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**Peritoneal Carcinomatosis: The Good, the Bad, and the Ugly**  
January 17

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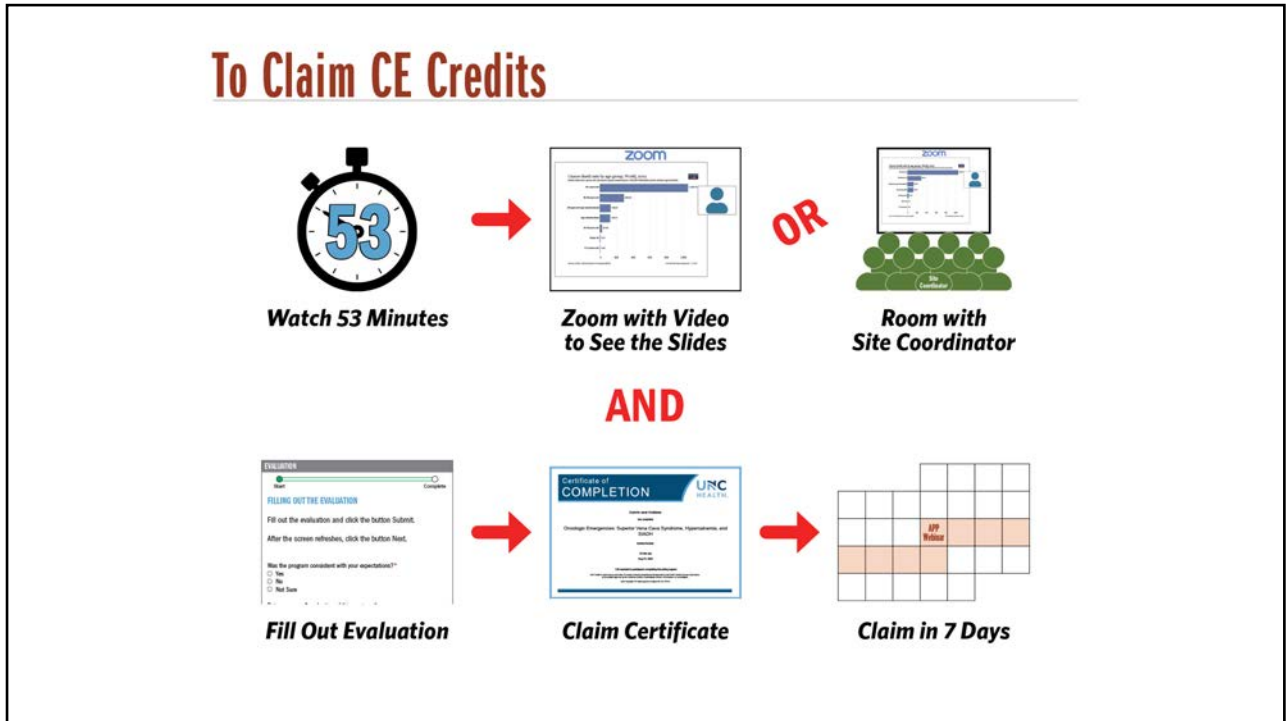
1

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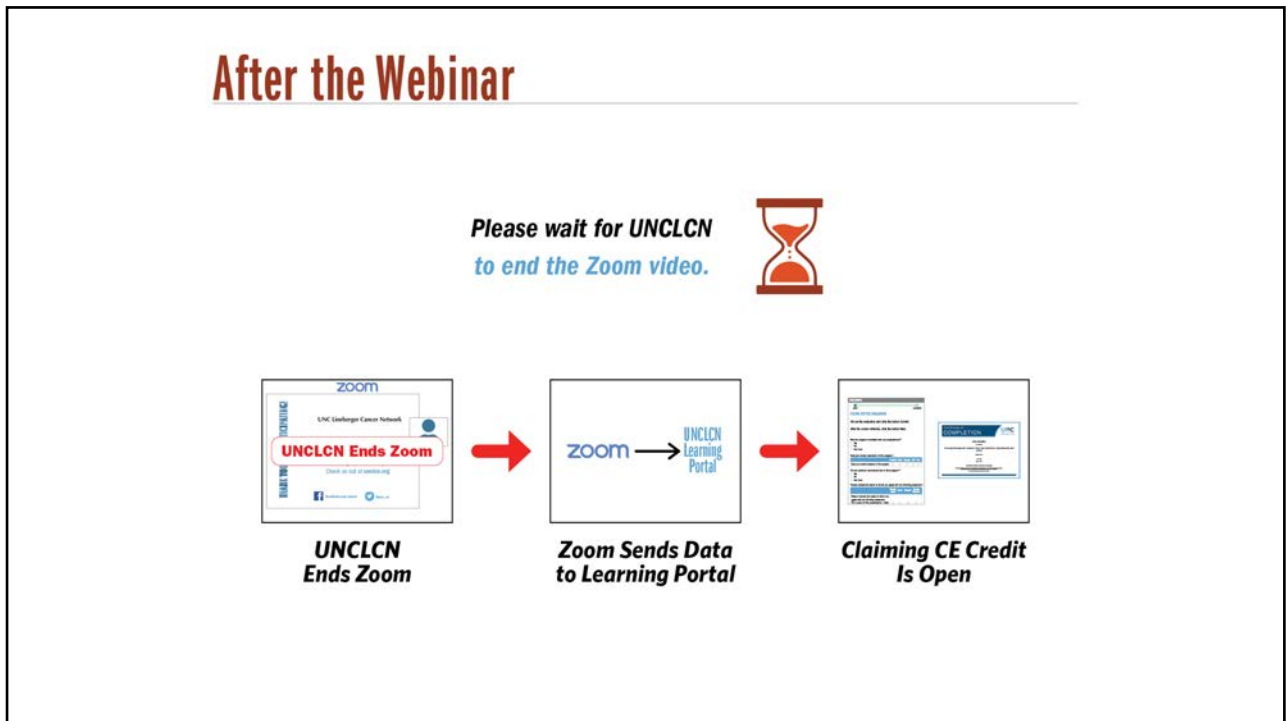
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UNC Lineberger Cancer Network  
**ADVANCED PRACTICE PROVIDER**  
Live Webinar




Jeremiah "Jig" Deneve,  
DO, FACS

**Peritoneal Carcinomatosis:  
The Good, the Bad, and the Ugly**

**January 17**

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## Our Presenter



**Jeremiah 'Jig' Deneve,**  
DO, FACS

Jeremiah 'Jig' Deneve, DO, FACS, is board certified by the American Board of Surgery in general surgery and surgical oncology fellowship trained with clinical and research interest in the treatment and management of peritoneal malignancies.

He also has an interest in treating gastric, pancreatic, hepatobiliary, and colon malignancies as well as soft tissue sarcoma and melanoma. Dr. Deneve also serves as an Associate Professor with the University of North Carolina Department of Surgery and has several roles in the teaching and training of surgical residents and medical students.

Dr. Deneve is a member of the American College of Surgeons, the Society of Surgical Oncology, the Association for Academic Surgery, the Southwestern Surgical Congress, Southeastern Surgical Congress, and the NC Chapter of the American College of Surgeons. He participates in clinical trial enrollment with the Southwest Oncology Group and has an interest in clinical research and outcomes.

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## Our Presenter

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## Our Presenter

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**5.** Surgical Oncologist new to UNC

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## Our Presenter

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- 5.** Surgical Oncologist new to UNC
  
- 4.** Manages and treats complex GI and skin/soft tissue malignancies as well as performs HIPEC

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## Our Presenter

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- 5.** Surgical Oncologist new to UNC
  
- 4.** Manages and treats complex GI and skin/soft tissue malignancies as well as performs HIPEC
  
- 3.** Participates in clinical trial enrollment with the Southwest Oncology Group

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## Our Presenter

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- 5.** Surgical Oncologist new to UNC
- 4.** Manages and treats complex GI and skin/soft tissue malignancies as well as performs HIPEC
- 3.** Participates in clinical trial enrollment with the Southwest Oncology Group
- 2.** Board certified by the American Board of Surgery in general surgery

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## Our Presenter

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- 5.** Surgical Oncologist new to UNC
- 4.** Manages and treats complex GI and skin/soft tissue malignancies as well as performs HIPEC
- 3.** Participates in clinical trial enrollment with the Southwest Oncology Group
- 2.** Board certified by the American Board of Surgery in general surgery
- 1.** Enjoys reading, history, triathlons, and Alabama football

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Cyoreductive surgery and Hyperthermic Intraperitoneal Chemotherapy (HIPEC) are used in combination to treat peritoneal metastases.

(A) True 0%

(B) False 0%

Instructions Responses More Clear responses

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## ACCME Disclosure

This activity has been planned and implemented under the sole supervision of the Course Director, Stephanie B. Wheeler, Ph.D. MPH, in association with the UNC Office of Continuing Professional Development (CPD). The course director and CPD staff have no relevant financial relationships with ineligible companies as defined by the ACCME.

A potential conflict of interest occurs when an individual has an opportunity to affect educational content about health-care products or services of a commercial interest with which he/she has a financial relationship. The speakers and planners of this learning activity have not disclosed any relevant financial relationships with any commercial interests pertaining to this activity.

The presenter has no relevant financial relationships with ineligible companies as defined by the ACCME.

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## ANCC Disclosure

**NCPD Activity #: 001-L23058**  
**1.0 Contact Hours Provided**

**Relevant Financial Relationship:**

No one with the ability to control content of this activity has a relevant financial relationship with an ineligible company.

**Criteria for Activity Completion:**

Criteria for successful completion requires attendance at the NCPD activity and submission of an evaluation within 30 days.

**Approved Provider Statement:**

UNC Health is approved as a provider of nursing continuing professional development by the North Carolina Nurses Association, an accredited approver by the American Nurses Credentialing Center's Commission on Accreditation.

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The screenshot shows a poll interface for a quiz question. The question text is "Cytoreductive surgery and Hyperthermic Intraperitoneal Chemotherapy (HIPEC) are used in combination to treat peritoneal metastases." Below the question, there are two options: "True" and "False". Each option has a corresponding horizontal bar representing the percentage of correct answers, both currently at 0%. At the bottom of the interface, there is a footer text: "Start the presentation to see live content. For screen share software, share the entire screen. Get help at [pollev.com/app](https://pollev.com/app)".

