

“Energize your Practice”

An Update on Energy Estimation

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“The ENERGY BALANCE INITIATIVE (EBI)”

A CALL TO ACTION !!!

Interprofessional Network Led by RDNs and DTRs to “GO FAR”

WORKSHOP I: ASSESSMENT (Improvement and Personalization)

1. Evaluate the Current EB Equation and “GO FAR” Beyond the Mifflin St. Jeor Equation (MSJE) Using New Technology, Methods and Information.

2. Improve and Personalize Assessments of Total Energy Expenditure (TEE) including Resting Energy Expenditure (REE) and Physical Activity Levels (PAL).

3. Simplify and Improve the Assessment of Total Energy Intake (TEI) and Evaluate the Caloric Equivalents of Weight Change with differences in TEE and TEI.

4. Define Weight Maintenance as a Focal Point for Weight Management and Train Nutrition Professionals to Enhance Their Practices on the “GO”.

WORKSHOP II: APPLICATION (Skills Development and Evaluation)

5. Introduce Serial Measures of Weight and Weight Fluctuations as Clinical Indicators to Evaluate Overall Energy Balance and Better Target Energy Requirements and Rx.

6. Identify Biometrics, Biomarkers and Nutrigenomics To Identify Risk Factors to Personalize Rx

7. Empower Leadership by Developing Expertise with Behavioral Strategies, Coaching and Client Centered Motivational Skills to Achieve Weight Maintenance as the Starting Point

8. Create New Opportunities by Being Proactive To Fight Harmful Fads & Practices

Disclosures:

▶ Technical Consultant:

TF Health (dba Breezing Indirect Calorimeters)- Erica Forzani, Ph.D, Tempe, AZ

▶ Current Collaborations:

Diet ID Analysis Program - David Katz, M.D, Hamden, CT

Accusplit Pedometers - Mr. Ron Sutton, Pleasanton, CA

▶ CEO and Owner:

St. Jeor Nutrition Associates, PLLC (dba GenQuest Nutrition)

Energy Balance Initiative: Director - Sachiko St. Jeor, MS, Ph.D, RDN, LD, Reno, NV

Co-Directors - Barbara Scott, MPH, RDN, LD, Reno, NV

Miriam Een, MS, RDN, LD, Las Vegas, NV

MAJOR GOAL IS TO DEVELOP LEADERS:

1. By enhancing practices and empowering qualified nutrition professionals to be proactive;
2. Encouraging interprofessional work collaboratively to improve client outcomes and satisfaction.

OBJECTIVES: Workshop I - Assessment

1. Discuss the ENERGY BALANCE EQUATION (EB) and identify current limitations and major challenges;
2. Describe and outline selected methods to IMPROVE THE EB ASSESSMENTS AND PERSONALIZE RESULTS using technological advances, new methods, and practical applications by identifying and recommending:
 - (EBP) Evidence-Based Best Practices
 - (CBE) Consensus-Based Expert Recommendations
 - (TBI) Trial-Based Innovations (which need further study)
3. Discuss the questions surrounding CALORIC EQUIVALENTS OF WEIGHT and WEIGHT CHANGES and how best to assess factors which directly affect energy requirements (body composition etc.).
4. Define WEIGHT MAINTENANCE AND CATEGORIZE WEIGHT FLUCTUATIONS and describe advantages as the starting point for baseline assessments first on which to build any needed or desired interventions.

Energize your Practice **Workshop I: Assessment**

Director EB Initiative: Sachiko St. Jeor, MS, PhD, RDN
Co- Directors: Barbara Scott, MPH, RDN and Miriam Een, MS, RDN

Moderator: Gail Frank, PhD, RDN
IT Program Coordinator: Michelle Rebaleati
Website Master: Matthew Minten

Speakers:
Erica Forzani, Ph.D
James O. Hill, Ph.D.
David Katz, M.D.
Dale Schoeller, Ph.D.

Program Sponsors:
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Breezing IDC (JaLeena Davis)
Accusplit (Ron Sutton)

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Erica Foote, RDN
Nancy Munoz, Ph.D.
Barbara Scott, MPH, RDN

REE/TEE/Wt.Changes

Kevin Hall, Ph.D.
Steve Heymsfield, M.D.

