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ANESTHETIC MANAGEMENT OF PERITONITIS AND SEPTIC SHOCK IN COLORECTAL CANCER: A CASE REPORT

Joseph Rusli[1], Angela Mulyana Sugiaman[2], Julia Windi Gunadi[3*]

[1]Departemen Anestesi Fakultas Kedokteran Universitas Kristen Maranatha
[2]Fakultas Kedokteran Universitas Kristen Maranatha
[3]Departemen Fisiologi Fakultas Kedokteran Universitas Kristen Maranatha

[*)]Email Korespondensi : julia.windi@maranatha.ac.id

Abstract: Anesthetic Management of Peritonitis and Septic Shock in Colorectal Cancer: A Case Report. *A 64-year-old male presented with signs of peritonitis, including severe abdominal pain, distension, and dehydration. Laboratory findings showed elevated inflammatory markers (leukocyte count: 19,500/mm³, C-reactive protein: 25 mg/dL), impaired renal function (serum creatinine: 2.1 mg/dL), and metabolic acidosis (pH: 7.25, lactate: 4.5 mmol/L). Imaging revealed a perforated rectal tumor with extensive peritoneal contamination. Emergency exploratory laparotomy was performed, involving tumor resection, colostomy formation, and peritoneal lavage. Hemodynamic instability due to septic shock was managed with norepinephrine to maintain blood pressure. Dobutamine was used to enhance cardiac output, while nitroglycerin supported coronary perfusion to prevent ischemic complications. Postoperatively, the patient required intensive care, including ventilatory support, fluid resuscitation, and tailored antibiotic therapy. Despite complications such as transient paralytic ileus, the patient was extubated on day five and discharged to the general ward by day ten. This case emphasizes the importance of early diagnosis, prompt surgical intervention, and personalized hemodynamic management in malignant-associated peritonitis. Multidisciplinary collaboration is critical to optimizing outcomes. Limitations of this case include its single-patient design. Further research should focus on advanced diagnostic tools and tailored resuscitation protocols to improve the management of similar cases.*

Keywords : *Fluid Resuscitation, Peritonitis, MODS, Septic Shock, Vasopressor Therapy*

Abstrak: Manajemen Anestetik Peritonitis dan Syok Septik pada Kanker Kolorektal: Sebuah Laporan Kasus. Seorang pria berusia 64 tahun datang dengan tanda-tanda peritonitis, berupa nyeri perut hebat, distensi, dan dehidrasi. Hasil laboratorium menunjukkan peningkatan marker inflamasi (jumlah leukosit: 19.500/mm³, C-reactive protein: 25 mg/dL), gangguan fungsi ginjal (kreatinin serum: 2,1 mg/dL), dan asidosis metabolik (pH: 7,25, laktat: 4,5 mmol/L). Pencitraan menunjukkan adanya tumor rektal yang mengalami perforasi dengan kontaminasi peritoneal yang luas. Dilakukan laparotomi eksplorasi darurat, yang mencakup reseksi tumor, pembentukan kolostomi, dan lavage peritoneal. Ketidakstabilan hemodinamik akibat syok septik dikelola dengan norepinefrin untuk mempertahankan tekanan darah. Dobutamin digunakan untuk meningkatkan curah jantung, sementara nitrogliserin mendukung perfusi koroner guna mencegah komplikasi iskemik. Pascaoperasi, pasien memerlukan perawatan intensif, termasuk dukungan ventilasi, resusitasi cairan, dan terapi antibiotik yang disesuaikan. Meskipun mengalami komplikasi berupa ileus paralitik sementara, pasien berhasil diekstubasi pada hari kelima dan dipindahkan ke bangsal umum pada hari kesepuluh. Kasus ini menekankan pentingnya diagnosis dini, intervensi bedah yang cepat, serta manajemen hemodinamik yang dipersonalisasi dalam peritonitis yang terkait dengan keganasan. Kolaborasi multidisiplin sangat penting untuk mengoptimalkan hasil

klinis. Keterbatasan kasus ini adalah desain hanya satu pasien. Penelitian lebih lanjut perlu difokuskan pada alat diagnostik canggih dan protokol resusitasi yang disesuaikan untuk meningkatkan tata laksana kasus serupa.
Kata Kunci : Resusitasi Cairan, Peritonitis, MODS, Syok Septik, Terapi Vasopressor