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# Peritoneal Carcinomatosis: The Good, The Bad & The Ugly

Jig Deneve, DO FACS  
University of North Carolina  
APP Grand Rounds  
1-17-24



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# No disclosures



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**Peritoneal carcinomatosis is an aggressive form of disease spread and characterized by the following manifestations:**

Advanced disease at onset	0%
Malnutrition	0%
Malignant ascites	0%
Progression to malignant obstruction	0%
All of the above	0%

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**Recommended treatment for malignant-related ascites includes all of the following except:**

Diuretics	0%
HIPEC-hyperthermic intraperitoneal chemotherapy	0%
Paracentesis	0%
PIPAC-pressurized intraperitoneal chemotherapy	0%
PV Shunt	0%

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Cytoreduction and hyperthermic intraperitoneal chemotherapy (HIPEC) offer a potential cure for carcinomatosis. HIPEC is characterized by all of the following except:


Heat is synergistic with chemotherapy	0%
High regional concentration of chemotherapy/low systemic toxicity	0%
Maximum tissue penetration of 3-5 mm	0%
Short learning curve with low morbidity	0%
Should be performed at high-volume centers	0%

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## Peritoneal Carcinomatosis

- Background
- Anatomy
- Pathophysiology
- CRS/HIPEC
- Unresectable



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## Natural History

- Pseudomyxoma Peritonei Syndrome<sup>1</sup>
  - Ascites
  - Malnutrition
  - Malignant obstruction
- Poor prognosis<sup>2,3</sup>
  - OS ~5 months untreated
  - ~5-15 months with palliative therapy



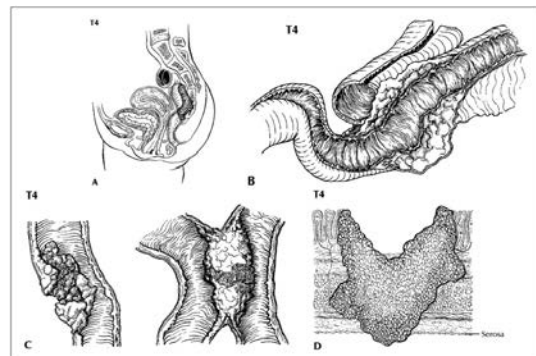
1-Eur J Surg Oncol 2006;32(6):644-7  
 2-World J Gastroenterol 2012;18:5489-94  
 3-Ann Oncol 2011;22:2250-6



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## Peritoneal Carcinomatosis

- Risk Factors
  - Local advanced tumors (T4)
  - Histology (mucinous, signet ring)
  - Perforated tumors
  - Nodal stage
  - Incomplete resection



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## Peritoneal Surface Malignancies

- Appendix
  - Psuedomyxoma peritonei (Jelly Belly)
    - 2-4 cases/million/year
- Colorectal Cancer
  - 3<sup>rd</sup> most common malignancy in the world
    - 1.4 million diagnosed 2012<sup>1</sup>
  - Peritoneum
    - 2<sup>nd</sup> most common site of recurrence<sup>2</sup>
    - 25% of all recurrences
- Other: Ovary/Mesothelioma/Gastric/DSRCT

1-Int J Cancer, 2014;136:359-86  
 2-Int J Colorectal Dis 2015;30:205-12



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## EVOCAPE-1

Natural history of peritoneal carcinomatosis from nongynecologic malignancies

Olivier Glehen, MD<sup>a</sup>, Dimitri Osinsky, MD<sup>a</sup>,  
 Annie Claude Beaujard, MD<sup>b</sup>,  
 François Noël Gilly, PhD, MD<sup>c,\*</sup>

<sup>a</sup>Centre Hospitalo-Universitaire Lyon Sud, Surgical Department, 69495 Pierre Bénite Cedex, France

<sup>b</sup>Centre Hospitalo-Universitaire Lyon Sud, Intensive Care Department, 69495 Pierre Bénite Cedex, France

<sup>c</sup>Lyon University of Sciences, Surgical Department, Centre Hospitalo-Universitaire Lyon Sud, 69495, Pierre Bénite Cedex, France

Table 4  
 Peritoneal carcinomatosis staging

PC staging	Stage 0	Stage 1	Stage 2	Stage 3	Stage 4	Total
Gastric	9	22	22	27	45	125
Colorectal	2	11	27	33	45	118
Pancreas	2	11	13	12	20	58
Unknown	0	1	4	7	31	43
Small bowel	0	1	1	0	2	4
Liver	0	1	2	0	0	3
Pseudomyxoma	0	0	2	3	7	12
Mesothelioma	0	0	0	2	5	7
Total	13	47	71	84	155	370

Abbreviation: PC, peritoneal carcinomatosis.

Cancer 2000; 88:358-63



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## EVOCAPE 1 - CRC (N=118)

- Mean age 62.3 years
- Synchronous carcinomatosis (58%)
- Ascites (~30%)
- Bowel Obstruction (19.5%)
- Surgery
  - 75 Rxn of Primary
  - 26 Bypass
  - 24 Biopsy only
- Adjuvant Chemo (39%)
- Median OS 5.2 months



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## Treatment Concerns

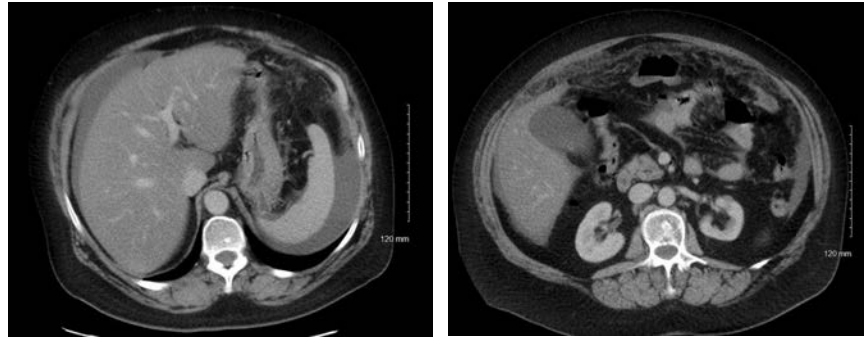
- Often present late/symptomatic
  - Ascites
  - Malnutrition
  - Malignant obstruction
- Difficult to identify imaging
- Treatment options
  - Declining performance status
  - Palliative systemic chemotherapy ineffective
    - Dz progression/2<sup>nd</sup> or 3<sup>rd</sup> line
  - Large volume disease precludes surgery



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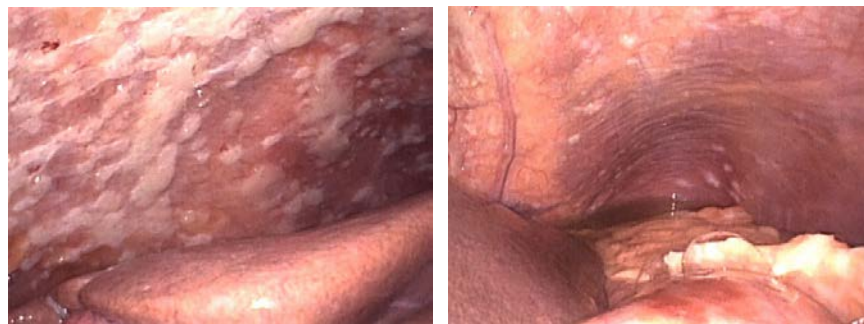
## Ascites & Omental Caking



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## RUQ & LUQ

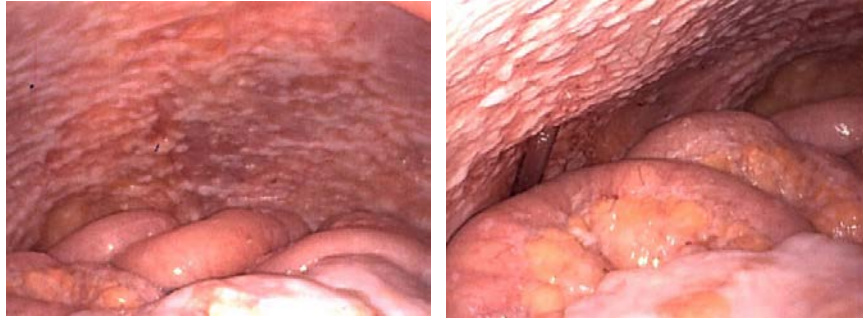


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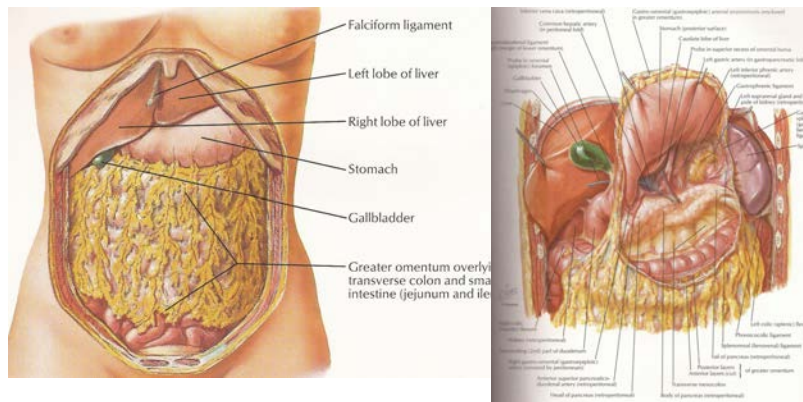
## Pelvis & SB Mesentery



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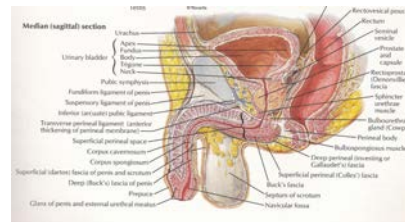
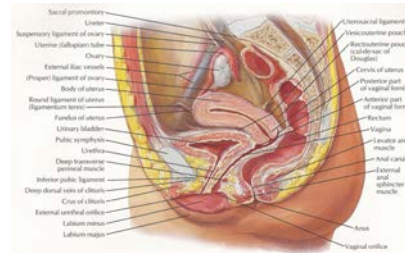
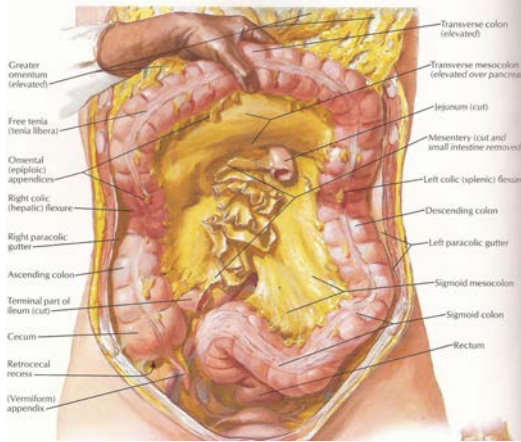
## Areas of Involvement



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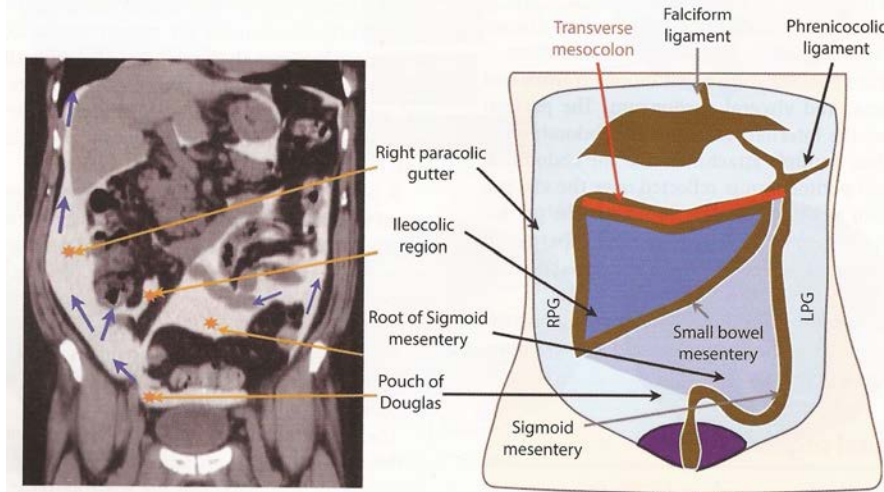
# Areas of Stasis



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# Lymphatic Flow



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## Milky Spots

- Accumulations of lymphocytes and macrophages
- Clear particles from abd cavity
- Cancer cells

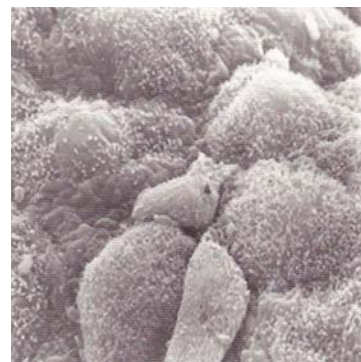


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## Mesothelial Cell

- Structural cell
- Mesoderm
- Serosal hemostasis
  - Intact barrier
  - Initiate inflammation
- Target of cancer cells
  - ECM
  - Hijack mesothelial cells
- Tumor spread
  - Transversal growth
  - Exfoliation/Intraperitoneal spread