OBJECTIVES : Workshop II:

Skills Development for Improving and Maintaining Energy Balance and Rx

5. Introduce **WEIGHT AND WEIGHT CHANGES (FLUCTUATIONS) AS CLINICAL INDICATORS (BIOMARKERS)** to assess accuracy of the personalized energy balance and Rx by the updated EB Assessment;
6. Describe the use of selected **BIOMETRICS AND BIOMARKERS** to assess at risk behaviors and needed intervention strategies and to evaluate change;
7. Provide practical **BEHAVIOR CHANGE, COACHING AND CLIENT CENTERED MOTIVATIONAL INTERVIEWING SKILL SETS** and appropriate interpretations and applications for weight maintenance and goal attainment; and,
8. Discuss and **IDENTIFY CHALLENGES, NEW MARKETS AND INNOVATIVE OPPORTUNITIES** to fight harmful fads and practices.

MAJOR GOAL : TO DEVELOP LEADERS of the INTERPROFESSIONAL, PROACTIVE TEAM

1. Improving and Personalizing The Current Energy Balance Equation

CURRENT EB FORMULA = A “GUESSTIMATE”

$$\text{TOTAL ENERGY INTAKE (TEI)} = \text{TOTAL ENERGY EXPENDITURE (TEE)}$$

Food and Beverage Intake (FI) = “Basal” Energy Expenditure (BEE ~60-70%)
 + Physical Activity Level (PAL ~20-30%)
 + Thermic Effect of Food (TEF ~10%)

FI (100 %) = “Resting” Energy Expenditure (REE) = BEE + 10 %

FI (kcal/day) = REE X PAL (physical Activity Level) (kcal/day)

PREDICTIVE ERROR = ESTIMATION OF Food Intake ~ 10 to 50%
REE (MSJE) ~ ± 10%
PAL ~ 10 to 30%
TOTAL ADDITIVE ERROR > 50%

MANY INDEPENDENT, UNKNOWN AND ADDITIVE FACTORS AFFECT METABOLISM.....

The Energy Balance Equation

Weight Maintenance (\pm)

Respiratory Quotient (RQ) ?
Diet Quality ?/ Nutrient Adequacy ?
Macronutrient Distribution?
Habits?/Eating Patterns?
Biomarkers?

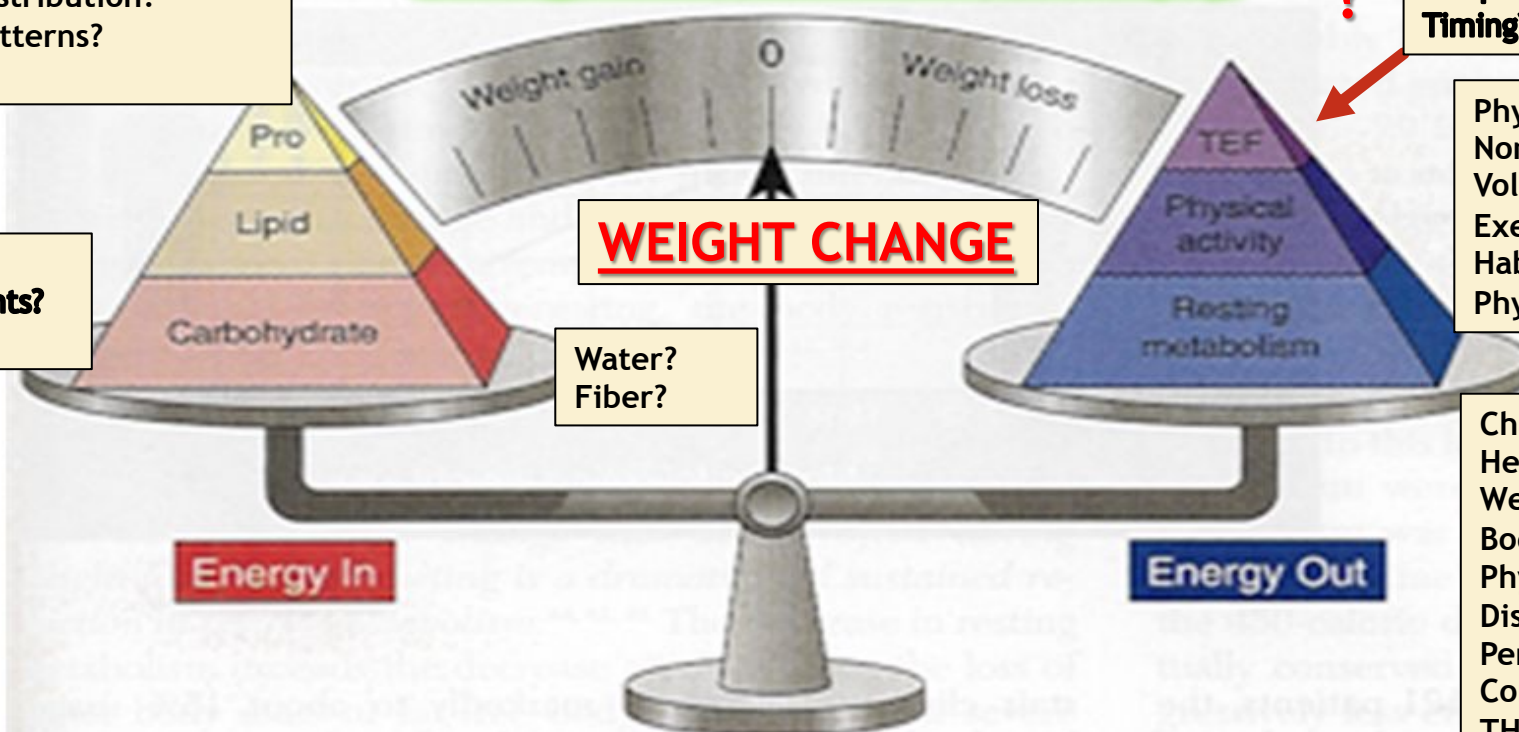
Thermic Effect of Food (TEF)?
Macronutrient Composition?
Frequency?/Loading?
Timing?/Intermittent Fasting?

