes; differences between CC-1 and CC-2 should be interpreted with caution because the CC-2 group is small.

Figure 3. Kaplan–Meier overall-survival curves stratified by PCI category (0–10, 11–20, 21–39). Patients with PCI ≤ 20 show markedly better outcomes; interpretation of the 21–39 curve is limited by the small cohort size.

Graphical Abstract. Visual synopsis of the Lower Silesian CRS-HIPEC programme (2014 – 2024).
Key facts: 292 patients (319 procedures); PCI ≤ 20 achieved in 58 % and CC-0 cytoreduction in 70 %.
Main results: 5-year overall-survival (OS) by tumour type—LAMN 90 %, primary peritoneal cancer 81 %, colorectal cancer 56 %, ovarian cancer 38 %, gastric cancer 25 %.
Main conclusion: Low tumour burden (PCI ≤ 20) combined with complete cytoreduction (CC-0) yields the best long-term outcomes.
Take-home message: **PCI ≤ 20 + CC-0 ⇒ best survival; early referral to experienced centres is essential.**

Title: "Combined CRS-HIPEC for Peritoneal Malignancies: A 10-Year Single-Center Experience."

Key bullet points (facts & figures):

•**Study period:** 2014 – 2024 | **Centre volume:** 292 patients, 319 CRS-HIPEC procedures

•**Tumour mix:**

- Colorectal cancer 34 %
- Ovarian cancer 27 %
- Low-grade appendiceal mucinous neoplasm (LAMN) 16 %
- Primary peritoneal cancer 18 %
- Gastric cancer 4 %

•**Completeness of cytoreduction (CC-0) achieved in 70 %** of cases

•**Peritoneal Cancer Index (PCI)**

- ≤ 10 → best outcomes
- 11–20 → intermediate
- 21–39 → poorest

•**Five-year overall survival (OS)** by tumour type

- LAMN **90 %** | PPC **81 %** | CRC 56 % | Ovary 38 % | Gastric 25 %

Main conclusions:

1.Low tumour burden (PCI ≤ 20) and complete cytoreduction (CC-0) are the dominant prognostic determinants after CRS-HIPEC.

2.Slow-growing histologies (LAMN, primary peritoneal cancer) derive the greatest long-term benefit, whereas gastric cancer outcomes remain limited.

3.Over the decade studied, centre experience doubled procedure volume and eliminated in-hospital mortality, demonstrating the value of programme maturation and multidisciplinary protocols.

Take-home messages:

•*PCI ≤ 20 + CC-0 ⇒ Best survival.*

•Early referral to high-volume centres enables optimal cytoreduction and patient selection.

•The Lower-Silesian 10-year data support continued, guideline-concordant use of CRS-HIPEC for carefully chosen patients with peritoneal surface malignancies.

Tables

Table 1. Patient selection summary

Variable	n (%)
Total Patients	319
Total CRS-HIPEC Procedures	292
Female	232 (72.0%)
Male	87 (27.0%)
Age at Surgery (Median, Range)	60.70 (16.54–81.53)
Geographic Origin: Wrocław	43 (13.4%)
Geographic Origin: Wrocław County	12 (3.7%)
Geographic Origin: Lower Silesian Voivodeship (excluding Wrocław)	123 (38.2%)
Geographic Origin: Other Polish Voivodeships	141 (43.8%)

Table 1. Baseline characteristics of patients undergoing CRS-HIPEC, including demographic and geographic distribution.

Table 2. Surgical and HIPEC procedural details summary

Variable	n (%)
Cytoreduction Score (CC-Score)	
CC-0 (Complete)	225 (69.9%)
CC-1 (Minimal residual, ≤2.5 mm)	59 (18.3%)
CC-2 (Macroscopic residual)	17 (5.3%)

