PATIENT OPTIMIZATION: NUTRITION IS THE KEY TO BETTER OUTCOMES

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OBJECTIVES

BY THE END OF THIS PRESENTATION THE AUDIENCE SHOULD BE ABLE TO:

1. Recognize patients at risk for nutritional impairment.
2. Optimize their patient’s nutritional status using an evidence-based approach.

DISCLOSURES

NONE
NUTRITION IN OUR EVERYDAY LIVES

Importance of Nutrition

- Our everyday life
- Weight loss
- Muscle mass
- Energy
- Our pet's health
- Farm animal health
- Not the health of our patients

NUTRITION:

Our food should be our medicine and our medicine should be our food - Hippocrates

Ironically nutrition is important in every aspect of our lives..... except healthcare

OPTIMIZING NUTRITION IN OUR PATIENTS?

Modifiable risk factors for complications

- Smoking
- Obesity
- DM
- Malnutrition

"I Spent Years Studying Nutrition in Med School"

Said No Medical Doctor Ever
MALIGNUTRITION

- 30-55% of hospitalized patients are malnourished

J of Parenteral & Enteral Nutrition 2011

OUR APPROACH TO NUTRITION IN HEALTHCARE

- Up to 69% of hospitalized patients undergo declining nutritional status during their hospital stay

J of Parenteral & Enteral Nutrition 2011

NUTRITIONAL STATUS CONTRIBUTES TO FRAILTY IN THE ELDERLY

- Frailty = reduced resistance to low-level stress event
  - Multifactorial
- Study of 112 hospitalized patients at least 65 years old
  - 75% of frail patients were malnourished or at risk of malnutrition

Valentini, Clin Interv Aging 2018
FRAILTY IN THE ELDERLY

Commonly Used Tools in CGA 40
Cognitive Status
Mini Mental Status Examination (MMSE)
Affective Status
Yale Geriatric Depression Scale (GDS)
Mobility – Gait and Balance
Trends Performance Oriented Mobility Assessment (POMA)
Functional Status - Activities of Daily Living
Katz Activities of Daily Living (ADL)
Functional Status - Instrumental Activities of Daily Living
Instrumental Activities of Daily Living (IADL)
Nutritional Adequacy
Mini Nutritional Assessment (MNA®)

Comparison of Malnutrition Risk Screening Tools

<table>
<thead>
<tr>
<th>Screening Tool</th>
<th>Patient Population</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNSG</td>
<td>Hospital</td>
<td>Unintentional weight loss, BMI, appetite, disease severity</td>
</tr>
<tr>
<td>SNAQ2</td>
<td>Hospital</td>
<td>Unintentional weight loss, appetite, use of CEN or enteral feeding</td>
</tr>
<tr>
<td>MNSG</td>
<td>Hospital</td>
<td>Unintentional weight loss, appetite</td>
</tr>
<tr>
<td>MNA3</td>
<td>Elderly</td>
<td>Unintentional weight loss, BMI, mobility, neuropsychological problems</td>
</tr>
<tr>
<td>MUST</td>
<td>Community</td>
<td>Unintentional weight loss, BMI, disease severity, food intake</td>
</tr>
</tbody>
</table>

MINI NUTRITIONAL ASSESSMENT

MNA® - Mini Nutritional Assessment
MALNUTRITION IN ELDERLY SURGICAL PATIENTS

- Majority of surgical inpatients are elderly
- Total joint replacements
- Spinal fusions
- Colon resections
MALNUTRITION: AN INDEPENDENT RISK FACTOR FOR COMPLICATIONS

- Retrospective study of 4,551 revision total knee arthroplasty patients
  - Albumin <3.5 OR
    - any complication 2.74
    - wound infection 2.57
    - deep wound SSI 2.70
    - pneumonia 2.84
    - UTI 3.01
    - acute renal failure 7.89
    - sepsis 5.30

J Knee Surg 2016

MALNUTRITION: AN INDEPENDENT RISK FACTOR FOR COMPLICATIONS

- Retrospective study of 3,671 anterior cervical fusions
  - Malnutrition = albumin <3.5 g/dL increased the rate of
    - pulmonary complications
    - readmission
    - reoperations
    - longer LOS
    - overall complications: relative risk = 3.37


MALNUTRITION: AN INDEPENDENT RISK FACTOR FOR COMPLICATIONS

- Full 100% sample of Medicare data from 2005-2012
  - elective 1-2 level posterior lumbar fusion for degenerative pathology
  - Malnutrition = albumin <3.5 g/dL increased the rate of
    - any major complication (OR 4.24)
    - wound dehiscence (OR 2.52)
    - SSI (OR 2.37)
    - 1-year mortality (OR 6.14)

