**Journal of Local Therapy**
**Vol. 05, No. 1, 2026**
**p-ISSN: 2809-3240; e-ISSN: 2810-0875**
**pp: 40-48**

# Preoperative Nutrition in a Malnourished Child with Cryptorchidism and Irreducible Inguinal Hernia: Case Report

Meintansari Manik[1]*, Nyono Dedi Prabowo[2]
[1,2]Nutrition Study Program, Universitas Negeri Medan
[1]Department of Nutrition Science, Postgraduate Program, Universitas Sebelas Maret
*E-mail: meintansari@unimed.ac.id

***Abstract:*** *The management of irreducible inguinal hernia with cryptorchidism is complicated by malnutrition, creating a "surgical-nutritional paradox" where surgical urgency conflicts with metabolic fragility. This case report elucidates the integrated nutritional management of a 10-year-old male presenting with an undescended testis, incarcerated hernia, and wasting. Methods: Utilizing the standardized Nutrition Care Process Terminology, a 72-hour preoperative "metabolic priming" strategy was implemented. This involved a High-Energy High-Protein (HEHP) diet synergized with Metamizole for pain and Dexamethasone for appetite stimulation to maintain the oral route. The intervention reversed the "Pain-Anorexia Cycle," increasing oral intake from a 52.3% deficit to 115.5% hyper-alimentation within three days. This optimization replenished glycogen stores, allowing for successful orchidopexy and herniotomy without complications. Short-term, aggressive preoperative nutritional support serves as a vital therapeutic bridge in hemodynamically stable patients, challenging the dogma of immediate incision.*

***Keywords:*** *Cryptorchidism, Hernia Inguinal, Preoperative Nutrition.*

## INTRODUCTION

Cryptorchidism (Holmboe et al., 2024) and Inguinal hernia constitutes a prevalent spectrum of inguinoscrotal pathology in pediatric surgery (Mourad & Kharbutli, 2023), sharing a common embryological etiology through the failure of the processus vaginalis to close (Favorito et al., 2017). While elective surgical correction—orchidopexy and herniotomy—is the gold standard (Shandilaya & Joshi, 2025), the clinical trajectory becomes markedly complex when the presentation involves incarceration or irreducibility (Farrell et al., 2025). An irreducible inguinal hernia represents a critical juncture in pediatric care; it transforms a routine anomaly into a potential surgical emergency, carrying the risk of bowel strangulation, testicular atrophy due to cord compression, and significant tissue ischemia (You et al., 2025).

The physiological burden of this surgical pathology is frequently compounded by pediatric malnutrition (Koofy et al., 2021), a silent comorbidity that fundamentally alters the patient's capacity for recovery (Roberson et al., 2021). Malnutrition is not merely a deficit of anthropometric indices but a systemic compromise of metabolic reserve (Wen et al., 2022). In the surgical candidate, undernutrition creates a state of physiological fragility (Keerio et al., 2024), characterized by impaired immune competence, reduced wound tensile strength, and a heightened susceptibility to nosocomial infections (Zhu et al., 2024). When a malnourished child faces the dual assault of an irreducible hernia and the requisite surgical trauma, the risk of perioperative morbidity escalates exponentially.

In this high-risk scenario, preoperative nutritional support transitions from a supportive role to a critical therapeutic imperative (Krasnovsky et al., 2024). The preoperative phase, however brief due to surgical urgency, serves as a vital "metabolic window" to intervene against the catabolic surge (Schricker & Lattermann, 2015) induced by stress and anesthesia. Without adequate nutritional priming, a malnourished child enters surgery with depleted glycogen stores (Lakananurak & Gramlich, 2020) and

electrolyte instability (Raza et al., 2020), leaving them ill-equipped to handle the metabolic insult of the procedure. Thus, aggressive and targeted nutritional optimization prior to incision is essential to attenuate the stress response and preserve lean body mass (Hirsch et al., 2021).

Despite the clear physiological rationale, the integration of acute nutritional resuscitation within the tight timeframe of semi-urgent surgery (Persatuan Ahli Gizi Indonesia & Asosiasi Dietisien Indonesia, 2025; Weimann et al., 2025) remains a clinical challenge. The goal of preoperative Medical Nutrition Therapy (MNT) in this context is to shift the patient from a catabolic trajectory toward a more stable anabolic milieu (Lasithiotakis et al., 2025). By correcting acute deficits and optimizing substrate availability, MNT serves as a bridge, enhancing surgical safety and facilitating a smoother, more rapid postoperative convalescence.