INTRODUCTION

Peritonitis represents an inflammation of the peritoneum, the protective membrane lining the abdominal cavity and covering abdominal organs. This form of peritonitis is typically classified into two major categories: primary and secondary peritonitis. Primary peritonitis arises in the absence of a direct anatomical disruption, often due to hematogenous or lymphatic spread of pathogens such as microbes—bacteria, fungi, mycobacteria, or chlamydia—penetrating the sterile abdominal cavity. Secondary peritonitis, which is more prevalent, occurs when bacteria or other microbes enter the abdominal cavity as a consequence of a perforation, traumatic injury, or pathological condition within the abdominal cavity, such as appendicitis, perforated diverticulitis, or gastrointestinal malignancy (F. Charles Brunicardiz et al., 2023; TOWNSEND et al., 2021).

Peritonitis has a markedly higher mortality in patients older than 50 years. In the setting of rectal adenocarcinoma, age-related vulnerability compounded by perforation and septic shock further deteriorates outcomes. Rectal adenocarcinoma disrupts bowel-wall integrity, predisposing to ischemia and perforation; consequent bacterial translocation can trigger peritonitis, sepsis, and other life-threatening complications. Tumor-induced bowel obstruction can elevate intraluminal pressure, leading to accelerated necrosis and perforation, which allows pathogens or irritants to enter the peritoneal cavity and trigger severe inflammatory responses. This intrusion triggers an intense immune response characterized by cytokine release, complement activation, and neutrophilic infiltration. While these responses aim to contain the infection, they frequently result in collateral tissue damage, increased capillary permeability, and fluid shifts into the peritoneal space, causing hypovolemia and impaired organ perfusion. If this inflammatory response remains unchecked, it transitions into systemic inflammation, contributing to septic shock and MODS. The hallmark of septic shock in peritonitis is persistent hypotension resistant to fluid resuscitation, accompanied by tissue hypoxia and metabolic acidosis (Evans et al., 2021; Ross et al., 2018).

Diagnosing peritonitis can be complex due to the variability in its clinical presentation. While classic signs such as rebound tenderness, abdominal rigidity, and absent bowel sounds are helpful, they may be absent or masked in elderly or immunocompromised patients. Imaging modalities such as ultrasound and computed tomography (CT) are critical tools, with CT scans providing superior sensitivity and specificity. However, reliance on advanced imaging can be a limitation in resource-constrained settings (Macdonald, 2022). Anesthetic management in critically ill patients with peritonitis and septic shock requires a nuanced approach. The primary goals include maintaining hemodynamic stability, ensuring adequate oxygen delivery, and minimizing perioperative complications. Vasopressors, such as norepinephrine, play a vital role in supporting blood pressure, while judicious fluid management prevents complications from both hypovolemia and fluid overload. Sedation with agents like propofol must be carefully titrated to avoid compromising cardiac output (Evans et al., 2021; Faintuch & Faintuch, 2024; Hamzaoui et al., 2017).

This case report is unique because it illustrates the anesthetic and perioperative management of a 64-year-old male with secondary peritonitis caused by rectal adenocarcinoma perforation, complicated by septic shock, MODS, and severe dehydration. This study aims to highlight the critical importance of timely diagnosis, aggressive resuscitation,

multidisciplinary collaboration, and evidence-based anesthetic techniques in optimizing outcomes, emphasizing the broader challenges associated with managing critically ill patients with gastrointestinal malignancies.

CASE REPORT

A 64-year-old male presented to the emergency department with severe abdominal pain, progressive distension, and signs of dehydration. On admission, vital signs revealed a temperature of 38.5°C, heart rate of 120 bpm, respiratory rate of 24 breaths/min, blood pressure of 90/60 mmHg, and oxygen saturation of 94% on room air. Physical examination findings included marked abdominal tenderness with rebound tenderness, guarding, and absent bowel sounds, consistent with peritonitis. Initial laboratory investigations, as shown in Table 1, demonstrated elevated inflammatory markers, including a white blood cell count of 19,500/mm³ and C-reactive protein of 25 mg/dL. Renal function tests indicated acute kidney injury with a serum creatinine of 2.1 mg/dL. Arterial blood gas analysis revealed metabolic acidosis (pH 7.25, lactate 4.5 mmol/L). The elevated markers and acidosis confirmed the severity of the systemic inflammatory response. Liver function tests and coagulation profiles were within normal limits.