Alcohol ?
Supplements?
Drugs?

Water?
Fiber?

Physical Activity Level (PAL)
Non-Exercise Thermogenesis (NEAT)
Volitional Activity ?
Exercise ?
Habits?/Patterns?
Physical/Medical Limitations?

Changes in Metabolism.
Height/Weight/Age/Gender (MSJE)
Weight Changes (Serial Measurements)?
Body Composition (Lean Body Mass, Fat Mass)?
Physical and Mental States/Behavioral Patterns
Disease States (Medical Considerations)+++
Personal?/Environmental Factors?
Complex interactions (drug/nutrient, etc.)?
THE UNKNOWN???



TEI

=

TEE

Definition of Weight Maintenance*

- $\pm < 5.0$ lbs between any 2 points in time \sim (03% BW)
- RENO Diet Heart Study End-Point Maintainers
 - After One year = 62%
 - After Four years = 46 %
- And + <5.0 LBS OVERALL (Fluctuation Index) or
FI = 0 = <5.0 lbs at any point in time
19% = True Maintainers

*St Jeor et al, J Am Dietet Assoc 1997;97:481-488

**Frequency of maintainer, gainer, loser (MGL) categories over five annual measurements (n= 385)
(RENO Diet Heart Study, Reno, NV)**

Time Interval	Maintainers		Gainers		Losers	
	n	%	n	%	n	%
1Y CHANGES						
Y2-1	244	63.4	76	19.7	65	16.9
Y3-2	243	63.1	85	22.1	57	14.8
Y4-3	242	62.9	81	21.0	62	16.1
Y5-4	227	59.0	102	26.5	56	14.5
AVERAGE	239	62.1	86	22.3	60	15.6
2Y CHANGES						
Y3-1	201	52.2	112	29.1	72	18.7
Y4-2	202	52.5	112	29.1	71	18.4
Y5-3	212	55.1	108	28.1	65	16.9
AVERAGE	205	53.3	111	28.8	69	18.0
3Y CHANGE						
Y4-1	187	48.6	126	32.7	72	18.7
Y5-2	200	51.9	120	31.2	65	16.9
AVERAGE	194	50.3	123	32.0	69	17.8
4Y CHANGE	178	46.2	131*	34.0*	76	19.7
			* p < .05		St Jeor et al. Ob Res. 1995;3:249s	

