Entry Level Clinical Nutrition:  
A cost effective, practical and simple addition to the functional medicine repertoire

Part I: Introduction

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Summer of work exposes medical students to system’s ills, The New York Times, September 9, 2009

“...a tidal wave of chronic illness...”
“One of every two adults lives with a chronic illness, estimates the Centers for Disease Control and Prevention. Conditions that can be managed but not cured included chronic kidney disease, diabetes, heart disease, lung disease, joint disease and chronic pain.”
LONDON/CHICAGO (Reuters) - Older Americans suffer more chronic disease than their English counterparts, but the English die earlier, according to a study on Thursday that could revive debate about whose health system is better.

Researchers at the U.S.-based RAND Corp and Britain's Institute for Fiscal Studies (IFS) found that while Americans aged 50 and older have higher rates of chronic disease, they live longer than elderly people who get old in England.

"If you get sick at older ages, you will die sooner in England than in the United States," said James Smith, an economist with RAND in Santa Monica, California, who co-authored the study with Janice Banister and Alistair馬的 of the IFS.

"It appears that at least in terms of survival at older ages with chronic disease, the medical system in the United States may be better than the system in England."

But that edge comes at a price.

Organisation for Economic Co-operation and Development (OECD) data show the United States spends more on healthcare than any other nation, and Banister said spending on healthcare for the elderly in the U.S. is almost double that in England.

In 2004, the latest year for which full OECD figures are available, the United States spent 16 percent of its national output or $7,058 per person on health — well over double the $3,800 per person average of all OECD countries.

British politicians have rejected this, saying their National Health System works well and is attacked during the 2005 U.S. presidential election campaign by Republicans who used criticism of the NHS — which they called a socialized system — to stoke opposition to Barack Obama's healthcare reforms.

Supporters of Obama's reforms argue too many people fall through the net and are without medical insurance. Those people in the United States turn 65, however, then become eligible...
• “Some of the sickest patients can run up hospital charges as high as $18,000 a day, with average stays of almost three weeks, according to a new government report on the cost of hospital care.”

• “These patients were much more severely ill than others; the five most common diagnoses were sepsis, or blood poisoning, along with clogged arteries, heart attack, respiratory failure and complications related to a medical device, implant or graft.”
"Lowering total health care expenses requires addressing the factors that drive those high-cost cases. For the most part, they involve chronic conditions like diabetes, hypertension, and congestive heart failure, whose treatment varies much more than you’d think from doctor to doctor."

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The thirsty man syndrome
Batmanghelidj F. Your body’s many cries for water, Second Edition, Global Health Solutions, Inc. Falls Church, VA, 1995

Makrides M et al. Effect of DHA supplementation during pregnancy on maternal depression and neurodevelopment of young children, JAMA, Vol. 304, No. 15, pp. 1675-1683, October 20, 2010

"The use of DHA-rich fish oil capsules compared with vegetable oil capsules during pregnancy did not result in lower levels of postpartum depression in mothers or improved cognitive and language development in their offspring during early childhood."
Quinn JF et al. Docosahexaenoic acid supplementation and cognitive decline in Alzheimer disease, JAMA, Vol. 204, No. 17, pp. 1903-1911, November 3, 2010

“Supplementation with DHA compared with placebo did not slow the rate of cognitive and functional decline in patients with mild to moderate Alzheimer disease.”

Manger MS et al. Dietary intake of n-3 long-chain polyunsaturated fatty acids and coronary events in Norwegian patients with coronary artery disease, Am J Clin Nutr, published ahead of print May 19, 2010

“In this population with established and well-treated CAD and with a relatively high intake of n-3 LCPUFAs, we observed no significant association between intakes of n-3 LCPUFAs or fish and risks of coronary events or mortality. Only patients with very low intakes of these fatty acids may reduce their risk of coronary events by increasing their intakes.”

"The continued and important advice for the public is to get their essential micronutrients from foods when possible. The use of supplements should be sparing and best decided in consultation with professionals. The public may additionally benefit from a more careful examination of the excess nutrients consumed in fortified foods, cereals, and vitamin ‘enhanced’ products."


"Dietary supplementation with folic acid to lower homocysteine levels had no significant effects within 5 years on cardiovascular events or on overall cancer or mortality in the populations studied."