However, current literature offering a comprehensive roadmap for managing this specific triad—cryptorchidism, irreducible hernia, and malnutrition—remains sparse. Most studies address these conditions in isolation rather than as a synergistic clinical entity. This case report aims to bridge this gap by delineating the integrated nutritional management of a pediatric patient with this complex diagnosis. Specifically, we highlight the strategic implementation of preoperative nutritional support as a fundamental determinant of successful surgical outcomes and recovery.

## METHODS

The nutritional management described in this report followed the standardized Nutrition Care Process Terminology (NCPT) model, as recommended by the Academy of Nutrition and Dietetics. This systematic framework involved four distinct steps: Nutritional Assessment: Comprehensive data collection involving food or nutrition-related history, biochemical data, medical tests and procedures, anthropometric measurements, nutrition-focused physical findings, and client history. Nutritional Diagnosis: Identification of specific nutritional problems formatted as PES statements (Problem, Etiology, Signs/Symptoms). Nutritional Intervention: This step encompassed both planning and implementation. The planning phase involved calculating targeted nutritional requirements based on pediatric energy needs for surgical stress and catch-up growth, alongside determining the appropriate diet type. This was followed by the implementation of the evidence-based Medical Nutrition Therapy (MNT), specifically tailored to optimize the patient's preoperative metabolic status and support postoperative wound healing. Monitoring and Evaluation: Continuous assessment of the patient's tolerance to diet, weight progression, and nitrogen balance throughout the hospitalization period. Clinical data were systematically obtained through specific methods: anthropometric data (weight, height, and mid-upper arm circumference) were collected through direct physical measurements; dietary history (via 24-hour recall and Food Frequency Questionnaire) and socioeconomic background were ascertained through semi-structured interviews with the patient's caregivers; while biochemical profiles and medical history were extracted from the electronic medical records. Finally, this case report was conducted as part of a clinical internship program under the supervision of the clinical preceptor at RSUD Dr. Moewardi. The patient's anonymity and confidentiality were strictly maintained, and verbal informed consent was obtained from the patient's parents for clinical data collection and publication.

## RESULTS AND DISCUSSION

### Case presentation

A 10-year-old male patient was admitted to the pediatric ward at RSUD Dr. Moewardi with a chief complaint of acute, intermittent pain in the left inguinal region (VAS score 2–3/10) accompanied by general malaise. The patient had a known history of undescended testis (cryptorchidism) since birth, which had recently been complicated by a reducible mass that progressed to an irreducible (incarcerated)

 DOI https://doi.org/10.31290/jlt.v5i1.6212

**Journal of Local Therapy**
**Vol. 05, No. 1, 2026**
**p-ISSN: 2809-3240; e-ISSN: 2810-0875**
**pp: 40-48**



state prior to admission. Consequently, the primary medical diagnosis was confirmed as Undescended Testis (UDT) with Irreducible Lateral Inguinal Hernia. Upon admission, a nutritional risk screening was immediately conducted using the STRONGkids instrument. The patient was stratified into a Moderate Nutritional Risk category (Score: 2), attributed to subjective clinical signs of reduced subcutaneous fat and a history of reduced food intake due to pain. This risk stratification served as the critical trigger for a comprehensive nutritional assessment and the formulation of a specialized preoperative nutrition support plan.

The anthropometric evaluation revealed a body weight of 25.0 kg and a height of 136.0 cm. Based on the CDC 2000 growth charts, the patient presented with significant growth faltering. The Weight-for-Height ratio was 83.3%, and the Body Mass Index (BMI)-for-age Z-score indicated thinness, classifying the patient as moderately malnourished (wasting) according to the Waterlow classification. Muscle mass depletion was further corroborated by a Mid-Upper Arm Circumference (MUAC) of 17.5 cm. Detailed dietary anamnesis using a semi-quantitative Food Frequency Questionnaire (FFQ) and 24-hour recall exposed a chronicity of suboptimal intake. The patient exhibited a preference for energy-dense, nutrient-poor foods, with negligible consumption of vegetables and animal protein. Pre-admission recall indicated a severe caloric deficit, meeting only 51.5% of the Estimated Energy Requirement (EER) and 72.2% of the Recommended Dietary Allowance (RDA) for protein; a hypophagic state exacerbated by the acute inguinal pain, which suppressed appetite.