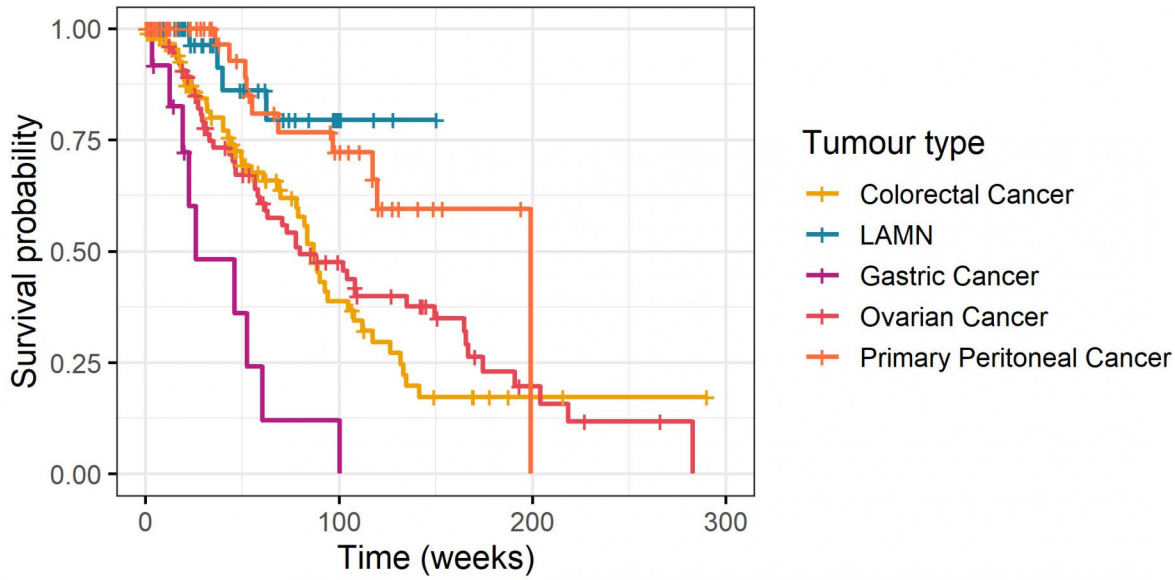
Peritoneal Cancer Index (PCI) Distribution	
PCI 0-10	158 (49.1%)
PCI 11-20	101 (31.4%)
PCI 21-30	27 (8.4%)
PCI 31-39	5 (1.6%)

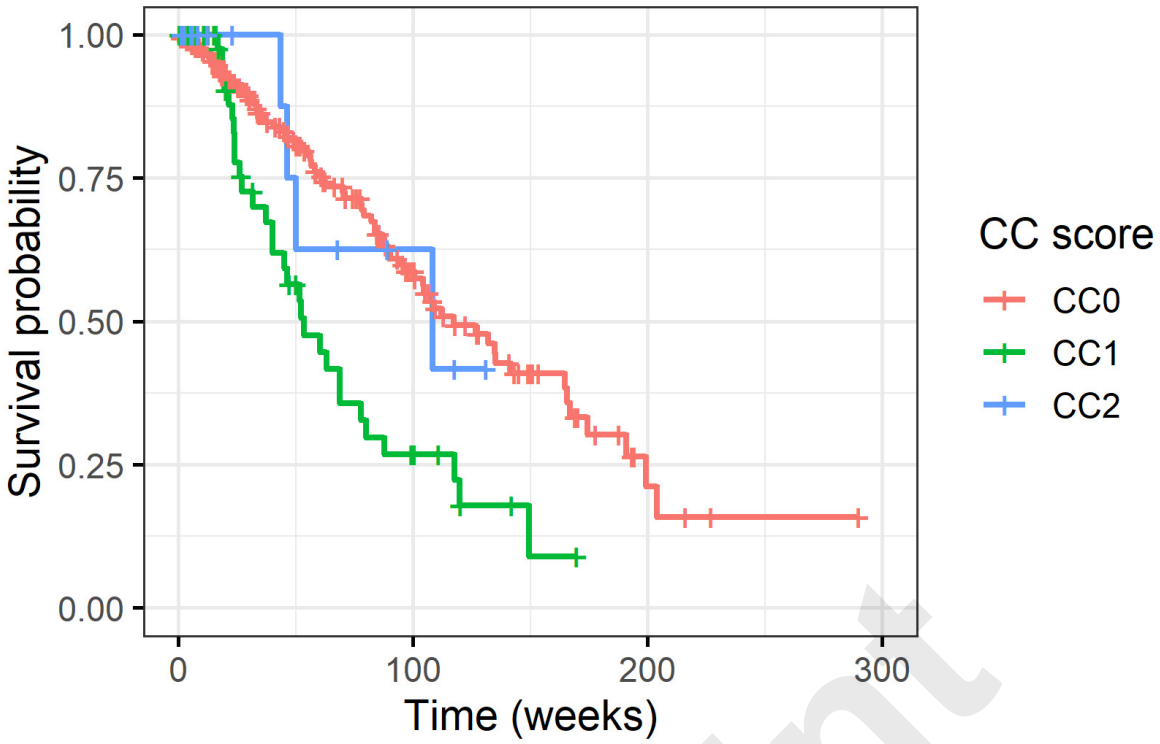
Table 2. Completeness of cytoreduction (CC-score) and Peritoneal Cancer Index (PCI) stratification.

