

SCOAP Metric

Preoperative Nutritional Status (Albumin)

Rationale: Albumin is measured prior to elective colon and rectal surgery and low albumin is considered in planning for elective, non-cancer colon surgery.

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Frequently Asked Questions

1. What is albumin?

- Albumin is one of the most abundant proteins found in blood, accounting for more than 50% of total serum proteins. The liver manufactures albumin; the albumin concentration reflects the protein status of the blood and internal organs.
- The main purpose of albumin within blood is to maintain colloidal osmotic pressure, which keeps fluid within the vascular space. Therefore, patients with very depleted albumin levels may develop edema, ascites, or pulmonary edema.
- Albumin is involved in at least sixty-five different biological functions. It is our body's main transport system carrying vitamins, minerals, hormones, fatty acids and other essential substances to their destinations. It is also one of our body's most powerful and by far the most voluminous antioxidant.
- Albumin has a relatively long half-life of approximately 20 days and a very large serum pool. By the time albumin values are below normal levels, a sizeable amount of the serum pool has been lost. Generally, albumin is considered a late indicator of malnutrition.

2. What is pre-albumin?

- Prealbumin is another protein status indicator. It has a much shorter half-life and smaller serum pool than albumin. The half-life of prealbumin is approximately 2 days, making prealbumin a timelier and more sensitive indicator of protein status.
- Prealbumin is a tryptophan-rich protein, and like albumin, it is synthesized in the hepatocytes of the liver.
- Prealbumin's main function is to serve as a binding and transport protein. The term prealbumin is a misnomer—the prefix pre implies that it is a precursor for albumin, which it is not. The more accurate name for prealbumin is transthyretin.

3. Why is it important to measure and manage albumin?

- Serum albumin concentration is a better predictor of surgical outcomes than many other preoperative patient characteristics.
- It is a relatively low-cost test that should be used more frequently as a prognostic tool to detect malnutrition and risk of adverse surgical outcomes, particularly in populations in whom co-morbid conditions are relatively frequent.

4. When should albumin be tested?

- Optimal testing should occur at least 2 weeks prior to elective major surgery.

5. What action should be taken if albumin level is low?

- Inform physician to determine if surgery should be delayed.
- Physician to refer patient for nutritional consult.
- Begin regular measurement of pre-albumin to monitor for improvement.



6. What is the connection between preoperative serum albumin and malnourishment?

- Preoperative serum albumin is one of the strongest predictors of anastomotic complications, as well as overall morbidity and mortality according to studies such as the National VA Surgical Risk Study and a 2009 European study of preoperative albumin and gastrointestinal surgery (Gibbs, 2009).
- To identify which patients will benefit from preoperative nutritional intervention, Kudsk et al. used albumin levels to stratify nutritional risk of 526 surgical patients undergoing elective esophageal, gastric, pancreaticoduodenal and colon surgery. In this retrospective cohort study, the authors found that albumin levels were an accurate and inexpensive indicator of potential morbidity and mortality. Preoperative albumin correlated inversely with complications, overall length of stay, and ICU admissions. It was also noted that as albumin drops mortality rates progressively increased, up to 30% for patients with the lowest albumin (Kudsk, 2003).

7. What are ways to avoid Complications and Poor Outcomes?

- A meta-analysis of studies related to preoperative issues in clinical nutrition recommends careful preoperative nutritional assessment, and that patients already demonstrating compromise of nutritional status (defined by >10% weight loss and serum albumin level <2.5) should be considered for a minimum of 7 to 10 days of nutritional repletion prior to surgery (McClave, 1999).
- Allowing a patient's nutritional state to deteriorate through the perioperative period adversely affects measurable outcomes related to nosocomial infection, multiple organ dysfunction, wound healing, and functional recovery. This evidence suggests that low albumin and poor nutritional status may be a modifiable risk factor for better outcomes, especially in patients having elective procedures like resection for rectal prolapse, colonic fistulae, diverticular disease, bleeding, inflammatory disease and chronic constipation.

8. What are the issues and Controversies in Addressing Malnutrition?

- SCOAP uses albumin as a measure for risk adjustment. Risk adjustment is essential in helping surgeons make apples-to-apples comparisons of their outcomes so that they can decide when to change their practice. If our patients do not have an albumin measure, SCOAP risk adjustment uses the default albumin level of the average patient and may unfairly characterize a higher risk patient as lower risk. Faulty risk adjustment makes it harder to drive QI, and that is what SCOAP is all about.
- While the data suggest that enteral supplementation provides value, some people apply the results of studies that looked at intravenous nutrition and draw a negative conclusion about enteral supplementation. It is true that a meta-analysis of studies of intravenous supplementation (TPN) showed that despite nutritional markers improving, the risk of intravenous line-related complications outweighed the benefit risk (except among highest risk patients) (Heyland, 2001).
- When it comes to enteral nutrition the debate now is about the type and timing of testing, route and type of intervention or supplementation and willingness to delay surgery. These are areas of emerging evidence. Some leaders in the field favor the



use of a ratio of prealbumin (half-life, 48 h) and C-reactive protein to indicate the extent and improvement of nutritional levels (Martindale,2006).