Who are the True Maintainers?*

- ~20 % of the population
- 75% normal weight Vs < 25% obese
- Older males
- Lower weight variability
- Less dieting
- Lower BMI, % BF and WHR
- Healthier levels of risk factors

*St.Jeor et al., Ob Res. 1995;3:249s

2. Beyond The Mifflin St. Jeor Equation (MSJE)Introducing New Technology and Information

#1 Recommended Predictive Equation for Estimating Resting Energy Expenditure(REE)*

MALE $10 \times \text{wt (kg)} + 6.25 \times \text{ht (cm)} - 5 \times \text{age (y)} + 5$

FEMALE $10 \times \text{wt (kg)} + 6.25 \times \text{ht (cm)} - 5 \times \text{age (y)} - 161$

*****TRANS GENDER** $10 \times \text{wt (kg)} + 6.25 \times \text{ht (cm)} - 5 \times \text{age (y)} - 78$ ***

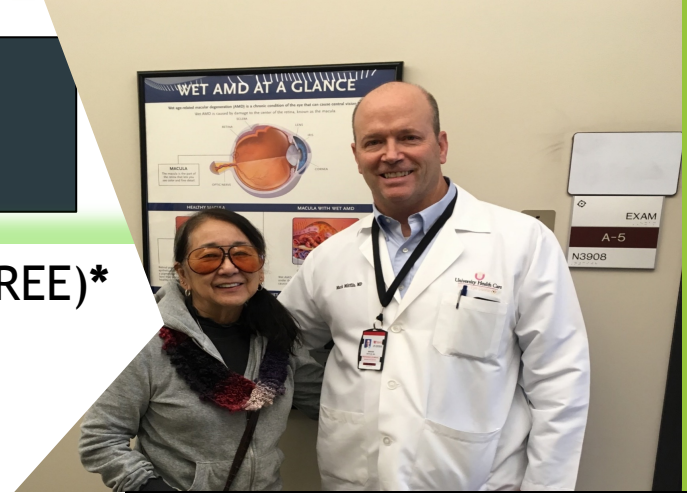
****“The Mifflin-St Jeor equation was found to be the most reliable, predicting REE within 10% of measured in more nonobese and obese individuals than any other equation, and it also had the narrowest error range.”**

*** Additional MSJE Formula $19.7 \times \text{FFM} + 413$ (LBM best predictor of REE)**

**MD Mifflin, St.Jeor, LA Hill, BJ Scott, SA Daugherty, YO Koh. A new predictive equation for resting energy expenditure in healthy individuals. Am J Clin Nutr 1990;51:241-7*

***Frankenfield, L Roth-Yousey, C Compher for the Evidence Analysis Working Group. Comparison of Predictive Equations for Resting Metabolic Rate in Healthy Nonobese and Obese Adults: A systematic Review. J. Am Dietet Assoc. 2005;105:775-789*

***** Privileged communication. Exclusive rights awarded - (copyrighted).
Katz/ Aronson, Diet ID: -78 is the mean (average) of the male and female factors using the MSJE: $(-161 + 5)/2$
St.Jeor: Should include measures weight and of body composition (especially LBM the main predictor of REE)**



Drs Sachiko St. Jeor & Mark Mifflin
Dr. Mifflin is a practicing physician at the Univ. of Utah, Moran Eye Ctr. in SLC. In 1990, he was the First SQIN (Special Qualification in Nutrition) medical student at the UNSOM in Reno, NV.

ADA Expert PANEL Report of the Top 2/14 Most Commonly used prediction Equations in 2005

Equation	Nonobese, 20-82 y, BMI 18.5-29.9	Obese, 20-82 y, BMI >30	Older adults, 60-82 y, nonobese and obese
Mifflin-St Jeor	<p>82% of estimates are accurate; errors evenly distributed between underestimation and overestimation.</p> <p>Error range: Maximal underestimation by 18% to overestimation by 15%</p>	<p>70% of estimates are accurate; errors tend to be underestimates.</p> <p>Error range: Maximal underestimation by 20% to overestimation by 15%</p>	<p>Accuracy within 10% not available.</p> <p>Error range: Underestimation by 18% to overestimation by 5% in men; underestimation by 31% to overestimation by 7% in women</p>
Harris-Benedict	<p>45 to 81% of estimates are accurate; errors tend to be overestimates.</p> <p>Error range: Maximal underestimation by 23% to overestimation by 42%</p>	<p>38 to 64% of estimates are accurate; errors tend to be overestimates.</p> <p>Error range: Maximal underestimation by 35% to overestimation by 43% of measured.</p>	<p>Accuracy within 10% not available.</p> <p>Error Range: Underestimation by 19% to overestimation by 9% in men; underestimation by 27% to overestimation by 12% in women.</p>