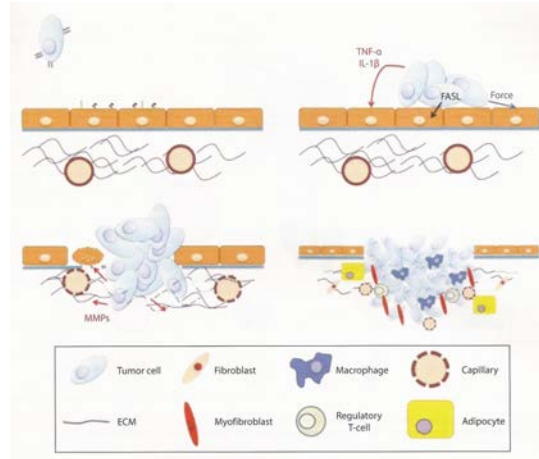


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## Development of Carcinomatosis

- Detachment
- Attachment
- Mesothelial Cell Invasion
- Proliferation
- Inflammation/Evasion
- Angiogenesis



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## Cytoreduction/HIPEC

- Cytoreduction
  - Aggressive surgical debulking of all visible dz
- HIPEC
  - Chemical destruction of microscopic dz
  - Regional therapy
    - Higher dose than plasma
    - Limited systemic absorption
- PCI/CCR Score<sup>1</sup>
  - Improved survival

[Surgery 2012;152:617-24](#)



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## Cytoreductive Surgery

- Laparotomy (xiphoid-pubis)
- Areas at highest risk of incomplete resection addressed first
- Resection of involved disease sites
- Peritonectomy
- HIPEC after Cytoreduction
- Anastamoses/Diversion



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## Technical Details

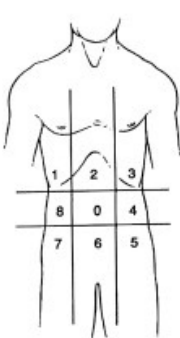
- Open
- Evacuate Ascites/Adhesiolysis
- Calculate PCI Score & CCR score
- Pelvis & pelvic peritoneum (Rectum +/- uterus)
- Diaphragm(s)
- Omentectomy
- Colectomy
- Small bowel & mesentery



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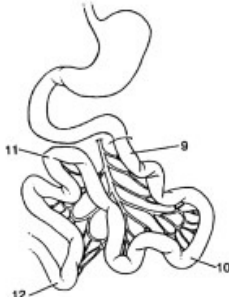
## Peritoneal Cancer Index




0 Central  
 1 Right Upper  
 2 Epigastrium  
 3 Left Upper  
 4 Left Flank  
 5 Left Lower  
 6 Pelvis  
 7 Right Lower  
 8 Right Flank  
 9 Upper Jejunum  
 10 Lower Jejunum  
 11 Upper Ileum  
 12 Lower Ileum

**PCI**

LS 0 No tumor seen  
 LS 1 Tumor up to 0.5 cm  
 LS 2 Tumor up to 5.0 cm  
 LS 3 Tumor > 5.0 cm or confluence



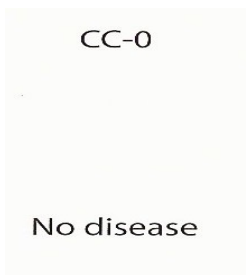


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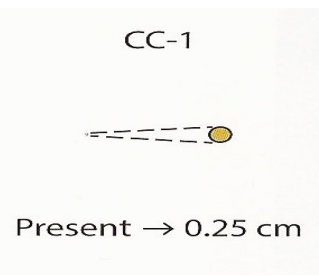
## Completeness of Cytoreduction

CC-0



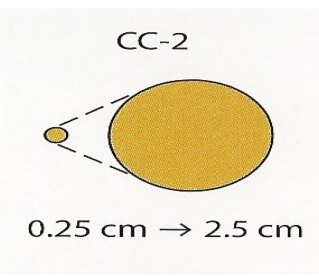
No disease

CC-1



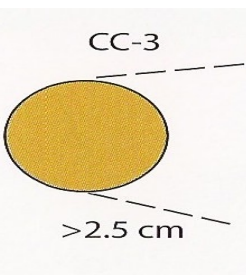
Present → 0.25 cm

CC-2




0.25 cm → 2.5 cm

CC-3



>2.5 cm



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## Mucinous Ascites



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## Omental Caking



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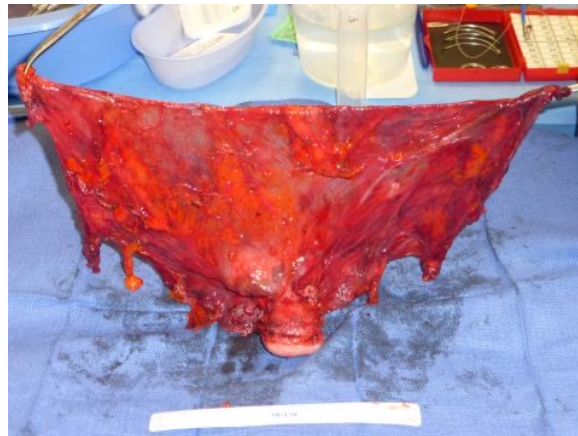
## Serosal & Mesenteric Nodules



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## Pelvic Peritoneum & Rectum

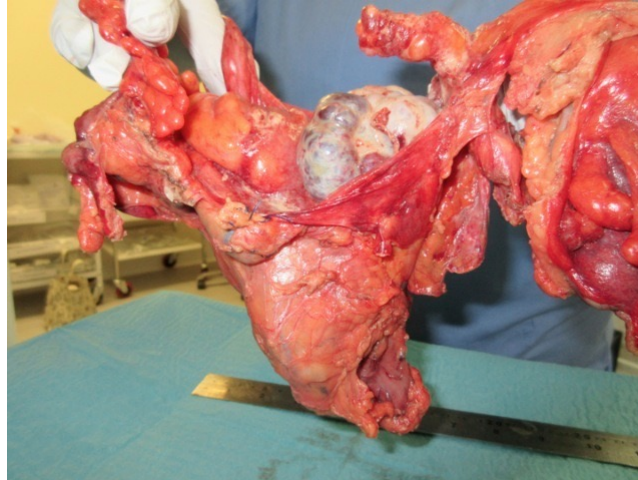


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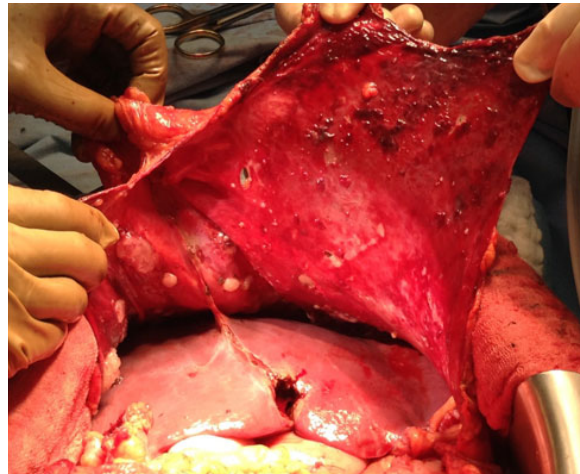
## En bloc Specimen



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## Diaphragm Peritonectomy



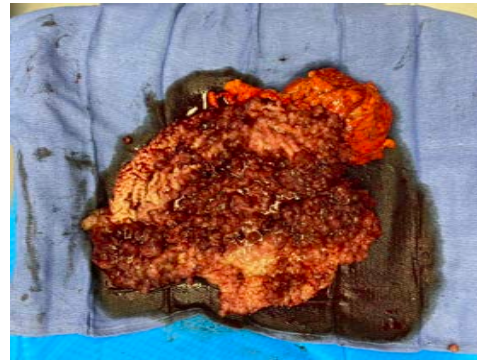
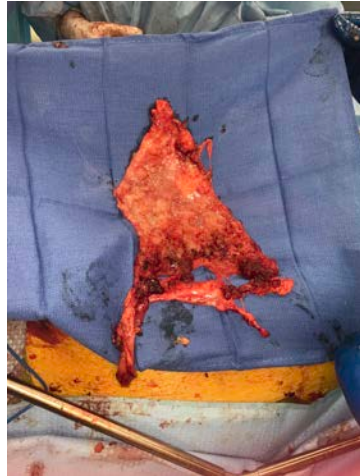
[Indian J Surg Oncol 2016; 7\(2\):139-151](#)



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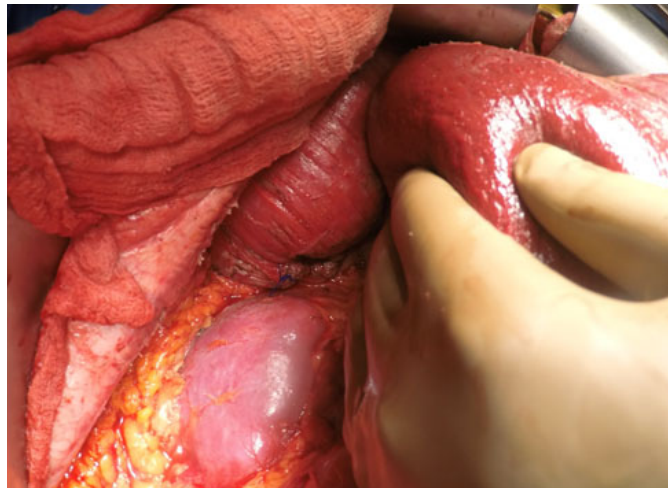
## Diaphragm Specimen



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## R Diaphragm Peritonectomy



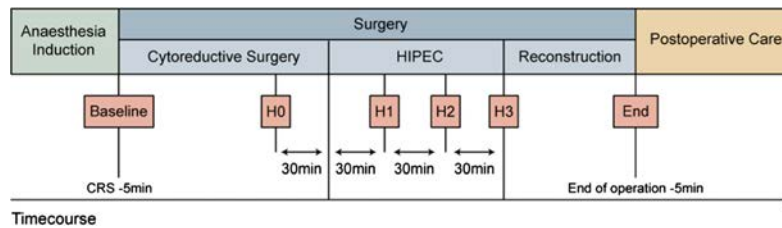
[Indian J Surg Oncol 2016; 7\(2\):139-151](#)



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## Operative Cadence



World J Surg Onc 2014, 12:136



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## Hyperthermic IntraPeritoneal Chemotherapy