- C-reactive protein is an acute-phase reactant that correlates well with the severity of the inflammatory response. It has a half-life of 8 h and is altered minimally by perioperative interventions.
- Prealbumin, a blood protein also known as transthyretin, has a half-life in plasma of ~2 days, much shorter than that of albumin and is therefore more sensitive to changes in protein-energy status than albumin. Its concentration closely reflects recent dietary intake rather than overall nutritional status.
- The ratio of prealbumin and C-reactive protein may indicate when the patient starts to produce visceral proteins as the inflammatory response wanes.
- There is no consensus about the ideal type of preoperative nutritional support. A growing understanding of nutrient effects on disease processes has led to the development of specialized nutritional formulas. One class of these formulas is called *immune enhancing diets* (IEDs). IEDs include increased quantities of nutrients that have been shown to improve immune cell function, modulate inflammation, and reduce infections. Use of IEDs has been somewhat controversial due to conflicting opinions about safety, efficacy and cost.

Braga and Gianotti performed an economic evaluation using data from a recent randomized trial of preoperative IEDs in patients with gastrointestinal cancer (Braga, 2009). Although the cost of nutrition was greater in the IED group, the total costs of hospitalization were lower in the IED group. The differences in cost occurred in patients with complications. The investigators concluded that preoperative IED was cost-effective.

Measure Change Concepts

STANDARDIZE:

Standard: Establish standard (i.e., value for hypoalbuminemia)

Process:

- Define population to be tested. Example: “All patients undergoing major general elective surgery will have their albumin tested within 6 weeks prior to surgery so that patients at risk for complications secondary to malnutrition are identified and managed appropriately.”
- Pre-Op Standardized Order Sets to include albumin testing
- Order sets include prompts for response to low albumin value, i.e., consideration of postponement if elective non-cancer case, referral to nutrition consult, orders for pre-albumin testing

Responsibility: Ownership of process steps is clearly defined

Timing: Testing prior to surgery, for elective surgery can be up to six weeks in advance

Documentation: Design and implement systematic documentation of albumin testing on every patient chart (paper or electronic)

DESIGN SYSTEMS TO AVOID MISTAKES:

- Develop protocol/algorithm for albumin testing and management within 6 weeks of surgery

USER REMINDERS:

- Checklists, embedded prompts, posters, signs

GIVE PEOPLE ACCESS TO INFORMATION:

- Provide staff education
- Provide regular feedback to physicians/surgeons/departments from SCOAP reports
(See attached Metric Improvement p.8)

CONSIDER PEOPLE AS IN THE SAME SYSTEM:

- Include Pre-op Clinic staff, Anesthesia, Nursing, Medical Staff, Dietician
- If pre-admission testing occurs at the outpatient clinic, ensure documentation is part of the inpatient record

USE AUTOMATION:

- EMR alerts

PARTNER WITH PATIENT:

- Provide patient/family education about why it is important to measure and address albumin and nutritional status.

CELEBRATE SUCCESS:

- Keep team members, physicians, and stakeholders informed about the progress that has been made using multiple forums (newsletters, awards, success stories posters, balloons, etc.

Metric Improvement

How do I improve these metrics at my hospital?

Form a workgroup to focus on the problem of low rates of albumin testing and/or operations on malnourished patients. The workgroup composition should include:

- Team leader (physician hospitalist, surgeon or another physician leader)
- Content expert (nutrition)
- Team facilitator (QI professional)
- Process owners (frontline personnel such as nurses, pre-admission staff, etc.)

Determine where and why the problem is occurring:

- Assess if there is a problem with getting albumin tested (and/or operating on patients with low albumin.
- Review the albumin testing process for patients being operated at your facility and determine what proportion of lab testing is being initiated in a hospital pre-admission clinic or at the physician's office. This helps determine where an initiative to increase testing should be focused.
- Determine at which point testing is done in a patient's preoperative course. Albumin testing at the time of admission cannot be acted on by the clinicians and may be the reason that patients with low albumin are undergoing elective surgery. Testing within 24-72 hours is also considered part of bundled care and cannot be billed for. In this population of patients even a week of nutritional supplementation may be helpful in reducing the risks of complication so at least that much time should be available after an albumin test to allow for intervention (4-6 weeks supplementation may be optimal but may require a delay in surgery). Best practice hospitals perform albumin testing as early as possible in the process of evaluation for surgery because it also helps in risk counseling.
- Review how and if outside testing results are included in your hospital's medical record to ensure that when testing is done the results are available for abstraction. Many times, the failure to record an album in is a failure to recognize "outside" testing.