Despite the anthropometric evidence of wasting, the preoperative biochemical profile remained within physiological limits, suggesting a state of metabolic compensation rather than acute decompensation. Hemoglobin levels (12.6 g/dL) and hematocrit (35%) ruled out anemia, while renal function (Urea 37 mg/dL, Creatinine 0.5 mg/dL) and electrolyte balance were preserved (Na 137 mmol/L, K 3.7 mmol/L). This "normal" biochemical picture masked the underlying somatic protein depletion identified by anthropometry. Clinically, the patient was hemodynamically stable and normotensive but appeared lethargic due to inadequate energy substrate availability. Based on this integrated assessment, the primary nutritional diagnosis was established as Inadequate Oral Intake related to pain-induced anorexia, alongside a secondary diagnosis of Malnutrition.

The primary diagnosis was identified as Inadequate Oral Intake (NI-2.1). The etiology was multifactorial but primarily driven by physiological causes, specifically the acute nociceptive pain associated with the incarcerated inguinal hernia, which precipitated a significant loss of appetite (anorexia). This diagnosis was empirically evidenced by the 24-hour recall data, revealing a severe caloric and protein deficit where the patient consumed less than 60% of the estimated daily requirements (Energy: 51.5%; Protein: 72.2%) prior to admission. Concurrently, the patient presented with Malnutrition (NI-5.2), reflecting a chronic imbalance between nutrient needs and intake. This diagnosis was substantiated by the anthropometric profile indicating wasting (Weight-for-Height <85% and MUAC 17.5 cm). The etiology was rooted in a history of suboptimal dietary habits—specifically a preference for energy-dense, nutrient-poor foods—compounded by the metabolic demands of catch-up growth. The prioritization of Inadequate Oral Intake (NI-2.1) was critical in the preoperative setting. Addressing the acute caloric deficit was deemed the immediate therapeutic imperative to halt catabolism. While the chronic malnutrition (NI-5.2) requires long-term rehabilitation, the acute correction of oral intake serves as the "bridge" to ensure metabolic stability during the impending surgical stress of orchidopexy and herniotomy.

A preoperative Medical Nutrition Therapy (MNT) protocol was initiated with two core objectives: to provide rapid caloric repletion to support surgical stress and to optimize nitrogen balance. The intervention consisted of a High-Energy High-Protein (HEHP) diet delivering 1,714 kcal/day (calculated for catch-up growth) and 1.5–2.0 g protein/kg/day. Crucially, the nutritional strategy was synergized with pharmacological management. The administration of Metamizole (500 mg/8h) was utilized to effectively manage inguinal pain, thereby removing the primary barrier to eating. Simultaneously,

Dexamethasone (1.2 mg/24h), prescribed for inflammation, provided a secondary benefit of appetite stimulation, which was strategically leveraged to support the feeding goals.

Monitoring over the 72-hour preoperative period demonstrated a marked positive trajectory. On the first day of admission, intake remained suppressed at 52.3% of energy targets due to persistent pain. However, following the intensification of nutritional counseling and the stabilization of pain control, the patient's oral intake improved significantly. By the third day, immediately prior to surgery, the patient achieved hyper-alimentation, consuming 115.6% of the energy target and 90.7% of the protein target. This substantial increase in dietary protein intake successfully shifted the patient from an initial negative nitrogen balance into a positive nitrogen balance. Achieving this positive nitrogen balance reflects an anabolic state that is physiologically essential to withstand the impending surgical trauma and support postoperative tissue repair (Lasithiotakis et al., 2025). This rapid restoration of intake confirmed the patient's metabolic readiness for the scheduled orchidopexy and herniotomy, ensuring that glycogen stores were replenished to withstand the catabolic stress of the procedure. A detailed overview of the monitoring is provided in Figure 1.