Table 1. Initial Laboratory Results Upon Admission

Laboratory Test	Result	Normal range
White Blood Cell Count	19,500/mm³	4,000–11,000/mm³
C-Reactive Protein	25 mg/dL	<1.0 mg/dL
Serum Creatinine	2.1 mg/dL	0.7–1.3 mg/dL
pH (ABG)	7.25	7.35–7.45
Lactate	4.5 mmol/L	<2.0 mmol/L

An abdominal ultrasound showed free peritoneal fluid, suggestive of peritonitis, but failed to identify the source of perforation. A subsequent contrast-enhanced CT scan revealed a perforated rectal tumor with diffuse peritoneal contamination and abscess formation. An emergency exploratory laparotomy was performed to address the patient's critical condition. Upon entering the abdominal cavity, extensive findings were noted, including a perforated rectal adenocarcinoma with significant peritoneal contamination, fibrinous exudates, and adhesions involving adjacent bowel loops. The perforation had caused widespread peritoneal infection, with abscess formation in multiple quadrants. A resection of the rectal tumor with colostomy formation was carried out. Extensive adhesiolysis was conducted to separate adherent bowel loops, facilitating a thorough examination of the peritoneal cavity. Large volumes of purulent material and necrotic debris were evacuated, followed by meticulous peritoneal lavage using warmed saline to reduce the bacterial load and remove contaminants. The procedure aimed to achieve optimal source control, an essential component in managing secondary peritonitis.

Intraoperatively, norepinephrine was administered to counteract profound hypotension caused by septic shock, a consequence of systemic inflammation and vascular collapse due to peritonitis. The patient was transferred to the ICU postoperatively, where he was managed with mechanical ventilation on volume-controlled settings (tidal volume: 6 mL/kg, PEEP: 8 cm H_2O, FiO_2: 40%) to optimize oxygenation and reduce lung injury risk. Aggressive fluid resuscitation continued, with balanced crystalloids to maintain adequate urine output and hemodynamic stability. Norepinephrine

infusion was gradually tapered over 48 hours, and antibiotics were escalated to meropenem and vancomycin based on culture sensitivity. Postoperative complications included transient paralytic ileus, managed conservatively. The patient was extubated on postoperative day 5 and discharged to a general ward by day 10.

DISCUSSION

This case highlights the complexity of managing peritonitis in a 64-year-old male with a perforated rectal adenocarcinoma, complicated by multiple organ dysfunction syndrome (MODS). The patient presented in septic shock, with metabolic acidosis, acute kidney injury, and signs of significant systemic inflammation, underscoring the critical need for rapid and comprehensive intervention.

Colorectal cancer is the most common malignancy of the gastrointestinal tract. Perforation and subsequent leakage of intestinal contents in colorectal cancer can lead to peritonitis and eventually sepsis if left untreated (Hafner et al., 2024). Managing peritonitis promptly involves aggressive fluid therapy and immediate surgical intervention. Surgical complications can include issues like enterocutaneous fistulas, infections at the incision site, sepsis, and failure of multiple organs (Evans et al., 2021). The presence of multiple organ dysfunction syndrome (MODS) further complicates the clinical picture, a significant predictor of mortality in critically ill patients. Prolonged intensive care and advanced life support may be necessary to manage the complex physiological disturbances associated with MODS (Asim et al., 2020).