“Long-term treatment of poststroke survivors with folic acid, B6, and B12 was associated with a reduction in the hazard of major depression in our patient population. If these findings can be validated externally, B-vitamin supplementation offers hope as an effective, safe, and affordable intervention to reduce the burden of poststroke depression.”


“The study included 31,671 women with no history of cardiovascular disease (CVD) and 2262 women with a history of CVD aged 49-83 y from Sweden.”

“In Sweden there is a policy to add vitamin D to milk and to add vitamin A and D to butter and margarine; however, there is no mandatory fortification policy for other vitamins and minerals, although some foods (eg, cereals and fruit juices) may be fortified with different vitamins and minerals. A bigger effect of multivitamins might be expected when the food supply was not already fortified.”
Entry Level Clinical Nutrition
Dr. Jeff Moss

Fukushima R & Yamazaki E. Vitamin C requirement in surgical patients, *Curr Opin Nutr Metab Care*, Online ahead of print, 2010

"The postoperative requirement for vitamin C appears to be increased probably owing to increased demand, and the RDA or doses recommended in parenteral guidelines may not be sufficient to maintain an adequate plasma concentration. It seems that more than 500 mg/day is needed for uncomplicated surgical patients and higher doses for severely stressed patients."


"We demonstrated transient, but significant, decreases in blood vitamin concentrations during the acute-phase response."

"...biochemical vitamin concentrations, determined during the acute-phase response, should be interpreted with care."
• “Certainly there is little debate that supraphysiologic supplementation is indicated for a brief period when a frank deficiency of a micronutrient is identified. As a general guideline, the provision of 5 to 10 times the RDA on a daily basis for 5-7 days, either enterally or parenterally, will suffice as a means of repletion.”

• “Cachexia may well represent the devastating flip side of the tremendous achievements of modern medicine, as the incidence of cachexia is also a function of survival of chronic illness.”

• “Many diseases – which rapidly led to death only a few years ago – are now better controlled by new therapies. Even if we cannot cure and eradicate these diseases, their natural history has significantly increased by months and years. Although these new therapeutic strategies represent a remarkable advantage over the previous standards of care, it is impossible to ignore the fact that many more patients are now facing the nutritional and metabolic consequences of prolonged immunological and hormonal challenges due to both the illness process itself and the aggressive therapies.”


“An understanding of the nature of stress is fundamental to the rational design of nutrient mixtures to feed patients whose homeostasis has been altered by one or more stressors.”

“All stresses may be presumed to be associated with characteristic modifications in the metabolism of lipids, carbohydrates, amino acids, and micronutrients.”
Nutritional support

John Kress
University of Chicago, Chicago, IL, USA

Cachexia is a common consequence of critical illness, and it is characterized by marked muscle breakdown. It correlates with an increased susceptibility to infection, prolonged ventilatory requirements, and mortality. Causes include the following:
- pro-inflammatory mediators prior to admission to the intensive care unit (ICU)
- hypermetabolic response to critical illness
- delayed introduction of nutritional support

The hypermetabolic response that accompanies severe trauma, burns, sepsis, pancreatitis, etc., differs significantly from the normal physiologic response to starvation (Figure 11.1).

Energy
The total calorie intake should be approximately equivalent to predicted resting energy requirements (16-20 kcal/kg per day), and for prolonged feeding regimens approximately one-third of this should be given as fat. Patients who are very hypermetabolic (e.g., with severe burns) may require more than this. However, in general, an average of calories should be maintained.

Nitrogen
Nitrogen intake should be 1.2 g protein/kg per day (this should be reduced in cases of renal failure to minimize urea). Approximately 100 kcal of non-protein energy source are required per gram of nitrogen to permit satisfactory protein synthesis. Glutaminergic supplements (127 g/day) may help maintain...

"Critical illness itself may increase metabolic demand on the host in the early stages of the stress response, and nutrient intake may be limited."


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• “The acute phase response (APR) is an acute systemic response to infection. Recent studies reveal that the APR is chronically activated in patients at risk for atherosclerosis. Diabetes, hypertension, and elevated cholesterol trigger the APR, leading to the systemic release of hundreds of effector molecules that might damage the endothelium and activate macrophages, driving the process of atherogenesis. The signaling molecules that mediate the APR are attractive candidates for anti-inflammatory therapy of patients with atherosclerosis.”