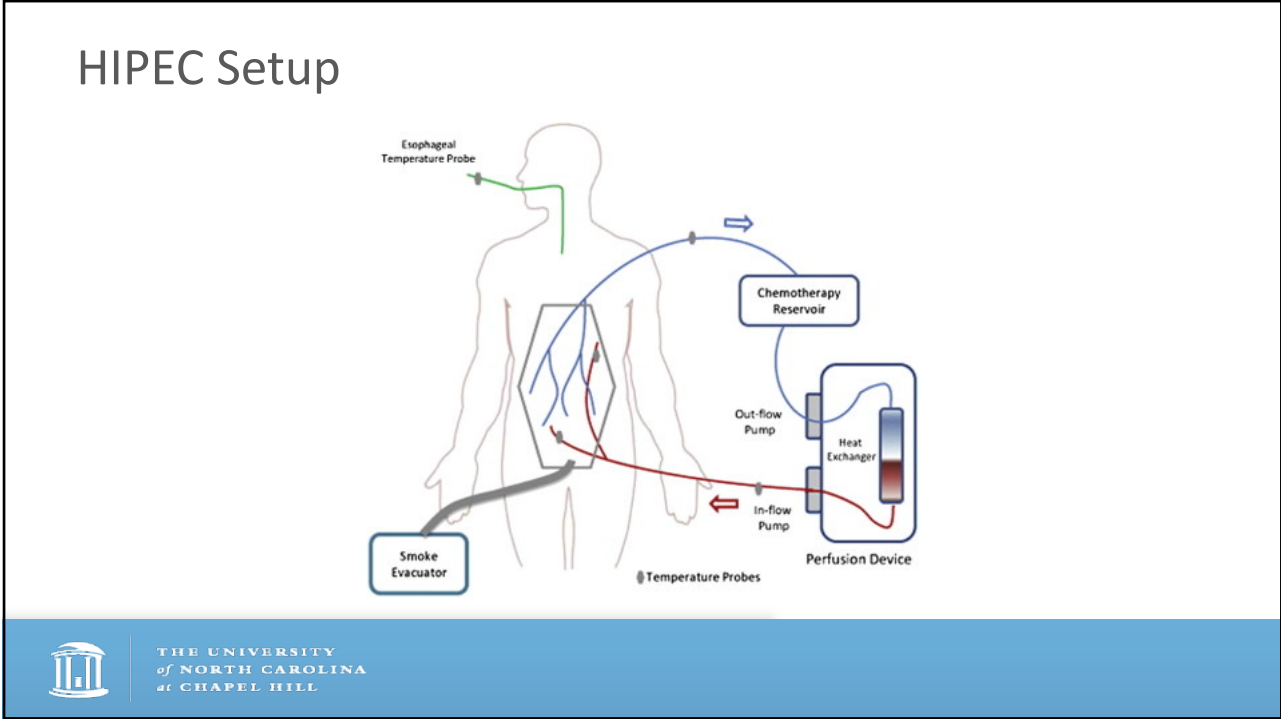
- IP Chemotherapy
  - High regional concentration/Low systemic
    - 10-20 fold increase
  - “plasma-peritoneal” barrier
- Tissue Penetration
  - Maximum penetration 3-5 mm<sup>1</sup>
- Hyperthermia (40-42C)
  - Synergistic with intraperitoneal chemotherapy

Cancer Chemo Pharm 1991;28:159-65



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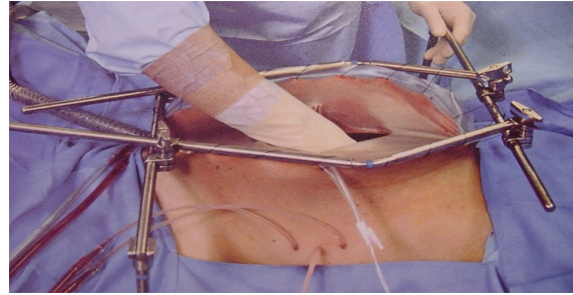


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## Techniques



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## HIPEC Agents

- Mitomycin C
- Oxaliplatin
- Cisplatin
- Carboplatin
- Doxorubicin
- Irinotecan
- Paclitaxel
- Docetaxel
- 5-Fluorouracil
- Gemcitabine
- Pemetrexed
- Melphalan

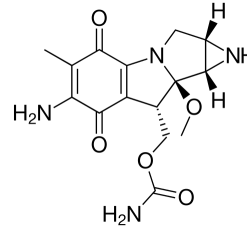


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## Mitomycin C

- Alkylating Antitumor Antibiotics
  - Extracted from *Strep spp.*
- Binds with DNA (cross linking)
  - Inhib DNA synthesis
    - Supresses cellular RNA
    - Supresses protein synthesis
- Metabolized predominantly in the liver
- Dose dependent



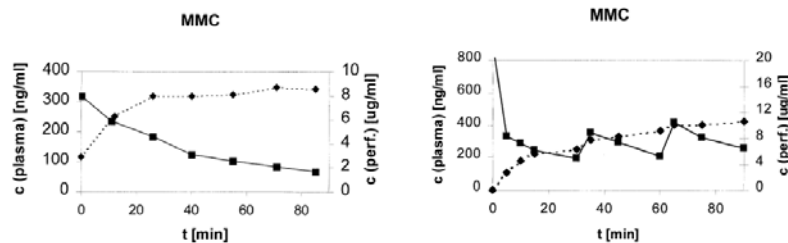
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## Pharmacokinetics of intraperitoneal mitomycin C

S. van Ruth, MD\*, V.J. Verwaal, MD,  
F.A.N. Zoetmulder, MD, PhD

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[Surg Oncol Clin N Am 2003;12:771-780](#)

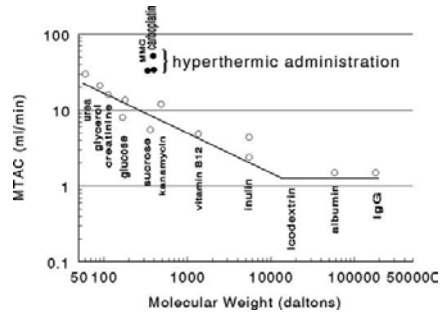


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## Advantages of Mitomycin C

- Noncell cycle specific
  - Directly cytotoxic
- Large molecular weight
  - High plasma/perit AUC
- Rapidly cleared
- Water soluble
- Cytotoxicity enhanced by hyperthermia
- \*Bone marrow toxicity

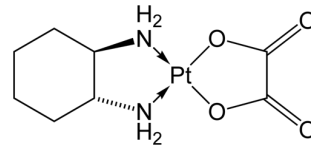


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## Oxaliplatin

- Platinum based antineoplastic
- Inhibits DNA synthesis
  - Forms inter- and intra-strand cross links
  - Prevents DNA replication/transcription
- IP Oxali ~5x > IV dose
- T<sup>1/2</sup> 29 minutes
- Carrier Dependent
- Volume Dependent



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## Advantages of Oxaliplatin

- Large molecular weight 397 daltons
- Administered with 5-FU/Leucovorin
- Less volume of perfusate
- Short perfusion (30 min)
- Cytotoxicity enhanced by hyperthermia
- \*Thrombocytopenia/neutropenia
- \*Hemorrhage



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## ASPSM Consensus Guidelines

Ann Surg Oncol (2014) 21:1501–1505  
DOI 10.1245/s10434-013-3061-z

Annals of  
**SURGICAL ONCOLOGY**  
OFFICIAL JOURNAL OF THE SOCIETY OF SURGICAL ONCOLOGY

REVIEW ARTICLE – GASTROINTESTINAL ONCOLOGY

### Consensus Guidelines from The American Society of Peritoneal Surface Malignancies on Standardizing the Delivery of Hyperthermic Intraperitoneal Chemotherapy (HIPEC) in Colorectal Cancer Patients in the United States

K. Turaga<sup>1</sup>, E. Levine<sup>2</sup>, R. Barone<sup>3</sup>, R. Sticca<sup>4</sup>, N. Petrelli<sup>5</sup>, L. Lambert<sup>6</sup>, G. Nash<sup>7</sup>, M. Morse<sup>8</sup>, R. Abdel-Misih<sup>5</sup>, H. R. Alexander<sup>9</sup>, F. Attiyeh<sup>10</sup>, D. Bartlett<sup>11</sup>, A. Bastidas<sup>12</sup>, T. Blazer<sup>8</sup>, Q. Chu<sup>13</sup>, K. Chung<sup>7</sup>, L. Dominguez-Parra<sup>14</sup>, N. J. Espat<sup>15</sup>, J. Foster<sup>16</sup>, K. Fournier<sup>17</sup>, R. Garcia<sup>18</sup>, M. Goodman<sup>19</sup>, N. Hanna<sup>9</sup>, L. Harrison<sup>20</sup>, R. Hofer<sup>21</sup>, M. Holtzman<sup>11</sup>, J. Kane<sup>22</sup>, D. Labow<sup>23</sup>, B. Li<sup>13</sup>, A. Lowy<sup>24</sup>, P. Mansfield<sup>17</sup>, E. Ong<sup>25</sup>, C. Pameijer<sup>26</sup>, J. Pingpank<sup>27</sup>, M. Quinones<sup>28</sup>, R. Royal<sup>17</sup>, G. Salti<sup>29</sup>, A. Sardi<sup>30</sup>, P. Shen<sup>2</sup>, J. Skitzki<sup>22</sup>, J. Spellman<sup>31</sup>, J. Stewart<sup>2</sup>, and J. Esquivel<sup>32</sup>

Ann Surg Oncol 2014;21:1501-1505



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## ASPSM Consensus Guidelines

**TABLE 2** American Society of Peritoneal Surface Malignancies standardized HIPEC delivery in patients with colorectal cancer with peritoneal dissemination

1	HIPEC method	Closed
2	Drug	Mitomycin C
3	Dosage	40 mg
4	Timing of drug delivery	30 mg at time 0; 10 mg at 60 min
5	Volume of perfusate	3 L
6	Inflow temperature	42 °C
7	Duration of perfusion	90 min



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### Institutional Learning Curve of Cytoreductive Surgery and Hyperthermic Intraperitoneal Chemoperfusion for Peritoneal Malignancies

Patricio M. Polanco, MD<sup>1</sup>, Ying Ding, PhD<sup>2</sup>, Jordan M. Knox, BA<sup>1</sup>, Lekshmi Ramalingam, MD<sup>1</sup>, Heather Jones, MPA-C<sup>1</sup>, Melissa E. Hogg, MD<sup>1</sup>, Amer H. Zureikat, MD<sup>1</sup>, Matthew P. Holtzman, MD<sup>1</sup>, James Pingpank, MD<sup>1</sup>, Steven Ahrendt, MD<sup>1</sup>, Herbert J. Zeh, MD<sup>1</sup>, David L. Bartlett, MD<sup>1</sup>, and Haroon A. Choudry, MD<sup>1</sup>

<sup>1</sup>Division of Surgical Oncology, University of Pittsburgh Medical Center, Pittsburgh, PA; <sup>2</sup>Department of Biostatistics, University of Pittsburgh, Pittsburgh, PA