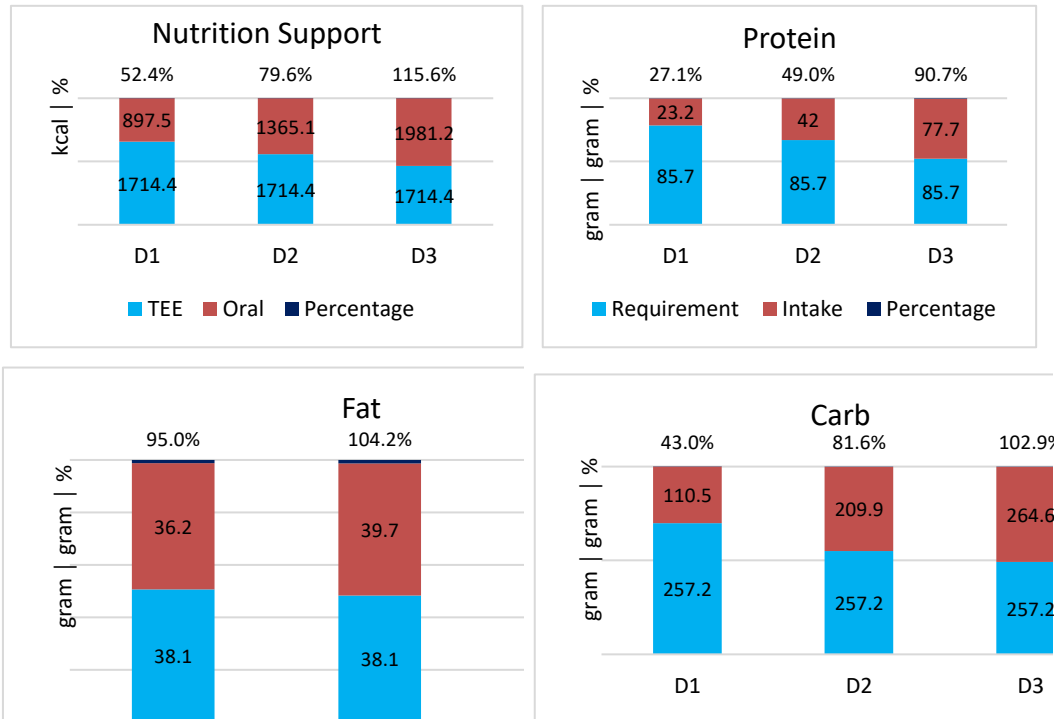


Figure 1. Trends in Daily Dietary Intake

**The Clinical Management Approach**

The clinical management of pediatric inguinal hernia complicated by undescended testis (cryptorchidism) presents a multifaceted challenge, particularly when superimposed with the metabolic burden of malnutrition. While the surgical imperative for an irreducible hernia is well-documented to prevent bowel strangulation and testicular ischemia (Stabilini et al., 2023), the concurrent management of the patient's nutritional fragility is often under-prioritized in acute surgical settings. This case report highlights a critical "surgical-nutritional paradox": the urgency of surgical correction versus the metabolic unreadiness of the patient to withstand the procedure. Our findings illustrate that a targeted, short-term preoperative nutritional intervention—synergized with multimodal pharmacological pain


DOI https://doi.org/10.31290/jlt.v5i1.6212

**Journal of Local Therapy**
**Vol. 05, No. 1, 2026**
**p-ISSN: 2809-3240; e-ISSN: 2810-0875**
**pp: 40-48**



control—can effectively reverse the catabolic trajectory and optimize surgical safety, even within a limited preoperative window.

A pivotal learning point from this case lies in the discordance between the patient's biochemical profile and his anthropometric reality. Despite significant somatic wasting, characterized by a Weight-for-Height of 83.3% and a Mid-Upper Arm Circumference (MUAC) of 17.5 cm, the patient presented with a preserved electrolyte profile and normal renal function. This phenomenon aligns with the pathophysiology of "adapted starvation" or undernutrition (J. L. Lee et al., 2015). In chronic energy deficiency, the pediatric body engages homeostatic mechanisms to reprioritize hepatic protein synthesis, preserving visceral proteins such as albumin to maintain oncotic pressure, often at the expense of skeletal muscle catabolism (Page et al., 2025). Consequently, relying solely on routine laboratory markers would have resulted in a "false negative" nutritional diagnosis. This reinforces the critical necessity of integrating validated screening tools, such as STRONGkids, alongside sensitive anthropometric indices like MUAC. As demonstrated, the identification of wasting was the pivotal trigger that shifted the care plan from immediate surgery to "nutritional pre-habilitation," validating the assertion that hidden malnutrition is a silent predictor of adverse surgical outcomes (Keerio et al., 2024).

Furthermore, the etiology of the preoperative nutritional deficit in this patient was not merely a consequence of food insecurity, but rather a complex "Pain-Anorexia Cycle." The nociceptive stimuli arising from the incarcerated hernia likely induced a systemic stress response, characterized by the elevation of catecholamines and cortisol (Finnerty et al., 2013). These stress hormones are known to suppress the hypothalamic appetite centers (Jiang & Tong, 2022), creating a physiological anorexia that was further compounded by the patient's maladaptive dietary behaviors. By identifying Inadequate Oral Intake as the primary diagnosis, we targeted the root cause of the acute deficit. The data revealed a severe caloric gap prior to admission, placing the patient in a negative nitrogen balance. In the context of impending surgery, this state is precarious; operating on a glycogen-depleted child amplifies the surgical stress response, leading to rapid proteolysis and gluconeogenesis to provide energy substrates (Yuki et al., 2017). Thus, interrupting this cycle was not merely a supportive measure but a physiological prerequisite for surgical safety.