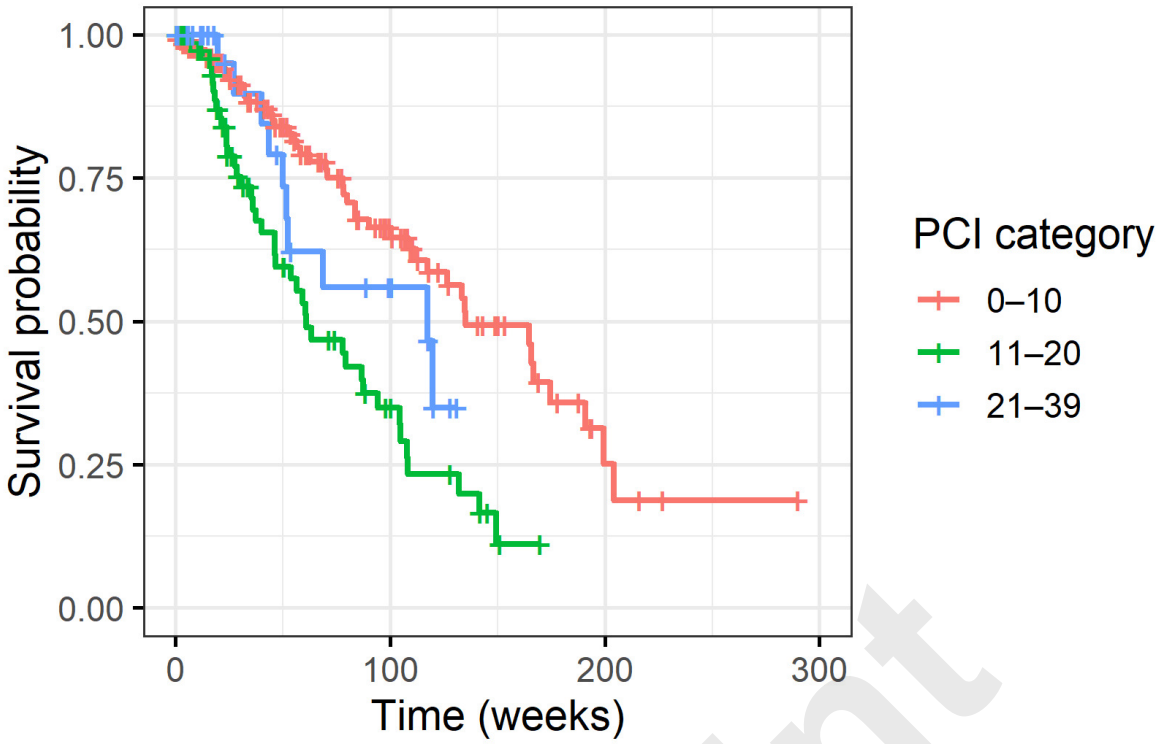
Table 3. Survival analysis and outcomes summary

Tumor Type	n (%)	Median Survival (months)	5-Year Survival Rate (%)
Colorectal Cancer	111 (34.5%)	41.6	55.9
Gastric Cancer	12 (3.7%)	21.4	25.0
LAMN	52 (16.1%)	29.2	90.4
Ovarian Cancer	87 (27.0%)	57.3	37.9
Primary Peritoneal Cancer	57 (17.7%)	47.3	80.7

Table 3. Survival metrics stratified by tumor type, including median survival and 5-year survival rates.


1.00
0.75
0.50
0.25
0.00
Survival probability
0
100
200
300
Time (weeks)
Tumour type
Colorectal Cancer
LAMN
Gastric Cancer
Ovarian Cancer
Primary Peritoneal Cancer


1.00
0.75
0.50
0.25
0.00
Survival probability
0
100
200
300
Time (weeks)
CC score
CC0
CC1
CC2


1.00
0.75
0.50
0.25
0.00
Survival probability
0
100
200
300
Time (weeks)
PCI category
0–10
11–20
21–39