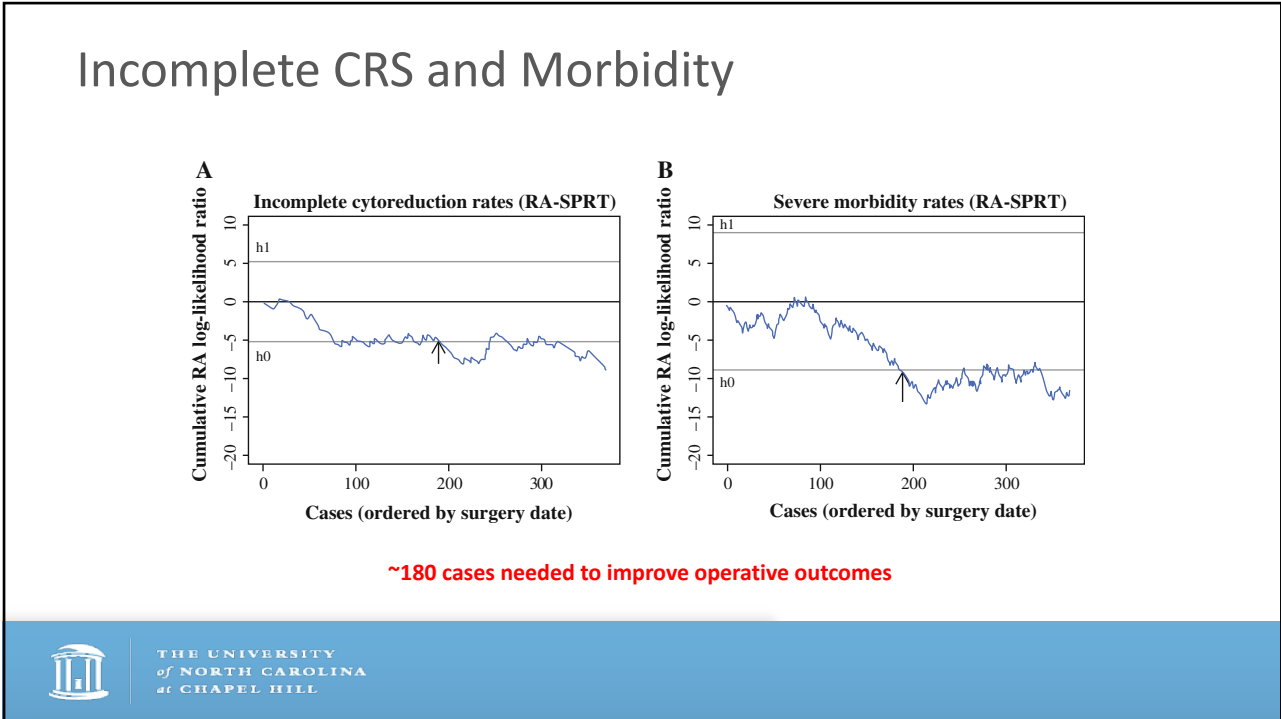
- Single center, retrospective review
- 370 patients
  - Appendiceal/Meso/Gastric (Colon-excluded)
- RA-SPRT
  - Learning curve
  - Incomplete CRS
  - Severe morbidity
- Risk Adjusted-Cumulative Average Probability
  - 1 & 2 yr PFS/OS

[Ann Surg Onc 2015;22:1673-79](#)

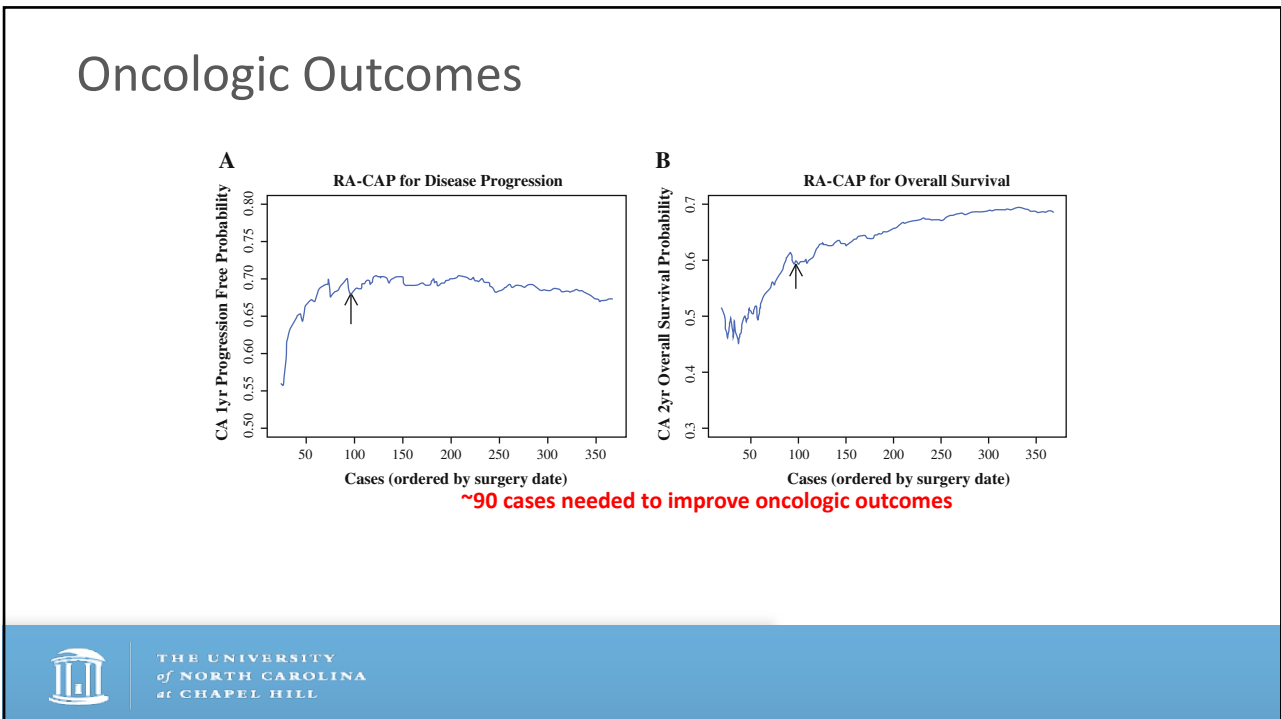


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## The Chicago Consensus on Peritoneal Surface Malignancies: Standards

Chicago Consensus Working Group

**TABLE 1.** Recommended Case Numbers for Individuals Undergoing Cytoreductive Surgery Training

Type of Procedure	Recommended Case No.
Overall cytoreductive surgery cases	20
Diaphragmatic peritonectomy	5
Pelvic peritonectomy	5
Intraperitoneal chemotherapy	5

Cancer 2020; 126:2516-2524



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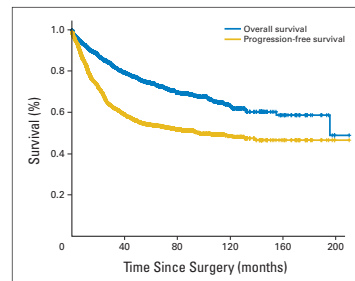
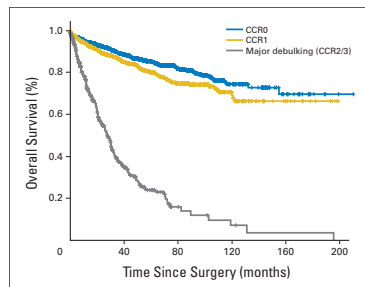
VOLUME 30 · NUMBER 20 · JULY 10 2012

JOURNAL OF CLINICAL ONCOLOGY

ORIGINAL REPORT

### Early- and Long-Term Outcome Data of Patients With Pseudomyxoma Peritonei From Appendiceal Origin Treated by a Strategy of Cytoreductive Surgery and Hyperthermic Intraperitoneal Chemotherapy

Terence C. Chua, Brendan J. Moran, Paul H. Sugarbaker, Edward A. Levine, Olivier Glehen, François N. Gilly, Dario Baratti, Marcello Deraco, Dominique Elias, Armando Sarai, Winston Lian, Tristan D. Yin, Pedro Barriss, Alberto Gómez Portilla, Ignace H.J.T. de Hingh, Wim P. Ceelen, Joerg O. Peltz, Pompiliu Piso, Santiago González-Moreno, Kurt Van Der Speeten, and David L. Morris

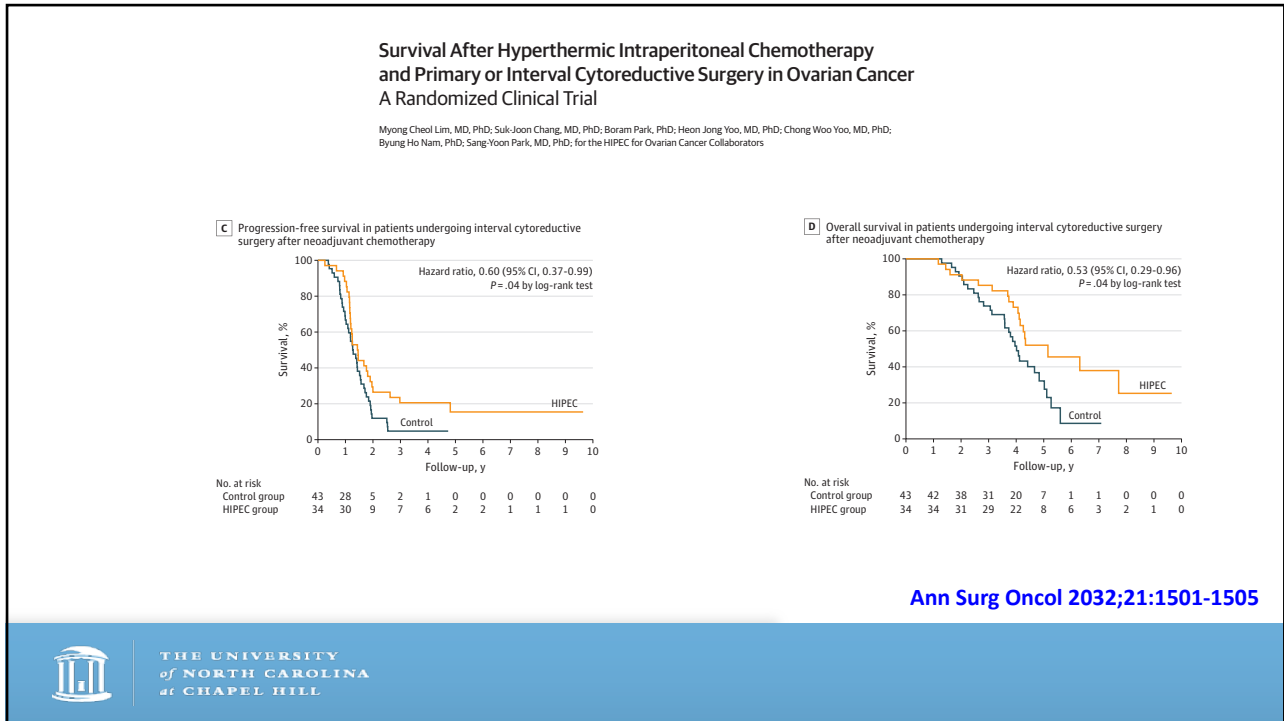


J Clin Oncol 2012;30(20):2449-56

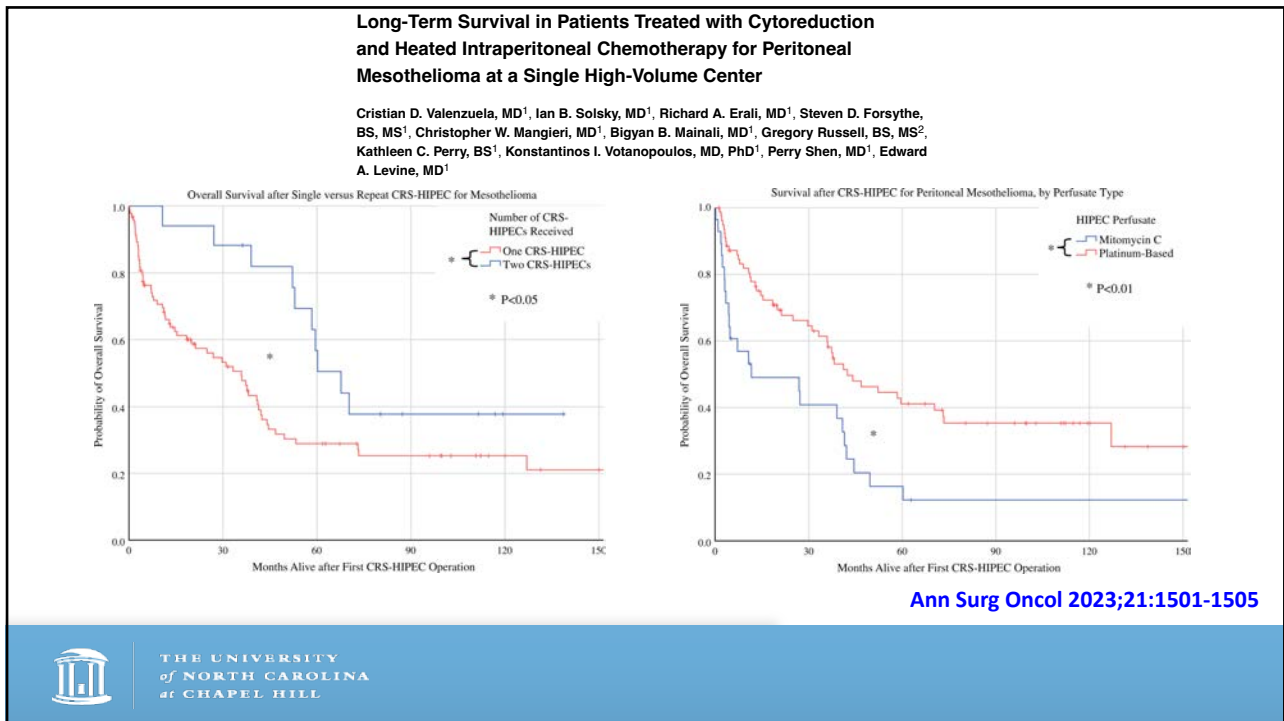


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### 8-Year Follow-up of Randomized Trial: Cytoreduction and Hyperthermic Intraperitoneal Chemotherapy Versus Systemic Chemotherapy in Patients with Peritoneal Carcinomatosis of Colorectal Cancer