To counteract this deficit, we implemented a strategy of "Metabolic Priming" through a High-Energy High-Protein (HEHP) diet. Contrary to the misconception that nutritional rehabilitation requires weeks to manifest benefits, our results demonstrate that a 72-hour window of aggressive feeding significantly altered the patient's metabolic status. The transition from a 52% deficit on admission to hyper-alimentation (115% intake) by the third day served to saturate hepatic glycogen stores (Borriello et al., 2025). This glycogen loading is crucial to prevent postoperative hypoglycemia and attenuate the catabolic surge during the NPO (Nothing Per Oral) period (Rajan et al., 2021). Moreover, the decision to maintain the oral route—rather than resorting to enteral tube feeding or parenteral nutrition—was a calculated clinical judgment aimed at "Gut-Preservation (Weimann et al., 2025)." Physiologically, oral intake stimulates the release of trophic factors such as gastrin and GLP-2 (Baccari et al., 2024), which are essential for maintaining gut mucosal integrity and the Gut-Associated Lymphoid Tissue (GALT) (Abdalqadir & Adeli, 2022). By keeping the gastrointestinal tract functional, we minimized the risk of bacterial translocation and systemic inflammation, aligning with modern Enhanced Recovery After Surgery (ERAS) protocols (Althans et al., 2024), which advocate for minimizing preoperative fasting to support immune competence.

The success of this intervention was further amplified by a serendipitous drug-nutrient interaction. The administration of Dexamethasone, primarily indicated for its anti-inflammatory properties in hernia management, provided a secondary advantage of appetite stimulation (orexigenic effect) (Kuckuck et al., 2023). This pharmacological regimen, combined with Metamizole for effective analgesia (Luz et al., 2025)(Luz et al., 2025), effectively managed the disease. This synergy allowed the nutritional team to implement "Small Frequent Feeding" effectively, overcoming early satiety. This outcome underscores

the importance of the nutritionist's role in reviewing the medication chart, not only to avoid adverse interactions but to strategically leverage pharmacological side effects to achieve nutritional goals.

A critical component of the perioperative nutritional strategy was the strict adherence to modern evidence-based fasting guidelines, deviating from the archaic "nil per os (NPO) after midnight" dogma. Aligning with current recommendations from the European Society of Anaesthesiology (ESA) (Frykholm et al., 2022), we implemented a physiological fasting protocol to mitigate metabolic stress. The patient was permitted to consume a light meal up to six hours and clear carbohydrate-containing fluids up to two hours prior to the induction of anesthesia (Persatuan Ahli Gizi Indonesia & Asosiasi Dietisien Indonesia, 2025). This minimized fasting duration is strategically designed to optimize gastric emptying while preventing the metabolic derangements associated with prolonged starvation, such as preoperative dehydration, hypoglycemia, and postoperative insulin resistance (Di Vezza et al., 2025). By shortening the fluid fasting window to just two hours, we not only enhanced patient comfort by reducing thirst and anxiety but also attenuated the catabolic stress response, ensuring the patient entered the operating theater in a metabolically neutral, rather than depleted, state (D. Lee et al., 2025).

Finally, the integrity of the nutritional care plan was upheld through rigorous Monitoring and Evaluation (M&E), which served as the dynamic feedback loop for clinical decision-making. Surveillance extended beyond mere calorie counting to the real-time assessment of gastrointestinal tolerance and metabolic readiness. Throughout the 72-hour optimization window, the multidisciplinary team closely monitored the patient for adverse signs such as abdominal distension, vomiting, or worsening inguinal pain—none of which occurred, thereby validating the safety of the oral hyper-alimentation strategy. The trajectory of intake, rising from a profound deficit to a significant surplus, provided quantitative evidence of "nutritional repletion." This continuous monitoring offered the surgical team objective confirmation that the patient had accumulated the necessary physiological reserve to withstand surgical trauma. Culminating this targeted intervention, the patient underwent the scheduled orchidopexy and herniotomy on the third day of hospitalization without intraoperative complications. Postoperative recovery was uneventful, characterized by hemodynamic stability and rapid return of bowel function, allowing the patient to continue rehabilitative care until fully meeting the criteria for safe discharge.

## CONCLUSIONS

This case challenges the traditional surgical dogma that prioritizes immediate incision over metabolic optimization in non-strangulated hernias. We suggest that in hemodynamically stable patients with irreducible hernias, a brief, calculated delay for preoperative nutritional support is a vital therapeutic bridge. It transforms a fragile, catabolic patient into a resilient surgical candidate. The success of the "short-burst" HEHP intervention validates a paradigm where Medical Nutrition Therapy is integrated into the surgical timeline, ensuring that metabolic readiness is accorded the same priority as anatomical resectability. Future pediatric surgical protocols should consider mandatory nutritional screening and rapid optimization pathways to mitigate the risks associated with operating on the "hidden malnourished" child.