Characterized by widespread vasodilation, septic shock is a critical type of distributive shock triggered by inducible nitric oxide synthase activation. This activation leads to the hyperpolarization of vascular smooth muscle cells, making them less reactive to alpha-adrenergic stimuli, which ultimately lowers blood pressure and hinders blood flow to key organs (Carlos Sanchez et al., 2023). Hemodynamic instability is a hallmark of septic shock, requiring prompt and aggressive management (Carlos Sanchez et al., 2023; Evans et al., 2021; Macdonald, 2022). The key purpose of IV fluid administration in cases of circulatory shock is to raise cardiac output by expanding preload, the blood volume that fills the heart chambers (Carlos Sanchez et al., 2023).

As the primary vasopressor for managing sepsis and septic shock, norepinephrine is recommended by the 2018 International Survivorship Sepsis Campaign guidelines to be started within the first hour of resuscitation for fluid-refractory septic shock patients. Norepinephrine enhances left ventricular systolic function due to its positive inotropic effects (beta-adrenergic), which may improve metrics like ejection fraction or velocity time integral. This effect results from the direct stimulation of myocardial β1-adrenergic receptors and a rise in diastolic arterial pressure, leading to better coronary perfusion. The addition of dobutamine was warranted in this scenario to enhance myocardial contractility, particularly as septic shock often leads to myocardial depression. Nitroglycerin was employed to mitigate ischemia and support coronary perfusion during hemodynamic instability (Hamzaoui et al., 2017; Rasslan et al., 2024; Wang et al., 2021).

Propofol was chosen for sedation due to its favorable hemodynamic profile and ability to reduce oxygen demand. However, its dose was carefully titrated to avoid exacerbating hypotension. In septic patients, the choice of sedative agents must balance the need for adequate sedation with the potential impact on cardiovascular stability (Macdonald, 2022). The intraoperative period posed challenges, including severe dehydration and the absence of urine output. Hemodynamic monitoring, including blood pressure and heart rate, guided the administration of fluids and vasopressors (Biondo et al., 2019; Macdonald, 2022).

Postoperative management in cases of peritonitis and septic shock is fraught with challenges, particularly due to the risk of persistent infection, MODS,

and sepsis-related immunosuppression. In this case, the patient's transfer to the ICU allowed for close monitoring and intensive management of complications, such as persistent hypotension and renal dysfunction. Ventilatory support was critical in managing respiratory failure, likely due to systemic inflammation and fluid overload, and settings were adjusted based on arterial blood gas analysis, ensuring optimal oxygenation while minimizing the risk of barotrauma or volutrauma (Asim et al., 2020).

Nutritional support, initiated via parenteral routes, played a vital role in addressing the hypercatabolic state induced by sepsis. Adequate caloric and protein intake is essential to prevent muscle wasting, support immune function, and promote wound healing. The use of sedation with propofol facilitated patient comfort and ventilator synchrony, reducing the risk of secondary complications like ventilator-associated pneumonia (Asim et al., 2020; Evans et al., 2021; Macdonald, 2022).

While peritonitis secondary to gastrointestinal perforation is a well-recognized emergency, perforation of a colorectal cancer is relatively uncommon and carries a particularly poor prognosis, with a long-term mortality rate 77.7% and 44% in a study (Gök et al., 2021). Reports of such cases consistently highlight the difficulty of balancing timely surgical intervention with the need for hemodynamic stabilization (Scott, 2024).

Two case reports have described cases regarding elderly patients with perforated rectal cancer, accompanied by peritonitis and septic shock. Cragle and colleagues reported a case of a 68-year-old man who presented in septic shock due to a perforated low-rectal adenocarcinoma. The tumor perforation led to a severe necrotizing soft tissue infection in the perineal region. Management included emergent diversion with a colostomy, multiple surgical debridements, and an urgent robotic-assisted abdominoperineal resection once the patient was stabilized. This case underscores the importance of prompt source control and multidisciplinary critical care in an elderly patient with a perforated rectal cancer causing sepsis, similar to the scenario in our patient (Cragle et al., 2022). Ricciardi *et al.* described an obese 65-year-old female who developed diffuse fecal peritonitis and septic shock from an obstructing sigmoid colon cancer with transverse colon perforations. She arrived hypotensive (BP 90/60), tachycardic (HR 130), tachypneic (RR 28), and hypoxemic (O_2 saturation 89%), reflecting severe septic shock. An emergency damage-control surgery was performed (resecting the perforated colon segment) followed by transfer to the ICU for continued resuscitation with mechanical ventilation and vasopressor support. Unfortunately, despite aggressive management, the patient died 18 hours postoperatively. This report highlights the high mortality associated with colorectal perforation in elderly septic patients and emphasizes the need for timely surgery, intensive care support (hemodynamic stabilization, ventilation), and strategic anesthetic management (e.g. staged or damage-control procedures) to improve outcomes (Ricciardi, 2023).