Vic J. Verwaal, MD, PhD,<sup>1</sup> Sjoerd Bruin, MD,<sup>1</sup> Henk Boot, MD, PhD,<sup>2</sup> Gooike van Slooten, MD,<sup>1</sup> and Harm van Tinteren, ScM<sup>3</sup>

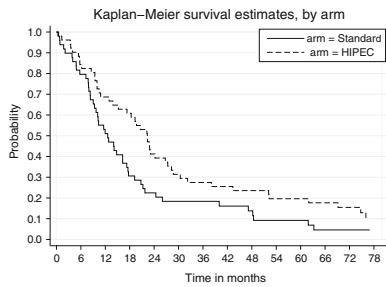


FIG. 2. Disease-specific survival of patients treated for peritoneal carcinomatosis, divided by treatment.

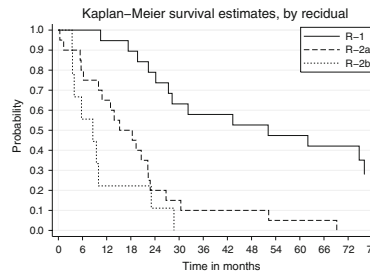


FIG. 3. Long-term results of cytoreduction followed by HIPEC in peritoneal carcinomatosis, divided to completeness of cytoreduction.

Ann Surg Oncol 2008; 15(9):2426-32

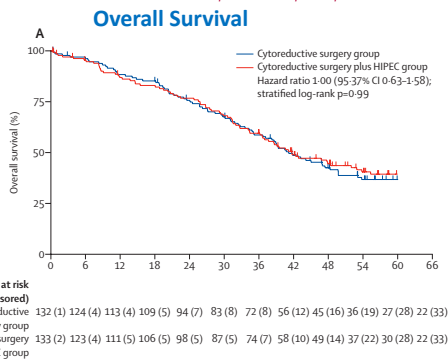


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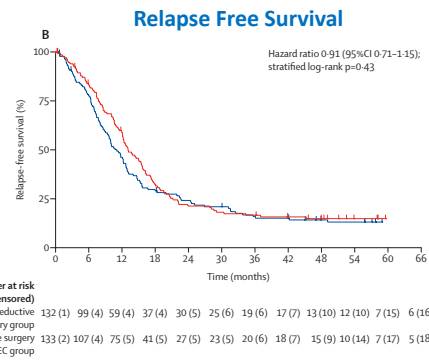
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### Cytoreductive surgery plus hyperthermic intraperitoneal chemotherapy versus cytoreductive surgery alone for colorectal peritoneal metastases (PRODIGE 7): a multicentre, randomised, open-label, phase 3 trial

François Quénet, Dominique Elias, Lise Roca, Diane Goéré, Laurent Ghouti, Marc Pocard, Olivier Facy, Catherine Arvieux, Gérard Lorimier, Denis Pezet, Frédéric Marchal, Valeria Loi, Pierre Meeus, Beata Juzyna, Hélène de Forges, Jacques Paineau, Olivier Glehen, on behalf of UNICANCER-GI Group and BIG Renape Group\*



HIPEC-41.7 mo vs CRS-41.2. mo



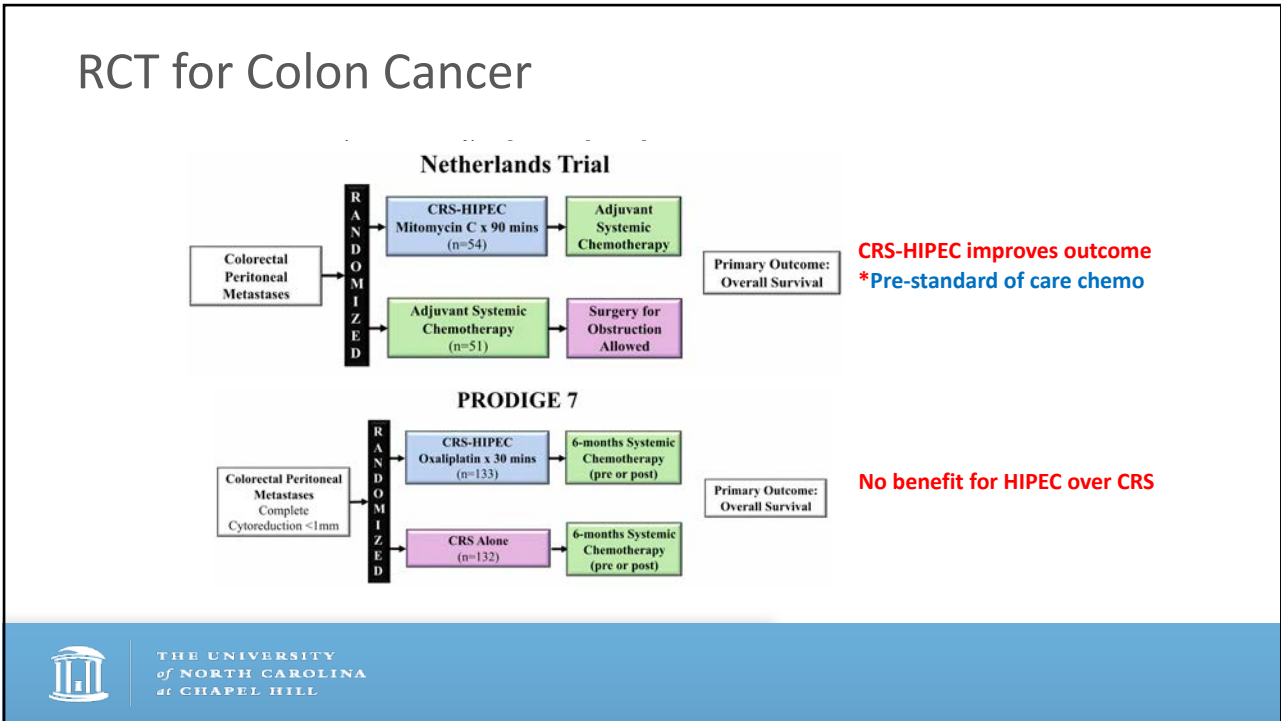
HIPEC-13.1 mo vs CRS-11.1 mo



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Lancet Oncol 2021; 22: 256-66

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## Current state of affairs


 National Comprehensive Cancer Network®

The panel currently believes that complete cytoreductive surgery and/or intraperitoneal chemotherapy can be considered in experienced centers for selected patients with limited peritoneal metastases for whom R0 resection can be achieved. However, the significant morbidity and mortality associated with HIPEC, as well as the conflicting data on clinical efficacy, make this approach very controversial.


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## Chicago Consensus Guidelines

**2018 Chicago Consensus**  
 on Peritoneal Surface Malignancies  
Consensus by the Society of Surgical Oncology and the American Society of Clinical Oncology

### Colorectal Cancer with Synchronous Peritoneal Metastases

Cancer 2020; 126(11): 2534-2540

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- Mesothelioma-Alexander (Rutgers)
- CRC-MMC (Foster)
- Gastric-Badgwell (MDACC)
- High Volume/Unresectable PC
  - Laparoscopic-Deneve (UTHSC/UNC)
  - Bi-Directional-Lambert (Utah)
- PIPAC-Roof/Lee (City of Hope/Stanford)
- Adjuvant HIPEC-Nash (MSKCC)
- Organoids-Levine/Votonopolous (Wake Forest)

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## Regional Therapy for Palliation

- What about patients who are not CRS/HIPEC candidates
  - High volume disease (CCR 2/3)
  - Refractory malignant ascites
  - Unable to tolerate CRS/HIPEC



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## Malignant Ascites

- Pathogenesis
  - Lymphatic obstruction
  - Increased capillary permeability
- Diuretics
- Repeated paracentesis
- Peritoneovenous shunts
- Laparoscopic HIPEC



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## Case Study

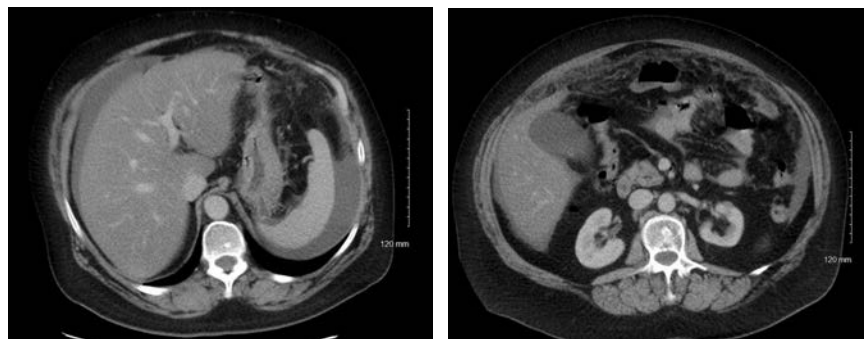
- 58 yo Caucasian female
- RLQ pain 9/2017
  - Colonoscopy 9/25/17-R sided colon cancer
    - Poorly differentiated adenocarcinoma
      - Signet ring cells
      - MSI stable
  - Ascites
- Paracentesis x 2
  - Cytology-positive for adeno
- CEA >400
- FOLFOX x 6 cycles
- CT-Peritoneum only, No Liver/Lung Metastasis



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## Ascites & Omental Caking



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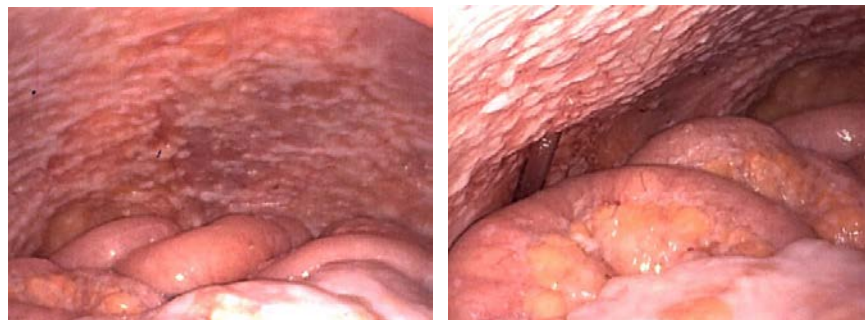
## RUQ & LUQ