## CONFLICT OF INTEREST STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could be perceived to influence the work reported in this paper.

## ACKNOWLEDGEMENTS

The authors wish to express their sincere gratitude to the Directorate of RSUD Dr. Moewardi, Surakarta, for facilitating this case study. We extend our appreciation to the entire medical, nursing, and nutritional staff of the Flamboyan 9 Pediatric Surgery Ward for their excellent collaboration and clinical support during the patient's care.

 DOI https://doi.org/10.31290/jlt.v5i1.6212

**Journal of Local Therapy**
**Vol. 05, No. 1, 2026**
**p-ISSN: 2809-3240; e-ISSN: 2810-0875**
**pp: 40-48**



## REFERENCES

Abdalqadir, N., & Adeli, K. (2022). GLP-1 and GLP-2 Orchestrate Intestine Integrity, Gut Microbiota, and Immune System Crosstalk. *Microorganisms*, *10*(10). https://doi.org/10.3390/microorganisms10102061

Althans, A. R., Holder-Murray, J., & Tessler, R. A. (2024). The Future of Enhanced Recovery After Surgery—Precision vs Protocol. *JAMA Network Open*, *7*(6), e2418968--e2418968. https://doi.org/10.1001/jamanetworkopen.2024.18968

Baccari, M. C., Vannucchi, M. G., & Idrizaj, E. (2024). The Possible Involvement of Glucagon-like Peptide-2 in the Regulation of Food Intake through the Gut–Brain Axis. In *Nutrients* (Vol. 16, Issue 18, p. 3069). https://doi.org/10.3390/nu16183069

Borriello, R., Esposto, G., Ainora, M. E., Podagrosi, G., Ferrone, G., Mignini, I., Galasso, L., Gasbarrini, A., & Zocco, M. A. (2025). Understanding Refeeding Syndrome in Critically Ill Patients: A Narrative Review. In *Nutrients* (Vol. 17, Issue 11, p. 1866). https://doi.org/10.3390/nu17111866

Di Vezza, F., Cacace, C., Sanvitti, M., & Bilotta, F. (2025). Preoperative Clear Fluid Fasting Duration and Arterial Hypotension During Anesthesia Induction: A Narrative Review. In *Journal of Clinical Medicine* (Vol. 14, Issue 19, p. 6950). https://doi.org/10.3390/jcm14196950

Farrell, M. S., Zhang, Z., Kirsch, J., Bower, K., Bower, C., Gelbard, R., Kent, A. J., Khariton, K., Perez, A., Menzo, E. Lo, Rabinowitz, J. B., & Ratnasekera, A. (2025). Surgical management of incarcerated and strangulated inguinal hernias requiring urgent surgical intervention: A systematic review, meta-analysis, and practice management guideline from the Eastern Association for the Surgery of Trauma. *The Journal of Trauma and Acute Care Surgery*. https://doi.org/10.1097/TA.0000000000004740

Favorito, L. A., Riberio Julio-Junior, H., & Sampaio, F. J. (2017). Relationship between Undescended Testis Position and Prevalence of Testicular Appendices, Epididymal Anomalies, and Patency of Processus Vaginalis. *BioMed Research International*, *2017*, 5926370. https://doi.org/10.1155/2017/5926370

Finnerty, C. C., Mabvuure, N. T., Ali, A., Kozar, R. A., & Herndon, D. N. (2013). The surgically induced stress response. *JPEN. Journal of Parenteral and Enteral Nutrition*, *37*(5 Suppl), 21S--9S. https://doi.org/10.1177/0148607113496117

Frykholm, P., Disma, N., Andersson, H., Beck, C., Bouvet, L., Cercueil, E., Elliott, E., Hofmann, J., Isserman, R., Klaucane, A., Kuhn, F., de Queiroz Siqueira, M., Rosen, D., Rudolph, D., Schmidt, A. R., Schmitz, A., Stocki, D., Sümpelmann, R., Stricker, P. A., … Afshari, A. (2022). Pre-operative fasting in children: A guideline from the European Society of Anaesthesiology and Intensive Care. *European Journal of Anaesthesiology*, *39*(1), 4–25. https://doi.org/10.1097/EJA.0000000000001599

Hirsch, K. R., Wolfe, R. R., & Ferrando, A. A. (2021). Pre- and Post-Surgical Nutrition for Preservation of Muscle Mass, Strength, and Functionality Following Orthopedic Surgery. *Nutrients*, *13*(5). https://doi.org/10.3390/nu13051675

Holmboe, S. A., Beck, A. L., Andersson, A.-M., Main, K. M., Jørgensen, N., Skakkebæk, N. E., & Priskorn, L. (2024). The epidemiology of cryptorchidism and potential risk factors, including endocrine disrupting chemicals. *Frontiers in Endocrinology*, *Volume 15*. https://doi.org/10.3389/fendo.2024.1343887

Jiang, Z., & Tong, Q. (2022). Hypothalamic CRH neurons: A crossroad between stress and metabolism.