These cases, both in older patients, illustrate the critical nature of perforated colorectal tumors leading to generalized peritonitis and septic shock. They reinforce that immediate surgical intervention for source control, coupled with ICU measures (fluid resuscitation, vasopressors, and protective mechanical ventilation), is key to managing such life-threatening presentations. In line with this, emergency surgery guidelines note that a tumor perforation with free fecal spillage often results in diffuse peritonitis and septic shock, with patients presenting acutely ill (fever, tachycardia, tachypnea, etc.)—mirroring the clinical picture and management challenges described in our case (Pisano et al., 2018).

Compared to other published cases, our patient presented with severe dehydration, metabolic acidosis, and anuric renal failure, all of which increased anesthetic risk. These factors necessitated careful titration of fluid therapy and vasopressors. While

norepinephrine remains the first-line agent for septic shock , dobutamine was added in this case due to septic myocardial depression (Evans et al., 2021). The concurrent use of nitroglycerin to optimize coronary perfusion further reflected the need for individualized hemodynamic management.

The choice of sedation was another key anesthetic consideration. Propofol was selected for induction and maintenance due to its predictable profile, but doses were carefully minimized to avoid worsening hypotension. Previous case reports have emphasized the importance of using lower doses or alternative agents in critically ill septic patients (Macdonald, 2022). In this context, our approach underscores the necessity of balancing adequate depth of anesthesia with cardiovascular stability.

Another important aspect was the intraoperative fluid strategy. While crystalloids were required to restore intravascular volume, excessive resuscitation risked worsening capillary leak and pulmonary edema. Close hemodynamic monitoring guided a restricted yet targeted fluid administration approach, consistent with recent recommendations to individualize resuscitation in sepsis rather than relying on fixed volumes (Suh et al., 2023).

Surgically, resection of the perforated rectal adenocarcinoma achieved source control, which remains the cornerstone of managing peritonitis. In published cases, delays in achieving source control are consistently associated with poorer outcomes In published cases, delays in achieving source control are consistently associated with poorer outcomes (De Waele, 2024). In our patient, the timely laparotomy likely contributed to the eventual stabilization despite severe MODS. The postoperative course reinforced the importance of multidisciplinary ICU care, including ventilatory support, renal monitoring, and nutritional therapy. This aligns with previous reports that emphasize comprehensive postoperative support as a determinant of survival in similar patients (Piekarska et al., 2024).

This case underscores several key clinical implications. First, early and aggressive resuscitation is vital to stabilizing hemodynamics and preventing further progression of organ dysfunction. The successful use of early goal-directed therapy (EGDT) in this patient demonstrates its practical value in improving outcomes. Second, source control through timely surgical intervention remains the cornerstone of managing secondary peritonitis. In this case, the resection of the perforated rectal adenocarcinoma not only addressed the immediate source of infection but also provided an opportunity to mitigate tumor-related complications. The patient's successful recovery underscores the value of a well-coordinated multidisciplinary team, including surgeons, anesthesiologists, intensivists, and nursing staff, working together to manage critically ill patients with multiple comorbidities. This approach, along with individualized treatment strategies and dynamic reassessment, plays a key role in optimizing patient outcomes.

Given the complexity of such cases, future research should focus on refining fluid resuscitation protocols, developing novel diagnostic tools, and investigating the role of immunomodulatory therapies to prevent MODS and improve survival in septic shock. Furthermore, the case illustrates the importance of tailoring fluid resuscitation to the patient's dynamic clinical status, helping to avoid fluid overload, a known risk factor for prolonged ICU stays and increased mortality in septic shock. The comprehensive, multidisciplinary care approach ensured that both the immediate and long-term needs of the patient were addressed.