Harris-Benedict vs. Mifflin-St. Jeor

- **HBE (BEE or BMR)**

- 1919

- Males (n=136), NW

 - Wt (kg) 64.0 ± 10.3

 - Age (y) 27 ± 9

- Females (n=103), NW

 - Wt (kg) 56.5 ± 11.5

 - Age (y) 31 ± 14

- University Population

- **MSJE (REE or RMR**

 - = BEE +10%)**

- 1990

- Males (n=250), NW & O

 - Wt (kg) 87.5 ± 14.4

 - Age (y) 44 ± 14

- Females (n=205), NW & O

 - Wt (kg) 70.2 ± 14.1

 - Age (y) 44 ± 14

- Population Based

 - (2 X @ X 5 Multifactorial Design)

Limitations of REE Predictive Equations:

decreases with age :- 2% in Women and -2.9% in Men (~150 kcal/decrease per decade);

ability exists in acute care, hospitalized patients (Penn State Equation used);

s factors hard to measure; inflammation major factor;

rent clinical conditions affect metabolism;

“dynamic state” of the individual needs more study;

Body Mass is the best predictor of REE but is hard to measure.

Indirect Calorimetry:

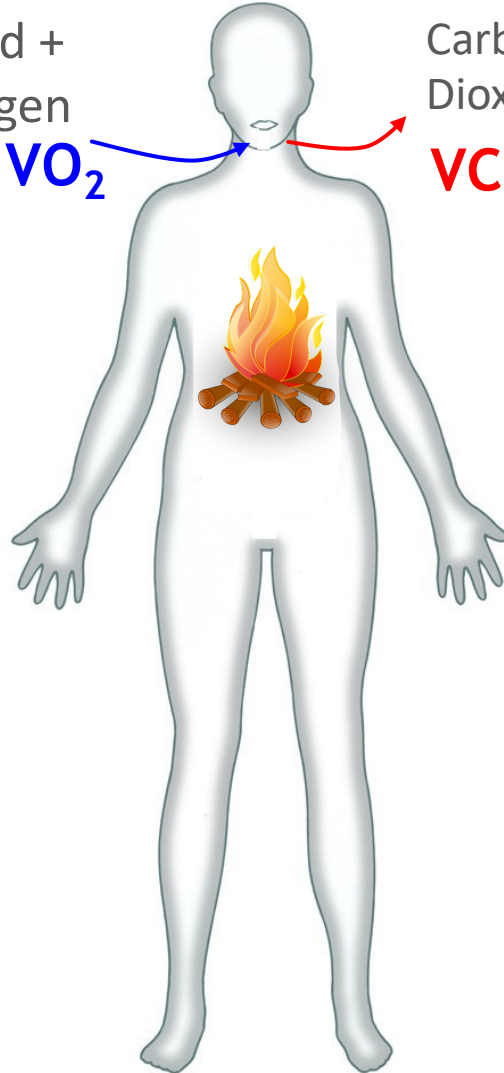


Food +
Oxygen

VO_2

Carbon
Dioxide

VCO_2



Consumed oxygen rate (mL/min)

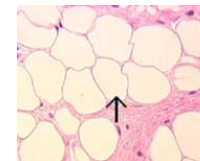
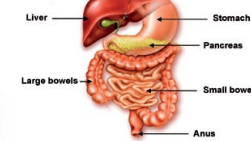
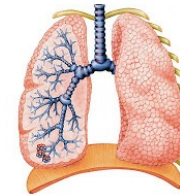
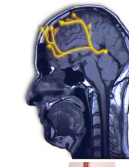
Produced carbon dioxide rate (mL/min)



Erica Forzani, Ph.D., Associate Professor
Biodesign Center for Bioelectronics and Biosensors
Arizona State University