*Current Opinion in Endocrine and Metabolic Research*, *26*, 100384. https://doi.org/https://doi.org/10.1016/j.coemr.2022.100384

Keerio, R. B., Ali, M., Shah, K. A., Iqbal, A., Mehmood, A., & Iqbal, S. (2024). Evaluating the Impact of Preoperative Nutritional Status on Surgical Outcomes and Public Health Implications in General Surgery Patients. *Cureus*, *16*(12), e76633. https://doi.org/10.7759/cureus.76633

Koofy, N. El, Eldin, H. M. N., Mohamed, W., Gad, M., Tarek, S., & Tagy, G. El. (2021). Impact of preoperative nutritional status on surgical outcomes in patients with pediatric gastrointestinal surgery. *Clinical and Experimental Pediatrics*, *64*(9), 473–479. https://doi.org/10.3345/cep.2020.00458

Krasnovsky, L., Weber, A. T., Gershuni, V., Pettke, E., & Lewis, J. D. (2024). Preoperative Exclusive Enteral Nutrition Is Associated With Reduced Skin and Soft Tissue and Intra-abdominal Infections in Patients With Crohn's Disease Undergoing Intestinal Surgery: Results from a Meta-Analysis. *Inflammatory Bowel Diseases*, *30*(11), 2105–2114. https://doi.org/10.1093/ibd/izad304

Kuckuck, S., van der Valk, E. S., Scheurink, A. J. W., van der Voorn, B., Iyer, A. M., Visser, J. A., Delhanty, P. J. D., van den Berg, S. A. A., & van Rossum, E. F. C. (2023). Glucocorticoids, stress and eating: The mediating role of appetite-regulating hormones. *Obesity Reviews : An Official Journal of the International Association for the Study of Obesity*, *24*(3), e13539. https://doi.org/10.1111/obr.13539

Lakananurak, N., & Gramlich, L. (2020). The Role of Preoperative Parenteral Nutrition. In *Nutrients* (Vol. 12, Issue 5, p. 1320). https://doi.org/10.3390/nu12051320

Lasithiotakis, K., Andreou, A., Migdadi, H., & Kritsotakis, E. I. (2025). Malnutrition and perioperative nutritional rehabilitation in major operations. *European Surgery*, *57*(5), 188–203. https://doi.org/10.1007/s10353-025-00863-4

Lee, D., Kim, S.-J., & Chang, W.-B. (2025). The safety and effect of preoperative reduced fasting time by oral clear liquid administration in adult surgery patients: a randomized controlled trial. *Annals of Surgical Treatment and Research*, *109*(1), 1–6. https://doi.org/10.4174/astr.2025.109.1.1

Lee, J. L., Oh, E. S., Lee, R. W., & Finucane, T. E. (2015). Serum Albumin and Prealbumin in Calorically Restricted, Nondiseased Individuals: A Systematic Review. *The American Journal of Medicine*, *128*(9), 1023.e1--22. https://doi.org/10.1016/j.amjmed.2015.03.032

Luz, M., Valente do Amaral Lopes, S. A., Brandao Barreto, B., da Silva Vieira, J., Tavares-Pereira, J., Novaes, L. P., & Gusmao-Flores, D. (2025). Effectiveness of dipyrone (metamizole) in postoperative analgesia: A systematic review and meta-analysis. *Trends in Anaesthesia and Critical Care*, *61*, 101540. https://doi.org/https://doi.org/10.1016/j.tacc.2025.101540

Mourad, M., & Kharbutli, B. (2023). Para-inguinal hernia; presentation, diagnosis and surgical treatment, a case report. *International Journal of Surgery Case Reports*, *108*, 108445. https://doi.org/https://doi.org/10.1016/j.ijscr.2023.108445

Page, L., McCain, E., & Freemark, M. (2025). Adaptive Responses in Severe Acute Malnutrition: Endocrinology, Metabolomics, Mortality, and Growth. In *Nutrients* (Vol. 17, Issue 17, p. 2864). https://doi.org/10.3390/nu17172864

Persatuan Ahli Gizi Indonesia & Asosiasi Dietisien Indonesia. (2025). *Penuntun Diet dan Terapi Gizi pada Anak* (4 (ed.)). Buku Kedokteran EGC.