This case report has several limitations that impact its generalizability and broader applicability. Being a single-patient study, it primarily reflects individual clinical circumstances and responses, which may not represent the full spectrum of patients with peritonitis

caused by rectal adenocarcinoma. The absence of long-term follow-up data limits insights into oncological and functional outcomes, such as cancer recurrence, survival rates, or the quality of life post-surgery. Additionally, the report does not provide a comparative analysis with other surgical options, such as primary anastomosis or minimally invasive techniques, which could add context to the decision-making process.

CONCLUSION

This case underscores the critical importance of early diagnosis, prompt intervention, and a coordinated, multidisciplinary approach to managing complex cases of peritonitis, particularly those complicated by septic shock, MODS, and rectal adenocarcinoma. The case offers valuable clinical lessons that can guide future management strategies in similar high-risk patients through tailored hemodynamic management (use of vasopressor and fluid resuscitation), early surgical intervention in patients with rectal adenocarcinoma with perforation and septic shock, the valuable insight of USG and CT Scan as diagnostic tools, and multidisciplinary coordination between surgeons, anesthesiologists, intensivists, and nursing staff.

The study is limited to a single-patient design and does not provide details on the patient's long-term follow up. Further randomized controlled trial studies, novel diagnostic tests, immunomodulatory therapies, minimally invasive surgical approaches, and global protocol development should be elaborated in future studies.

REFERENCES

Asim, M., Amin, F., & El-Menyar, A. (2020). Multiple organ dysfunction syndrome: Contemporary insights on the clinicopathological spectrum. *Qatar Medical Journal*, *2020*(2). https://doi.org/10.5339/qmj.2020.22

Biondo, S., Gálvez, A., Ramírez, E., Frago, R., & Kreisler, E. (2019). Emergency surgery for obstructing and perforated colon cancer: patterns of recurrence and prognostic factors. *Techniques in Coloproctology*, *23*(12), 1141–1161. https://doi.org/10.1007/s10151-019-02110-x

Carlos Sanchez, E., Pinsky, M. R., Sinha, S., Mishra, R. C., Lopa, A. J., & Chatterjee, R. (2023). Fluids and Early Vasopressors in the Management of Septic Shock: Do We Have the Right Answers Yet? *Journal of Critical Care Medicine (Universitatea de Medicina Si Farmacie Din Targu-Mures)*, *9*(3), 138–147. https://doi.org/10.2478/jccm-2023-0022

Cragle, C. E., Schlenker, J., Moonka, R., Wiebusch, A., & Simianu, V. V. (2022). Presentation and management of a case of rectal cancer complicated by perforation and necrotizing soft tissue infection. *Journal of Surgical Case Reports*, *2022*(7), rjac318. https://doi.org/10.1093/jscr/rjac318

De Waele, J. J. (2024). Importance of timely and adequate source control in sepsis and septic shock. *Journal of Intensive Medicine*, *4*(3), 281–286. https://doi.org/https://doi.org/10.1016/j.jointm.2024.01.002

Evans, L., Rhodes, A., Alhazzani, W., Antonelli, M., Coopersmith, C. M., French, C., Machado, F. R., Mcintyre, L., Ostermann, M., Prescott, H. C., Schorr, C., Simpson, S., Wiersinga, W. J., Alshamsi, F., Angus, D. C., Arabi, Y., Azevedo, L., Beale, R., Beilman, G., … Levy, M. (2021). Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock 2021. *Critical Care Medicine*, *49*(11), e1063–e1143. https://doi.org/10.1097/CCM.0000000000005337

F. Charles Brunicardiz, Dana K. Andersen, Timothy R. Billiar, David L. Dunn, & John G. Hunter. (2023). Schwartz's Principles of Surgery. In Mark H. Swartz (Ed.), *Schwartz's Principles Of Surgery* (11th ed.).