Kcal/day

+ ATP production rate + storage



Indirect Calorimetry provides Energy Expenditure (EE)

Weir Equation [1,2]:

$$EE \text{ (kCal/day)} = [3.9 (\text{VO}_2) + 1.1 (\text{VCO}_2)] \times 1.44$$

VO_2 : consumed oxygen rate (mL/min)

VCO_2 : produced carbon dioxide rate (mL/min)



- I. Measure Resting Metabolic Rate (RMR) or "Metabolism"
- II. Define for the 24 hr day = *Resting Energy Expenditure* (**REE**)



1. Weir, J. B. D. (1949). "New Methods For Calculating Metabolic Rate..." Journal Of Physiology-London **109**(1-2): 1-9.
2. Weir, J. B. D. (1990). "Nutrition Metabolism Classic..." Nutrition **6**(3): 213-221.

3. Introducing New Technology -Indirect Calorimeters

Wearable, Hand-held, Desktop

For Resting condition

✓ O₂



Korr

✓ O₂



MLHS

✓ O₂, CO₂



Breezing

Metabolic carts

For Resting, physical activity, ergometry conditions

✓ O₂, CO₂



Medical graphics, Cosmed, Korr, etc.

Wireless instruments

Mostly for sports

✓ O₂, CO₂



K5 (Cosmed)

PNOE


Forzani, energybalanceinitiative.com 2023

- More affordable
- Less expertise needed

- Expensive, calibration and/or maintenance needed (technical expertise)

Comparison

Metabolic Carts

Product Name	Fitmate WM	MedGem	Korr	Breezing Pro/Med	Quark	CCM Express
Product Picture						
Accurately Assess O ₂ and CO ₂ and REE?	✗	✗	✗	✓	✓	✓
Unique one-way check valve design for mask?	✗	✗	✗	✓	✗	✗
Remote Assessment?	✗	✗	✗	✓	✗	✗
Device self-calibration?	✓	✓	✓	✓	✗	✗
Personalized health management app	✗	✗	✗	✓ (Free)	✗	✗
Measure RER (=RQ at resting condition)?	✗	✗	✗	✓	✓	✓

*: depending on the quantities to be ordered, for Breezing Pro/Med: recurring cost:\$8 to \$10

MSJE vs IDC

Mifflin - St Jeor Equation

- ▶ Predictive Equation for REE/RMR
- ▶ 1990 by Regression Analyses
- ▶ Sample Size 499 healthy, normal weight and obese men and women
- ▶ Multiple Regression Formula Based on Age, Height, Weight and Gender
- ▶ Calculated Estimate of REE within **+ 10% of actual**
- ▶ No Cost - Programs to Calculate
- ▶ Only Physical Measurements of Ht/Wt
- ▶ Not Billable and Not Reimbursable

Indirect Calorimetry*

- ▶ Measured Direct on Client for REE/RMR and RQ
- ▶ 2000 - Current with Sensor Technology
- ▶ Individualized at Time of Measurement
- ▶ Comprehensive, Integrated whole body measurement
- ▶ Measurement of O₂ and CO₂ to provide both REE and RQ within **1% of actual**
- ▶ \$ Cost and Time required after initial investment of instrument
- ▶ Requires “Hands On” Physical Measurements, Measurements of Ht/Wt and Client PreTest Conditions and ~ 10 to 20 minutes per client.
- ▶ Billable and Reimbursable (Self-Pay?)

***An Integrated Measurement of the Individual's Current REE Status**

RECOMMENDATIONS: Indirect Calorimetry (IDC) (REE/RMR constitutes ~ 60-70% of the TEE)

- ▶ Use IDC whenever possible; provides more accurate results
- ▶ Compare IDC results with the MSJE if in doubt of measurements out of range. Recognize the limits of the MSJE in over and under predictions. Consider other individual factors.
- ▶ Assure that pre-test conditions have been followed and the test is properly administered.
- ▶ Do a comprehensive assessment of “actual” height and weight and confirm age and gender at the time of the measurement. Other physical measurements (such weight change and fluctuations, temperature, pulse, blood pressure, body composition, medical and psychological factors provide valuable information and can be used as clinical indicators for changing health status.
- ▶ Encourage serial measures over time to provide changes in measurements (biometrics) of energy utilization and requirements as metabolism change due to various conditions such as weight loss/gain, disease processes, changes in body composition, lifestyle factors.
- ▶ Be proficient at using and applying IDC in diet/nutrition recommendations and use it to expand and enhance your practice.
- ▶ Be “leaders” of the interprofessional team with regard to REE/RMR measurements, interpretations and recommendations!