Puvanesarajah. Spine 2017
MALNUTRITION: AN INDEPENDENT RISK FACTOR FOR COMPLICATIONS

- Retrospective study of 1,573 posterior cervical fusions
  - Malnutrition = Albumin <3.5 g/dL increased the rate of:
    - ANY complication (OR 2.8)
    - Pneumonia complication (OR 2.3)
    - Length of Stay >5 days (OR 2.8)
    - Sepsis (OR 4.0)
    - Blood transfusions (OR 3.2)
    - VTE (OR 3.6)
  - BMI and diabetes did not increase the risk of complications

Lee. Spine 2017

MALNUTRITION, MORE THAN OBESITY, ASSOCIATED WITH COMPLICATIONS AFTER TKA

Review of 77,785 total knee replacements.

Evaluated obesity (BMI>40) and malnutrition (Albumin <3.5) as risks factors for 21 different complications.

- Obesity was associated with:
  - ARI
  - Surgical infection OR 1.87
  - Sepsis

- Malnutrition was associated with:
  - Mortality
  - Sepsis OR 1.27
  - Deep incision OR 3.64
  - Pneumonia
  - Unplanned intubation
  - Septic shock
  - ARI
  - ARF
  - Cardiac arrest
  - Blood transfusions


PRESSURE ULCERS

Nutrition plays a critical role.

Nutrition plays a critical role.
PREVENTION AND TREATMENT OF PRESSURE ULCERS

- Adequate nutrition helps halt the development and progression of pressure ulcers in elderly patients.
- Cox. Crit Care Nurse 2014

CLOSTRIDIUM DIFFICILE TOXICITY

Adequate protein inhibits toxicity

- The patient in the next bed is highly infectious. Thank God for these curtains.

SERUM ALBUMIN IS AN ESSENTIAL COMPONENT OF THE HOST DEFENSE MECHANISM AGAINST CLOSTRIDIUM DIFFICILE INTOXICATION

- Albumin induces autoprotoxic cleavage and impairs toxin internalization into host cells.
- The host self-defense mechanism against C difficile is dependent on availability of serum albumin.
- Mass. J Infect Dis 2018
NUTRITION IS AN INDEPENDENT RISK FACTOR FOR COMPLICATIONS: BUT IS IT A MODIFIABLE RISK FACTOR?

OPTIMIZING NUTRITION IN SURGICAL PATIENTS

• OPTIONS FOR ADDRESSING NUTRITIONAL STATUS
  • DIETARY CONSULTATION
  • CHANGE DAILY DIET
  • BOOST OR ENSURE TO INCREASE PROTEIN LEVELS
  • IMMUNONUTRITION

OPTIMIZING NUTRITION IN SURGICAL PATIENTS

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IMMUNONUTRITION

- IMMUNOMODULATING NUTRIENTS
  - ARGinine: Stimulates the immune system and improves nitrogen balance
  - GLUTamine: Oxidative fuel for cell growth and tissue repair
  - OMEGA 3 Fatty Acids: Reduce inflammation and supports the immune system
  - NUCLEOTIDES: Stimulates protein synthesis and promotes tissue and cell recovery

IMMUNONUTRITION formulas have been studied extensively since the 1990s. Over 600 publications in a variety of journals have analyzed the safety, efficacy, and cost-effectiveness of immunonutrition ingredients and formulas.

META-ANALYSES OF STUDIES ON ROLE OF IMMUNONUTRITION FOR SURGICAL PATIENTS

<table>
<thead>
<tr>
<th>Meta-Analysis</th>
<th>No. of RCTs</th>
<th>Outcomes</th>
</tr>
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<tbody>
<tr>
<td>Zheng et al.</td>
<td>13</td>
<td>Fewer Post-op Infections; Shorter LOS</td>
</tr>
<tr>
<td>Drover et al.</td>
<td>35</td>
<td>Fewer Post-op Infections; Shorter LOS</td>
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<tr>
<td>Waitzbert et al.</td>
<td>17</td>
<td>Fewer Post-op Infections; Shorter LOS</td>
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<tr>
<td>Marik et al.</td>
<td>21</td>
<td>Fewer Post-op Infections; Fewer overall complications; Shorter LOS</td>
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<tr>
<td>Cerantola et al.</td>
<td>21</td>
<td>Fewer Post-op Infections; Fewer overall complications; Shorter LOS</td>
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<tr>
<td>Maimuthu et al.</td>
<td>26</td>
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<tr>
<td>Zhang et al.</td>
<td>19</td>
<td>Fewer Post-op Infections; Fewer overall complications; Shorter LOS</td>
</tr>
<tr>
<td>Osland et al.</td>
<td>21</td>
<td>Fewer Post-op Infections; Fewer overall complications; Shorter LOS</td>
</tr>
</tbody>
</table>
**SIGNIFICANT REDUCTION IN INFECTIONS AND LOS**