Educate the workgroup about baseline SCOAP data and begin abstracting albumin data at additional timepoints

- Begin contemporaneous abstraction (within week of surgery) and provide feedback to the group and relevant clinicians on albumin measure underperformance.
- Initiate preoperative screening of patient records to determine ahead of OR the cases that can be “recovered” before the operation

Albumin testing and supplementation:

- Choose specific targets (i.e., Improve albumin testing by 50% overall, achieve 100% testing with several surgeon groups, refer all patients with albumin <3.5 to a nutritionist and delay surgery, meet SCOAP benchmark for avoiding elective non-cancer surgery among malnourished patients)
- Refine referral pathways for nutritional support plans for all patients with low albumin.
- Monitor referrals to ensure 100% referral completion.
- Work with nutrition to ensure 1-6 weeks of added caloric support through supplemental shakes or diet plans
- Use prealbumin testing to determine the success of supplementation, in order to decide when surgery can proceed.
- Use weekly staff reminders to assess compliance with testing

Educational program:

- Provide education to surgeons, hospital personnel and to patients
- Post signs (Remember 100% albumin testing) in all clinician work areas where patients are seen preoperatively
- Standardize electronic order sets with embedded prompts for albumin testing
- Create algorithms, policies and protocols
- Provide case reviews of successful surgery diversion and resulting improved patient outcome
- Feedback of underperformance data to clinicians at regular intervals

Monitor and Reassess

- Weekly data on testing
- Monthly data on surgeries deferred, referrals to nutrition completed and surgeries performed on malnourished patients

Quarterly SCOAP data

References

Adogwa, O., Martin, J. R., Huang, K., Verla, T., Fatemi, P., Thompson, P., Cheng, J., Kuchibhatla, M., Lad, S. P., Bagley, C. A., & Gottfried, O. N. (2014). [Preoperative serum albumin level as a predictor of postoperative complication after spine fusion](#). *Spine*, 39(18), 1513–1519.

An investigation into the association between preoperative baseline serum albumin and postoperative surgical complication. Preoperative hypoalbuminemia (serum albumin <3.5g/dL) has been shown to be linked to an increased risk of morbidity and mortality.

Badia-Tahull, M.B, Llop-Talaveron, J, Fort-Casamartina, E, Farran-Teixidor, L, Ramon-Torrel, J.M, & Jódar-Masanés, R. (2009). [Preoperative albumin as a predictor of outcome in gastrointestinal surgery](#). *E-SPEN, the European E-journal of Clinical Nutrition and Metabolism*, 4(5), E248-E251.

Preoperative albumin determination, as a predictor of morbidity in patients undergoing major gastrointestinal tract surgery, is an inexpensive, simple, and effective test to include in the routine preoperative analytical workup of these patients.

Braga, M., & Gianotti, L. (2005). [Preoperative immunonutrition: cost-benefit analysis](#). *JPEN. Journal of parenteral and enteral nutrition*, 29(1 Suppl), S57–S61.

A randomized clinical trial with patients with gastrointestinal cancer evaluated whether preoperative immunonutrition could lead to savings in morbidity costs and patient care. The trial showed that a 5-day preoperative oral immunonutrition program reduced postoperative morbidity compared to no supplementation.

Gibbs, James, Cull, William, Henderson, William, Daley, Jennifer, Hur, Kwan, & Khuri, Shukri F. (1999). [Preoperative Serum Albumin Level as a Predictor of Operative Mortality and Morbidity: Results From the National VA Surgical Risk Study](#). *Archives of Surgery (Chicago. 1960)*, 134(1), 36-42.

Serum albumin concentration is a better predictor of surgical outcomes than many other preoperative patient characteristics. It is a relatively low-cost test that should be used more frequently as a prognostic tool to detect malnutrition and risk of adverse surgical outcomes, particularly in populations in whom co-morbid conditions are relatively frequent.

Heyland, D. K., Montalvo, M., MacDonald, S., Keefe, L., Su, X. Y., & Drover, J. W. (2001). [Total parenteral nutrition in the surgical patient: a meta-analysis](#). *Canadian journal of surgery. Journal canadien de chirurgie*, 44(2), 102–111.

An examination of the relationship between total parenteral nutrition (TPN) and death rates of surgical patients. A review of 237 abstracts or papers of clinical trials were examined to evaluate

the effect of TPN on complication and death rates. It was found that TPN does not influence the death rate but may reduce the complication rate especially for malnourished patients.