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## Pelvis & SB Mesentery



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## Unresectable

- Palliative Chemotherapy
- Supportive Care
- NGS/Molecular Profiling
- Natural HX-Progression of Disease



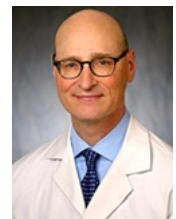
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## SWOG S1316

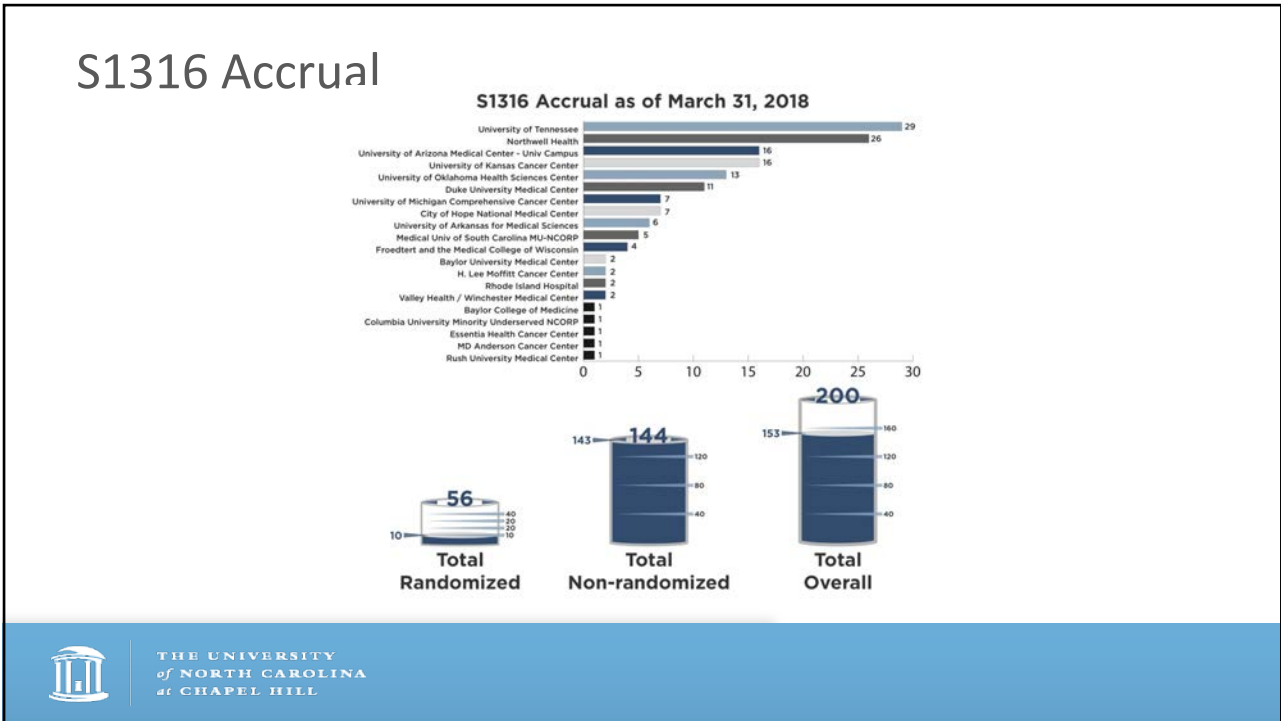


- Prospective Comparative Effectiveness Trial for Malignant Bowel Obstruction
  - PI-Robert Krouse, MD
- Inclusion
  - MBO 2' intra-abdominal cancer
  - ECOG 1-2/Surgical candidate
  - Admitted to the hospital
- End Point: "Good Days"-alive & out of the hospital

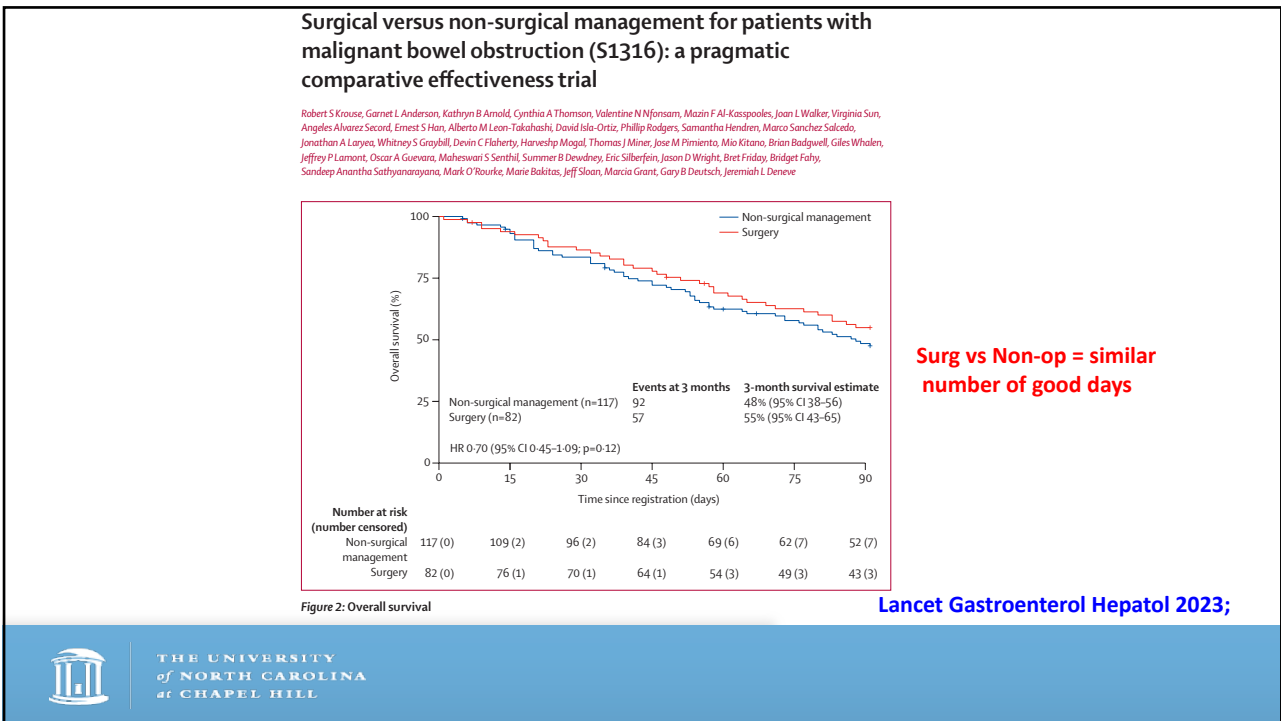


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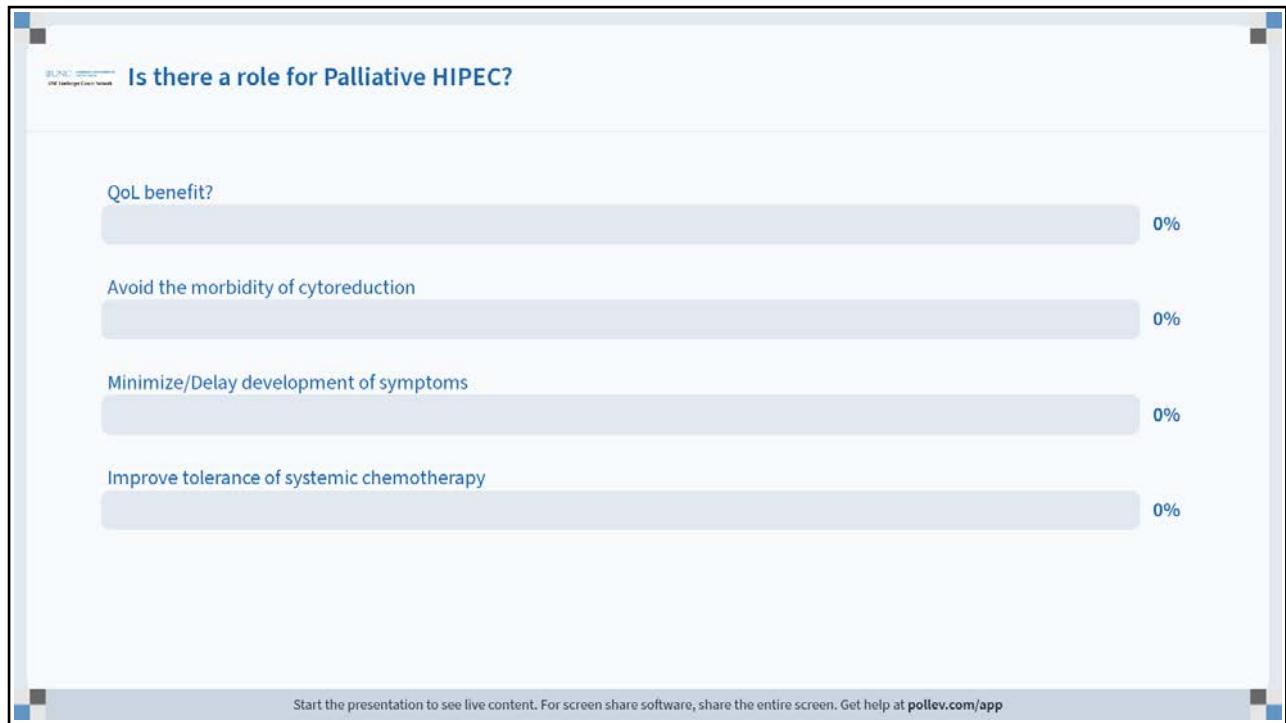
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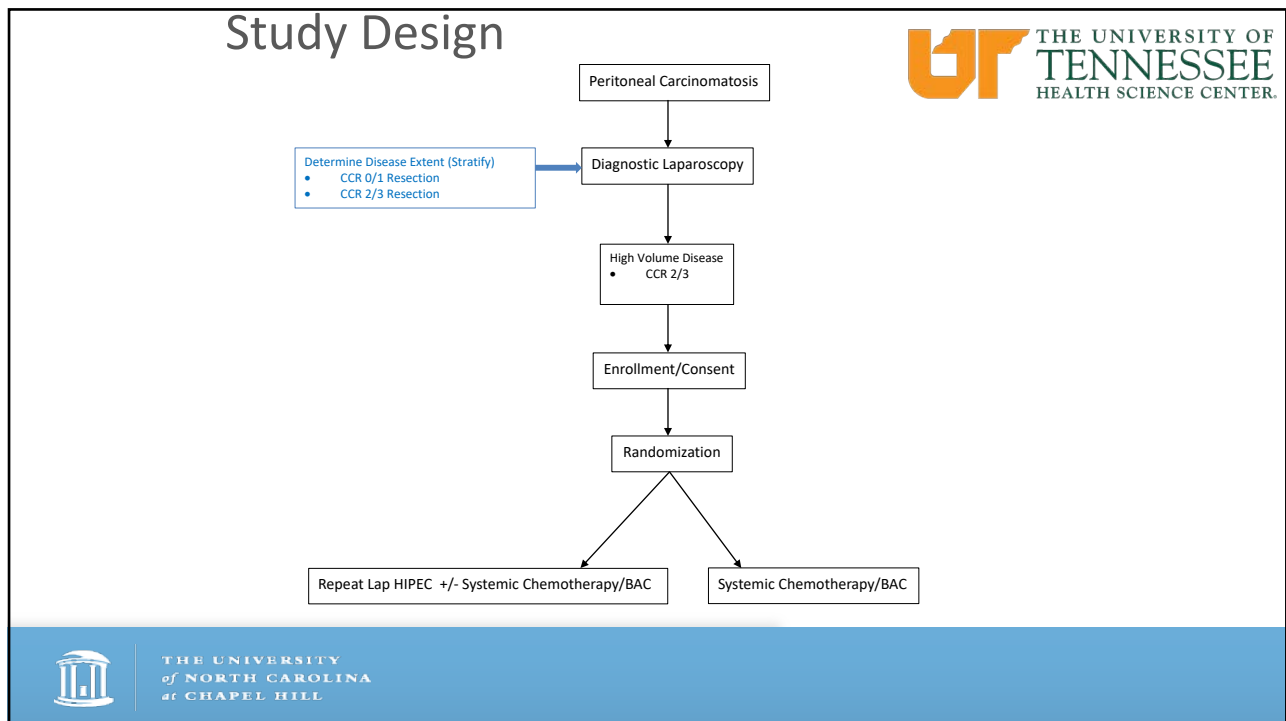
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Ann Surg Oncol (2017) 24:3338–3344  
DOI 10.1245/s10434-017-6047-4