- Immunonutrition used prior to major surgery:
  - 51% reduction in post-operative infections
  - 15% shorter hospital length of stay

- Meta analysis, 1,009 patients
  - 50% reduction post-operative infections
  - Reduction in length of hospital stay of 2.5 days

**REDUCTION OF COMPLICATIONS AND COST**

- Prospective, randomized, double-blinded multicenter clinical trial
- 145 patients with upper GI tract malignancy
- 5 days preop and 10 days postop
- Postoperative complications
  - IMM group had 50% fewer complications (14 vs 27)
  - Cost of complications per patient
    - IMM group complication costs were 25% of the control group
    - (75% reduction in cost of complications)
  - Net cost saving of DKK 1,426 ($193)

**REFERENCES**

- Senkal et al. Arch Surg, 1999
## WELL-NOURISHED VS MALNOURISHED

### Reduction of Serum Albumin POD 3

<table>
<thead>
<tr>
<th></th>
<th>Reduction of Serum Albumin</th>
<th>3%</th>
<th>44%</th>
<th>6 days</th>
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</thead>
<tbody>
<tr>
<td>Control</td>
<td>24.71%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IMN</td>
<td>14.69%</td>
<td>15.40%</td>
<td>4 days</td>
<td></td>
</tr>
</tbody>
</table>

### Postoperative Complications

<table>
<thead>
<tr>
<th></th>
<th>IMN Group 11%</th>
<th>Control 24%</th>
<th>54% fewer postoperative infections with IMN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Postoperative Infections:</td>
<td>IMN Group 10%</td>
<td>Control 21%</td>
<td>Malnourished 14%</td>
</tr>
</tbody>
</table>

### Mean Chest Tube Drainage Time

- Control: 25.71% 44.40% 6 days
- IMN: 14.69% 15.40% 4 days

Kaya et al., Journal of Cardiorthoracic Surgery 2016

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## WELL-NOURISHED VS MALNOURISHED

### Prospective, Randomized, Double-Blinded Clinical Trial

- 240 patients with lower GI cancer undergoing elective surgery
- Postoperative IMN significantly reduced the rate of postoperative infections regardless of baseline nutritional status

Braga et al., Arch Surg 1999

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## WHAT WE NOW KNOW!

- Malnutrition is a significant contributing factor to frailty in the elderly
- Immunonutrition decreases complications and improves outcomes
- Over 650 articles on PubMed.com
IT WORKS........WHAT DOES IT COST?

- LET'S DEFINE THE FINANCIAL RISK OF NOT OPTIMIZING OUR PATIENT'S NUTRITIONAL STATUS

DEFINING THE FINANCIAL RISK

- 30 DAY REHOSPITALIZATION RATE
  - 19.6%

- 90 DAY REHOSPITALIZATION RATE
  - 34%

  Based on a study of 12 million Medicare patients

DEFINING THE FINANCIAL RISK: SURGICAL COMPLICATIONS AND COST

- 5120 EPISODES OF SURGICAL CARE FOR 24 SURGICAL PROCEDURE GROUPS (17 GENERAL SURGICAL, 6 VASCULAR, AND 1 GYNECOLOGIC) WERE EXAMINED
- DATA WAS COLLECTED FROM THE MICHIGAN SURGICAL QUALITY COLLABORATIVE
- COMPARED HOSPITAL COSTS, THIRD-PARTY REIMBURSEMENT (IE, PAYER COSTS), AND HOSPITAL PROFIT MARGIN FOR CASES WITH AND WITHOUT COMPLICATIONS.
- MEAN HOSPITAL COSTS WERE $19,628 (119%) HIGHER FOR PATIENTS WITH COMPLICATIONS ($34,060) COMPARED WITH THOSE WITHOUT COMPLICATIONS ($14,434).
- HOSPITAL PROFIT MARGIN DECREASED FROM 5.8% FOR PATIENTS WITHOUT COMPLICATIONS TO 0.1% FOR PATIENTS WITH COMPLICATIONS.