• “Many of the inflammatory markers elevated in patients at risk for atherosclerosis are part of the APR. The APR is an innate systemic inflammatory response to diverse injuries, such as infection and trauma. Although the APR is a beneficial short-term response to life threatening physiological challenges, the APR can harm the host if it is chronically activated. Elevation of APR markers in patients with heart disease suggests that the APR plays a role in atherogenesis.”
“Elevations in the APR markers in patients with atherosclerosis suggest that risk factors for heart disease – such as diabetes, mediators of hypertension, and LDL cholesterol – might trigger the APR.”

“Normally, the APR is activated within hours by infection and then shuts down within two to three days. However, in patients with atherosclerosis the APR appears to be chronically activated at a low level for years. For example, elevated CRP levels predict the risk of atherosclerosis more than six years into the future. Perhaps the continued presence of atherosclerotic risk factors such as hypertension play a role in the persistent activation of the APR.”

Components that create the clinical picture

Causes of Organ-based Illness

Genetics and Nutrient intake

Gastroenterology
Toxicology
Neurology
Immunology
Endocrinology

Leaky gut/Malabsorb.
MCS/Neurologic damage
Mood Disorder
Autoimmunity

Allostasis/Allostatic load
Sickness behavior
Sick Syndrome
Hypermetabolic Syndrome

ANABOLIC/CATABOLIC IMBALANCE

Hypermetabolism
Insulin resistance
Metabolic acidosis
Nutrient depletion and aberrant nutrient metabolism

Chronic phase response (Inflammation)
GI mucosal atrophy

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A simplified approach to helping patients feel better

- Understanding the true nature of chronic illness: Excessive allostatic load
- Simple diagnostic tools
- A simplified menu to improve patient quality of life

### Considerations for the Catabolic Patient

<table>
<thead>
<tr>
<th>Signs &amp; Symptoms</th>
<th>Consider</th>
<th>Treatment Plan</th>
<th>Monitor</th>
<th>Supplementation</th>
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<tbody>
<tr>
<td>Feeling “hazy”</td>
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<td>Fatigue</td>
<td></td>
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<td>Cavities</td>
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<td>Depression/tiredness</td>
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<td>Poor quality sleep</td>
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<tr>
<td>Poor digestion/absorption/lazy gut</td>
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<tr>
<td>Chronic pain/infeciton</td>
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<tr>
<td>Optimize pH</td>
<td>Operate fluid and electrolyte balance</td>
<td>Morning urinary pH paper</td>
<td></td>
<td>Presence: Bicarbonate, K Alkaline (Moss) Magnesium Magnesium Glycinate (Vital Nutrients)</td>
</tr>
<tr>
<td>Optimize muscle mass (reduce sarcopenia) and amino acid levels</td>
<td>Pay special attention to protein and amino acids</td>
<td>Body composition: Bioelectrical impedance scale Grip-strength</td>
<td></td>
<td>Amino acids: Creatine, Aminos Base (Metabolic Moss) Protein powders/foods: Ultra Lean proteins, Paleo products (FH)</td>
</tr>
<tr>
<td>Reducing inflammation</td>
<td>Reduce inflammation</td>
<td>Address food allergies</td>
<td></td>
<td>Inflammatory biomarkers: CRP, TNF levels WBC, Differential, Anti-inflammatory agents: Biocell (Olympian), D-Fen (Powers), Pain Grant (Pener), Fish Oils, UltraPure Fish oil, Vital Nutrients, Food allergy stool, Microzyme (DH)</td>
</tr>
<tr>
<td>Improving insulin sensitivity</td>
<td>Watch carbohydrate/protein ratio</td>
<td>Fasting glucose, Fasting insulin, Craigings</td>
<td></td>
<td>Metabolic Synergy (DH)</td>
</tr>
<tr>
<td>Optimize dietary carbohydrate/protein ratio</td>
<td>Regulate protein deficiencies and reduce carbohydrate intake along with improvements in dietary quality</td>
<td>Diet diary, Optimal protein intake: 1.0 – 1.2 g/kg body weight</td>
<td></td>
<td>Presence: Bicarbonate, K, Alkaline (Moss) Magnesium, Magnesium Glycinate (Vital Nutrients)</td>
</tr>
<tr>
<td>Optimize GI function</td>
<td>Dietary changes, supplementation of digestive aids</td>
<td>Patient signs and symptoms</td>
<td></td>
<td>Presence: Bicarbonate, K Alkaline (Moss) Magnesium, Magnesium Glycinate (Vital Nutrients) Biocell (Olympian), Probiotics, Prebiotics and Digestive Enzymes (Probiotics)</td>
</tr>
<tr>
<td>Optimize Colorectal/deficiencies/imbalances</td>
<td>Supplementation of nutrients: Possible emphasis on vitamin D, orange, and zinc</td>
<td>Severe 25 OH vitamin D Parathyroid hormone indicators</td>
<td></td>
<td>Presence: Bicarbonate, K Alkaline (Moss) Magnesium, Magnesium Glycinate (Vital Nutrients) Multi Nutrients (Vital Nutrients) Vitamin D (Vital Nutrients) Total (Moss), Zinc Super (FH)</td>
</tr>
</tbody>
</table>