Kudsk, K. A., Tolley, E. A., DeWitt, R. C., Janu, P. G., Blackwell, A. P., Yeary, S., & King, B. K. (2003). [Preoperative albumin and surgical site identify surgical risk for major postoperative complications](#). *JPEN. Journal of parenteral and enteral nutrition*, 27(1), 1–9.

Malnutrition remains a frequently unrecognized and untreated risk factor in hospitalized patients. This review reconfirms previous work that nutrition assessment is either not acknowledged or ignored entirely. The absence of preoperative nutrition assessment recorded in most hospital charts demonstrates the wisdom of policies that initiate a screening procedure for all hospitalized patients.

Lobo, D. N., Gianotti, L., Adiamah, A., Barazzoni, R., Deutz, N., Dhatariya, K., Greenhaff, P. L., Hiesmayr, M., Hjort Jakobsen, D., Klek, S., Krznaric, Z., Ljungqvist, O., McMillan, D. C., Rollins, K. E., Panisic Sekeljic, M., Skipworth, R., Stanga, Z., Stockley, A., Stockley, R., & Weimann, A. (2020). [Perioperative nutrition: Recommendations from the ESPEN expert group](#). *Clinical nutrition (Edinburgh, Scotland)*, 39(11), 3211–3227.

Malnutrition is a risk factor for adverse postoperative outcomes. Preoperative optimization such as perioperative fluid therapy, glycemic control, and nutritional assessments of surgical patients with appropriate presurgical interventions can improve the functional conditioning of a surgical patient post-surgery.

Loftus, T. J., Brown, M. P., Slish, J. H., & Rosenthal, M. D. (2019). [Serum Levels of Prealbumin and Albumin for Preoperative Risk Stratification](#). *Nutrition in clinical practice: official publication of the American Society for Parenteral and Enteral Nutrition*, 34(3), 340–348.

Preoperative risk stratification is a strategy to predict postoperative outcomes that may alter or optimize comorbidities and modifiable risk. One modifiable risk with a predictor of poor postsurgical outcome is Malnutrition. Serum levels of albumin and prealbumin may be used as biomarkers for malnutrition.

Lohsiriwat, V., Chinswangwatanakul, V., Lohsiriwat, S., Akaraviputh, T., Boonnuch, W., Methasade, A., & Lohsiriwat, D. (2007). [Hypoalbuminemia is a predictor of delayed postoperative bowel function and poor surgical outcomes in right-sided colon cancer patients](#). *Asia Pacific journal of clinical nutrition*, 16(2), 213–217.

To determine the relationship between preoperative serum albumin and postoperative bowel function as well as surgical outcomes in right-sided colon cancer patients. This study concluded that hypoalbuminemia is a potential predictor of delayed recovery of bowel function postoperatively and significantly associated with postoperative complications in right-sided colon cancer patients undergone right hemicolectomy.

Martindale, R. G., & Maerz, L. L. (2006). [Management of perioperative nutrition support](#). *Current opinion in critical care*, 12(4), 290–294.

A review of new developments in nutrient delivery in the immediate perioperative period. This includes which patients will benefit, the route, timing and quantity of nutrient delivery. Albumin in particular plays a role in nutritional perioperative risk assessment.

McClave, S. A., Snider, H. L., & Spain, D. A. (1999). [Preoperative issues in clinical nutrition](#). *Chest*, 115(5 Suppl), 64S–70S. <https://doi.org/10.1378/chest.115.suppl.2.64s>

A patient's nutritional state if left to deteriorate in the perioperative phase will have adverse measurable outcomes that include nosocomial infections, multiple organ dysfunction, wound healing and functional recovery. Patients that have a compromised nutritional status, including weight loss and low serum albumin level, should have a 7-to-10-day nutritional repletion prior to surgery.

Sonoda, Akihiro, Ohnishi, Shun, Nakao, Shoji, Iwashita, Yoshitaka, Hashimoto, Naomi, Ishida, Kazuhisa, . . . Irie, Tetsumi. (2015). [Factors affecting serum albumin in the perioperative period of colorectal surgery: A retrospective study](#). *BMC Research Notes*, 8(639), 638.

Study background: Albumin is considered a negative acute-phase protein because its concentration decreases during injury and sepsis. Hypoalbuminemia is a risk factor for mortality, postoperative complications, and prolonged hospital stay. The magnitude of the systemic inflammatory response during the perioperative period, as indicated by the acute-phase proteins-C-reactive protein (CRP) in particular-, may help identify the risk of postoperative infectious complication. The correlation between serum albumin and CRP with gastrointestinal cancer has been reported. However, it is unclear whether antecedent CRP could be utilized to predict future hypoalbuminemia in the perioperative period in colorectal surgery. The primary endpoint of this study was to reveal that antecedent CRP could be utilized to predict future hypoalbuminemia in the perioperative period of colorectal surgery.