Rajan, S., Rahman, A. A., & Kumar, L. (2021). Preoperative oral carbohydrate loading: Effects on intraoperative blood glucose levels, post-operative nausea and vomiting, and intensive care unit stay. *Journal of Anaesthesiology, Clinical Pharmacology*, *37*(4), 622–627.

 DOI https://doi.org/10.31290/jlt.v5i1.6212

https://doi.org/10.4103/joacp.JOACP_382_19

Raza, M., Kumar, S., Ejaz, M., Azim, D., Azizullah, S., & Hussain, A. (2020). Electrolyte Imbalance in Children With Severe Acute Malnutrition at a Tertiary Care Hospital in Pakistan: A Cross-Sectional Study. *Cureus*, *12*(9), e10541. https://doi.org/10.7759/cureus.10541

Roberson, M. L., Egberg, M. D., Strassle, P. D., & Phillips, M. R. (2021). Measuring malnutrition and its impact on pediatric surgery outcomes: A NSQIP-P analysis. *Journal of Pediatric Surgery*, *56*(3), 439–445. https://doi.org/https://doi.org/10.1016/j.jpedsurg.2020.10.001

Schricker, T., & Lattermann, R. (2015). Perioperative catabolism. *Canadian Journal of Anaesthesia = Journal Canadien d'anesthesie*, *62*(2), 182–193. https://doi.org/10.1007/s12630-014-0274-y

Shandilaya, U., & Joshi, A. S. (2025). Laparoscopic herniotomy with orchidopexy: our experience and a review of literature. *International Surgery Journal*, *12*(10 SE-Original Research Articles), 1701–1706. https://doi.org/10.18203/2349-2902.isj20253018

Stabilini, C., van Veenendaal, N., Aasvang, E., Agresta, F., Aufenacker, T., Berrevoet, F., Burgmans, I., Chen, D., de Beaux, A., East, B., Garcia-Alamino, J., Henriksen, N., Köckerling, F., Kukleta, J., Loos, M., Lopez-Cano, M., Lorenz, R., Miserez, M., Montgomery, A., … Simons, M. (2023). Update of the international HerniaSurge guidelines for groin hernia management. *BJS Open*, *7*(5). https://doi.org/10.1093/bjsopen/zrad080

Weimann, A., Bezmarevic, M., Braga, M., Correia, M. I. T. D., Funk-Debleds, P., Gianotti, L., Gillis, C., Hübner, M., Inciong, J. F. B., Jahit, M. S., Klek, S., Kori, T., Laviano, A., Ljungqvist, O., Lobo, D. N., Segurola, C. L., Montroni, I., Reddy, B. R., Saur, N. M., … Bischoff, S. C. (2025). ESPEN guideline on clinical nutrition in surgery – Update 2025. *Clinical Nutrition*, *53*, 222–261. https://doi.org/10.1016/j.clnu.2025.08.029

Wen, B., Njunge, J. M., Bourdon, C., Gonzales, G. B., Gichuki, B. M., Lee, D., Wishart, D. S., Ngari, M., Chimwezi, E., Thitiri, J., Mwalekwa, L., Voskuijl, W., Berkley, J. A., & Bandsma, R. H. (2022). Systemic inflammation and metabolic disturbances underlie inpatient mortality among ill children with severe malnutrition. *Science Advances*, *8*(7), eabj6779. https://doi.org/10.1126/sciadv.abj6779

You, J., Sun, J., Jing, S., Liu, X., & Wang, J. (2025). Laparoscopic-assisted repair of inguinal undescended testis with concurrent incarcerated hernia in children: a single-center experience. *Frontiers in Pediatrics*, *13*, 1523591. https://doi.org/10.3389/fped.2025.1523591

Yuki, K., Matsunami, E., Tazawa, K., Wang, W., DiNardo, J. A., & Koutsogiannaki, S. (2017). Pediatric Perioperative Stress Responses and Anesthesia. *Translational Perioperative and Pain Medicine*, *2*(1), 1–12. http://www.transpopmed.org/articles/v2n1/v2n1a1.pd

Zhu, L., Cheng, J., Xiao, F., & Mao, Y.-Y. (2024). Effects of comprehensive nutrition support on immune function, wound healing, hospital stay, and mental health in gastrointestinal surgery. *World Journal of Gastrointestinal Surgery*, *16*(12), 3737–3744. https://doi.org/10.4240/wjgs.v16.i12.3737