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This is a relatively easy, inexpensive way to help most patients feel better early on during the course of therapy no matter what their “disease” or chief complaint.

Su KP. Biological mechanism of antidepressant effect of omega-3 fatty acids: How does fish oil act as a ‘mind-body interface’? *Neurosignals*, Vol. 17, pp. 144-152, 2009

Table 1. Overlapping of symptoms of acute sickness behaviour associated with IFN-α therapy and the somatic symptoms in MDD

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Prevalence in IFN-α therapy, %</th>
<th>Prevalence in MDD, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fatigue/asthenia</td>
<td>39–90</td>
<td>73</td>
</tr>
<tr>
<td>Headache</td>
<td>27–67</td>
<td>33*</td>
</tr>
<tr>
<td>Gastrointestinal symptoms</td>
<td>50*–1</td>
<td>34–47*</td>
</tr>
<tr>
<td>Psychomotor slowing</td>
<td>40*</td>
<td>59–65*</td>
</tr>
<tr>
<td>Insomnia</td>
<td>20–39*</td>
<td>63</td>
</tr>
<tr>
<td>Irritability</td>
<td>35*</td>
<td>50</td>
</tr>
<tr>
<td>Arthralgia</td>
<td>9–36</td>
<td>31*</td>
</tr>
<tr>
<td>Musculoskeletal pain</td>
<td>26–32</td>
<td>62–80*</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>15–20</td>
<td>21*</td>
</tr>
<tr>
<td>Anorexia</td>
<td>13–19</td>
<td>40</td>
</tr>
<tr>
<td>Anxiety</td>
<td>13–18*</td>
<td>57</td>
</tr>
<tr>
<td>Poor concentration</td>
<td>14*</td>
<td>51</td>
</tr>
</tbody>
</table>

1 [46], unless otherwise specified; 2 [99], unless otherwise specified; 3 [100]; 4 [101]; 5 [102]; 6 [103]; 7 [104].

1 Nausea, vomiting, bowel problems.
2 Result from depressed inpatient population.

“...a protective effect of cholesterol against peroxidation, due either to its antioxidant action or to its capacity to stabilize plasma membrane, has been reported for a variety of systems. For example, Lopez-Revuelta and colleagues found that depletion of cholesterol from RBCs increased their vulnerability to peroxidation which could be reversed by cholesterol repletion.”

Souters PB & Grimble RF. Dangers and benefits of the cytokine mediated response to injury and infection, *Clin Nutr*, published online 2009.
• “Endotoxin, via stimulation of pro-inflammatory cytokine production, induces increased plasma lipid concentrations due to increased synthesis and secretion of triglyceride-rich lipoproteins by the liver and inhibition of lipoprotein lipase.”

• “This effect leads to hyperlipoproteinemia and hypertriglyceridemia, which increases the availability of substrate for the immune system and wound healing, but can also bind and neutralize LPS.”

• “It has therefore been postulated that triglyceride-rich lipoproteins (very low-density lipoproteins and chylomicrons) are also components of an innate, non-adaptive host immune response to infection.”

• “In experimental settings it is has indeed been demonstrated that lipoproteins can bind LPS, protect against LPS-induced toxicity, and play an important role in host response to LPS.”
Stressed state – Catabolic, hypermetabolic

Initial Causes
- Direct tissue damage

Intervention

Responses
- Coping (Anabolic)

Effects
- Coping (Anabolic)

Stressed state

Intervention

Coping (anabolic)
Thank you!!