Annals of  
**SURGICAL ONCOLOGY**  
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CrossMark

ORIGINAL ARTICLE – GASTROINTESTINAL ONCOLOGY

**Phase II Trial of Laparoscopic Hyperthermic Intraperitoneal Chemoperfusion for Peritoneal Carcinomatosis or Positive Peritoneal Cytology in Patients with Gastric Adenocarcinoma**

Brian Badgwell, MD, MS<sup>1</sup>, Mariela Blum, MD<sup>2</sup>, Prajnan Das, MD<sup>3</sup>, Jeannelyn Estrella, MD<sup>4</sup>, Xuemei Wang, MS<sup>5</sup>, Linus Ho, MD<sup>2</sup>, Keith Fournier, MD<sup>4</sup>, Richard Royal, MD<sup>1</sup>, Paul Mansfield, MD<sup>1</sup>, and Jaffer Ajani, MD<sup>2</sup>



**FIG. 4** Intraoperative photograph demonstrating cannula placement during laparoscopic hyperthermic intraperitoneal perfusion with chemotherapy

**Ann Surg Oncol 2017;24:3338-3344**

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## Potential Advantages

- Novel treatment alternative
- Symptom Control
  - Ascites
  - Delay progression of disease/MBO
- Low morbidity procedure
- Prospective Tissue Assessment
  - Molecular correlative study

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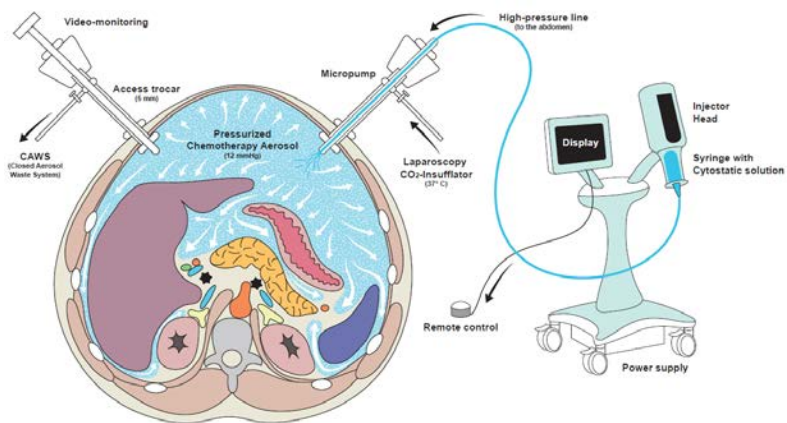
# Pressurized IntraPeritoneal Aerosolized Chemotherapy



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## PIPAC



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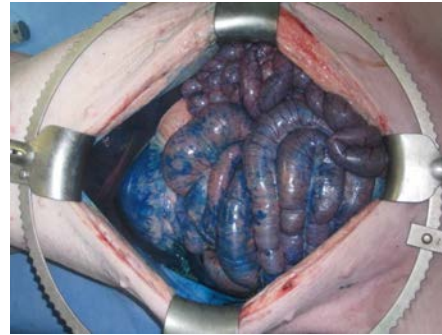
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## Improved tissue absorption

**HIPEC**



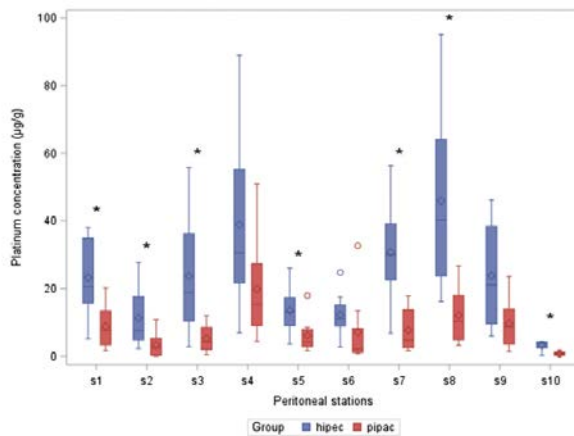
**PIPAC**



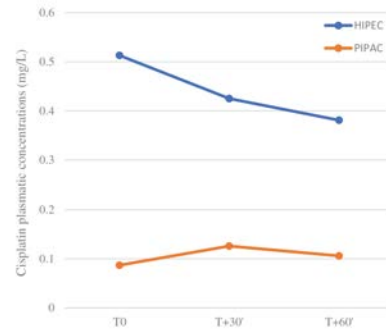
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## Reduced Systemic Absorption



HIPEC: 70 mg/m<sup>2</sup>@ 43° C, 60 min  
PIPAC: 7.5 mg/m<sup>2</sup>, 30 min



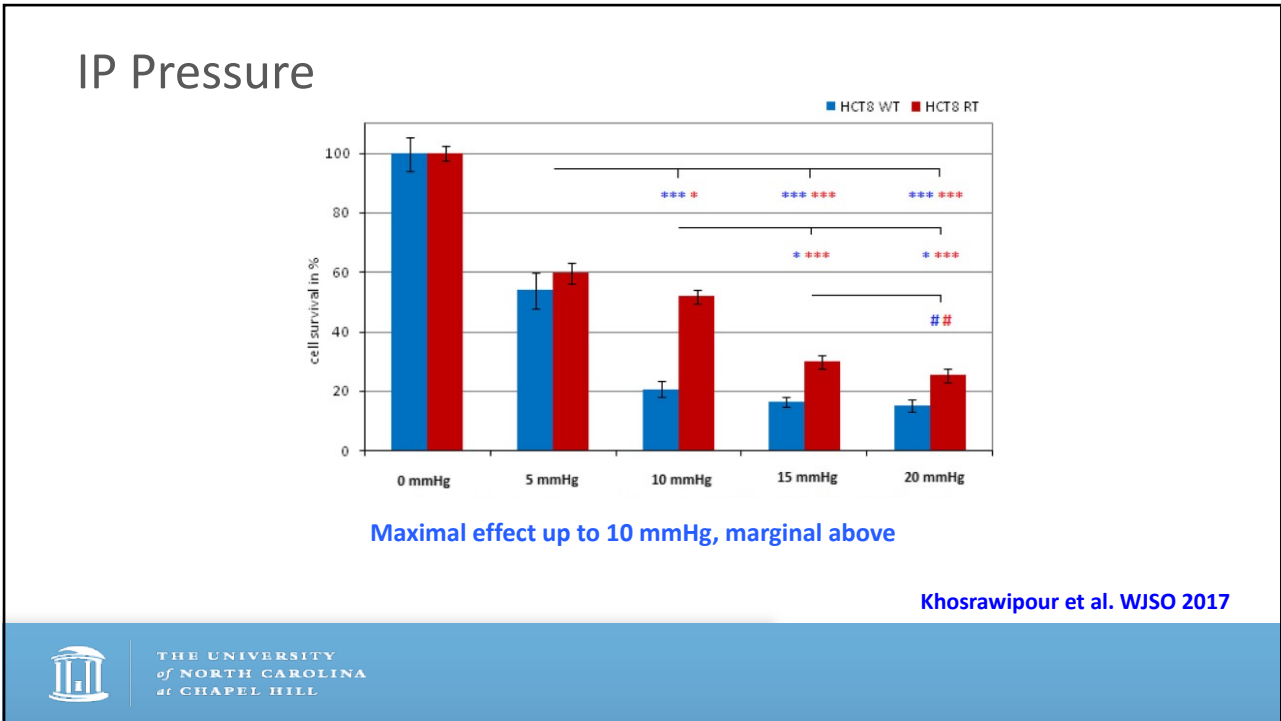
Davigo et al. Int J Hyperthermia 2020



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### Safety and Efficacy of Oxaliplatin Pressurized Intraperitoneal Aerosolized Chemotherapy (PIPAC) in Colorectal and Appendiceal Cancer with Peritoneal Metastases: Results of a Multicenter Phase I Trial in the USA

Mustafa Raouf, MD<sup>1</sup>, Richard L. Whelan, MD<sup>2</sup>, Kevin M. Sullivan, MD<sup>1</sup>, Christopher Ruel, MS<sup>3</sup>, Paul H. Frankel, PhD<sup>2</sup>, Sarah E. Cole, PhD<sup>4</sup>, Raechelle Tinsley, BS, CCRP<sup>5</sup>, Melissa Eng, CRN<sup>6</sup>, Marwan Fakih, MD<sup>6</sup>, Joseph Chao, MD<sup>6</sup>, Dean Lim, MD<sup>6</sup>, Yanghee Woo, MD<sup>1</sup>, Isaac Benjamin Paz, MD<sup>1</sup>, Michael Lew, MD<sup>7</sup>, Michaela Cristea, MD<sup>6</sup>, Lorna Rodriguez-Rodriguez, MD<sup>1</sup>, Yuman Fong, MD<sup>1</sup>, Rebecca Meera Thomas, MD<sup>8</sup>, Sue Chang, MD<sup>9</sup>, Danielle Deperalta, MD<sup>2</sup>, Amit Merchea, MD<sup>10</sup>, and Thanh H. Dellinger, MD<sup>1</sup>

- Phase 1 trial, City of Hope
- 12 patients
- 3 cycles
- 90 mg/m<sup>2</sup> Oxali with 5-FU/LV
- 12 mo OS
- Safe, feasible and efficacious

Ann Surg Oncol 2023

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## Conclusion

- Patients are complex/Multidisciplinary management
- ~100 centers in the United States
  - <200 surgeons
  - Increasing need awareness
- Complex procedures
  - Significant learning curve
- Multidisciplinary effort
- Palliative treatment options
  - Laparoscopic HIPEC/PIPAC
  - Malignant ascites/MBO
- RCT difficult
  - US-based RCT
  - Europeans much better
  - Multicenter collaboration



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**Peritoneal carcinomatosis is an aggressive form of disease spread and characterized by the following manifestations:**

Advanced disease at onset	0%
Malnutrition	0%
Malignant ascites	0%
Progression to malignant obstruction	0%
All of the above	0%

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**Recommended treatment for malignant-related ascites includes all of the following except:**

- Diuretics 0%
- HIPEC-hyperthermic intraperitoneal chemotherapy 0%
- Paracentesis 0%
- PIPAC-pressurized intraperitoneal chemotherapy 0%
- PV Shunt 0%

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**Cytoreduction and hyperthermic intraperitoneal chemotherapy (HIPEC) offer a potential cure for carcinomatosis. HIPEC is characterized by all of the following except:**

- Heat is synergistic with chemotherapy 0%
- High regional concentration of chemotherapy/low systemic toxicity 0%
- Maximum tissue penetration of 3-5 mm 0%
- Short learning curve with low morbidity 0%
- Should be performed at high-volume centers 0%

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