- Healy. JAMA Surg. 2016 Sep 1
DEFINING THE FINANCIAL RISK

COST OF READMISSION FOR CMS-TRACKED CONDITIONS

- **All-cause Readmissions**
  - Average Cost of Readmission: $11,200
  - 25.1% Readmission rate

- **Congestive Heart Failure Readmissions**
  - Average Cost of Readmission: $13,000
  - 21.2% Readmission rate

- **Joint Replacement Readmissions**
  - Average Cost of Readmission: $12,300
  - Cost for THR: $10,200
  - 8.2% Readmission rate for THR
  - Cost for TKR: $13,200
  - 5.1% Readmission rate for TKR

Ellie Rizzo Becker’s Hospital Review December 12, 2013

MALNUTRITION AND READMISSION

<table>
<thead>
<tr>
<th>Readmissions with Malnutrition (during index stay)</th>
<th>Readmissions Without Malnutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td>All-cause 30-day</td>
<td>All-cause 30-day</td>
</tr>
<tr>
<td>23%</td>
<td>14.9%</td>
</tr>
<tr>
<td>Cost for Readmission</td>
<td>Cost for Readmission</td>
</tr>
<tr>
<td>$17,900</td>
<td>$13,400</td>
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</table>

Healthcare Cost and Utilization Project 2013

MALNUTRITION AND COST

<table>
<thead>
<tr>
<th>Malnutrition at Index Stay</th>
<th>Avg Cost of Index Admission</th>
<th>Avg Cost of Readmission</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malnutrition</td>
<td>$21,200</td>
<td>$16,200</td>
<td>$37,400</td>
</tr>
<tr>
<td>No Malnutrition</td>
<td>$12,100</td>
<td>$13,400</td>
<td>$25,500</td>
</tr>
<tr>
<td>Difference in Cost</td>
<td>$9,100</td>
<td>$2,800</td>
<td>$11,900</td>
</tr>
</tbody>
</table>

Healthcare Cost and Utilization Project 2013
ACA QUALITY MEASURES AND PENALTIES

Readmission Rates
- 2,573 hospitals penalized for too high readmission rates
- Total penalties
- $564 million in Medicare payment cuts

HAC (Infection Rates)
- 769 hospitals penalized for Hospital Acquired Conditions rates being too high in 2017
- $430 million in Medicare payment cuts

Kaiser Health News

Cost Effectiveness of Immunonutrition

Hospital Cost Savings with Immunonutrition
- From a meta-analysis of 6 studies (869 medical inpatients)
  - $6,000 cost savings per patient based on hospital length of stay
  - $3,300 cost savings per patient based on reduction of infectious complications

Wauters, World J Surg 2006

Cost Effectiveness of Immunonutrition

Hospital Cost Savings with Immunonutrition
- Randomized double-blind controlled study (310 patients)
  - Cost effectiveness analysis showed net saving of 2,386 Euros ($2,619) per patient
    - Excluded the cost of the immunonutrition
  - Gianotti et al. Shock 2000
COST EFFECTIVENESS

- Hospital cost savings with Immunonutrition
- 722 adult patients who underwent elective colorectal surgery
- Cost saving in the Immunonutrition group
  - $2,500 cost saving at index admission (per patient)
  - $3,500 cost saving per patient through 30 days
  - $5,300 cost saving over 180 days per patient

Banerjee Nutrition 2017

MALNUTRITION CODING

Can increase DRG by more than $2,000

<table>
<thead>
<tr>
<th>ICD-10 Code</th>
<th>Description</th>
<th>MCC/CC</th>
</tr>
</thead>
<tbody>
<tr>
<td>E44.1</td>
<td>Malnutrition of mild degree</td>
<td>CC</td>
</tr>
<tr>
<td>E44.0</td>
<td>Malnutrition of moderate degree</td>
<td>CC</td>
</tr>
<tr>
<td>E43</td>
<td>Unspecified severe protein-calorie malnutrition</td>
<td>MCC</td>
</tr>
</tbody>
</table>

CC: Complication or comorbidity
MCC: Major Complication or comorbidity

THE FACTS:

- Truly Modifiable
- Simple
- Immunonutrition
- It’s an 8oz drink
- 6 days before and 6 days after surgery
- We are not purposing a lifestyle change
THE FACTS:
IMMUNONUTRITION SAVES YOUR HOSPITAL MONEY

- Coding for Malnutrition as a CC or MCC
- Fewer complications
- Fewer readmission
- Shorter LOS

OUR OBLIGATION AS PHYSICIANS

- Educate
  - Discuss the risks of treatment options
  - Discuss the Risk Factors
  - Discuss how to mitigate the potential complications
- Advocate
  - Hospitals and Health systems can help
  - Quality outcomes are important to the hospitals

MY PROTOCOL

- Drink two bottles of Immunonutrition each day 6 days prior to surgery and 6 days after surgery
- Immunonutrition is most effective taken 5-7 days pre-operatively and 5-7 days post-operatively
- Non-elective surgical patients should drink 2 bottles of Immunonutrition 6 or 12 days after surgery depending on nutritional status
- I recommend Immunonutrition to every patient undergoing any major or inpatient surgery.