MCGrawHill. https://doi.org/10.33029/978-5-9704-8033-5-pss1-2023-1-784

Faintuch, J., & Faintuch, S. (Eds.). (2024). *Recent Strategies in High Risk Surgery*. Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-56270-9

Gök, M. A., Kafadar, M. T., & Yeğen, S. F. (2021). Perforated colorectal cancers: clinical outcomes of 18 patients who underwent emergency surgery. *Przeglad Gastroenterologiczny*, *16*(2), 161–165. https://doi.org/10.5114/pg.2021.106667

Hafner, J., Tuma, F., Hoilat, G. J., & Marar, O. (2024). *Intestinal Perforation*.

Hamzaoui, O., Scheeren, T. W. L., & Teboul, J.-L. (2017). Norepinephrine in septic shock: when and how much? *Current Opinion in Critical Care*, *23*(4), 342–347. https://doi.org/10.1097/MCC.0000000000000418

Macdonald, S. (2022). Fluid Resuscitation in Patients Presenting with Sepsis: Current Insights. *Open Access Emergency Medicine*, *Volume 14*, 633–638. https://doi.org/10.2147/OAEM.S363520

Piekarska, B., Prusisz, M., Włodarczyk, M., Włodarczyk, J., Porc, M., Bilińska, I., Maryńczak, K., & Dziki, Ł. (2024). The Impact of Preoperative and Postoperative Nutritional Interventions on Treatment Outcomes and Quality of Life in Colorectal Cancer Patients—A Comprehensive Review. In *Medicina* (Vol. 60, Issue 10). https://doi.org/10.3390/medicina60101587

Pisano, M., Zorcolo, L., Merli, C., Cimbanassi, S., Poiasina, E., Ceresoli, M., Agresta, F., Allievi, N., Bellanova, G., Coccolini, F., Coy, C., Fugazzola, P., Martinez, C. A., Montori, G., Paolillo, C., Penachim, T. J., Pereira, B., Reis, T., Restivo, A., … Ansaloni, L. (2018). 2017 WSES guidelines on colon and rectal cancer emergencies: obstruction and perforation. *World Journal of Emergency Surgery*, *13*(1), 36. https://doi.org/10.1186/s13017-018-0192-3

Rasslan, R., de Oliveira Ferreira, F., Parra, J. A. P., da Costa Ferreira Novo, F., Menegozzo, C. A. M., Alves, P. H. F., Bertolli, E., Damous, S. H. B., Rasslan, S., & Utiyama, E. M. (2024). Damage control surgery in non-traumatic abdominal emergencies: prognostic value of SOFA, APACHEII, and Mannheim peritonitis index. *Updates in Surgery*. https://doi.org/10.1007/s13304-024-01984-3

Ricciardi, J. (2023). Damage control surgery by transverse colon perforation: case report. *MOJ Surgery*, *11*, 110–112. https://doi.org/10.15406/mojs.2023.11.00234

Ross, J. T., Matthay, M. A., & Harris, H. W. (2018). Secondary peritonitis: principles of diagnosis and intervention. *BMJ*, k1407. https://doi.org/10.1136/bmj.k1407

Scott, M. J. (2024). Perioperative Patients With Hemodynamic Instability: Consensus Recommendations of the Anesthesia Patient Safety Foundation. *Anesthesia and Analgesia*, *138*(4), 713–724. https://doi.org/10.1213/ANE.0000000000006789

Suh, G. J., Shin, T. G., Kwon, W. Y., Kim, K., Jo, Y. H., Choi, S.-H., Chung, S. P., & Kim, W. Y. (2023). Hemodynamic management of septic shock: beyond the Surviving Sepsis Campaign guidelines. *Clinical and Experimental Emergency Medicine*, *10*(3), 255–264. https://doi.org/10.15441/ceem.23.065

Townsend, J. C. M., Beauchamp, R. D., Evers, B. M., & Mattox, K. L. (2021). *Sabiston Textbook of Surgery: The Biological Basis of Modern Surgical Practice. 21st ed.*

Wang, L., Ma, X., He, H., Su, L., Guo, Y., Shan, G., Wang, Y., Zhou, X., Liu, D., & Long, Y. (2021). Compliance with the Surviving Sepsis Campaign guideline 1-hour bundle for septic shock in China in 2018. *Annals of Translational Medicine*, *9*(4), 278–278. https://doi.org/10.21037/atm-20-5429