****The IDC provides an “INTEGRATED” Measure of REE at the Time of Measurement**

4. Physical Activity (20-30% of Energy Expenditure)

TEE = REE X PAL (Physical Activity Level)

1. Mifflin-St.Jeor: (1990)

1.2 = Sedentary (20% above REE)

1.4 = Low Active to Moderate (40% above REE)

1.6 = Active (60% above REE)

2. NIH Body Weight Planner: (Dr. Kevin Hall)*

“Typical physical activity level ranges from: 1.4 (sedentary) to 2.5 (very active), The default value of 1.6 describes someone who does very light activity at school or work (mostly sitting) and moderate physical activity such as walking or cycling) at least once a week).

Describe your PA at work or School:

Very Light: sitting a computer most of the day, or sitting at desk

Light: light industrial work, sales or office work of light activities

Moderate: Cleaning kitchen, staff, delivering mail on foot or bicycle

Heavy: Heavy industrial work, construction or farming

Describe your PA at leisure time:

Very Light: Almost no activity at all.

Light: Walking, non-strenuous cycling or gardening approx. once a wk.

Moderate: Regular activity at least once a week, e.g., walking, bicycling (including to work) or gardening.

Active: Regular activity at least once a week, e.g., walking, bicycling (including to work) or gardening.

Very Active: Strenuous activities several times a week

*Available on our website: genquestnutrition.com
under formulas and TEE

3. Diet ID:

1.2 = Minimal

1.375 = Light

1.55 = Moderate

1.72 = Active

1.9 = Intense

4. Breezing IDC:

Sedentary: sitting most of the day (office work)

Female: 1.273 Male 1.274

Lightly Active: standing much of the day (indoor)

Female: 1.273 Male 1.378

Active: Standing & Lifting (indoor or outdoor)

Female: 1.3665 Male: 1.482

Very Active: Standing & Intense Lifting (outdoor)

Female: 1.46 Male: 1.578

5. Sports Nutrition Care Manual (2021 AND) and Dietary Reference Intake (DRIs)

1.0- 1.39 Sedentary, typical daily living activities

1.4 - 1.59 = Low active, typical daily living activities plus 30-60 minutes of daily moderate activity

1.6 - 1.89 = Active, typical daily activities plus at least 60 minutes of daily moderate activity

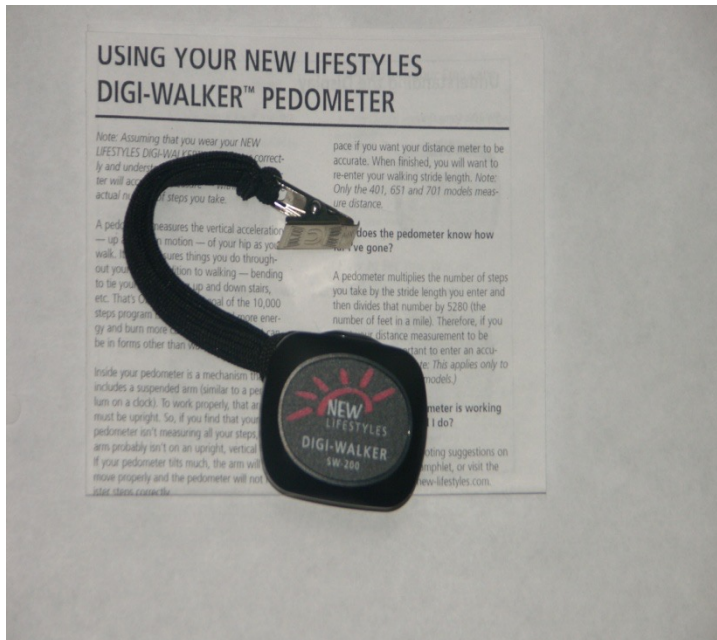
1.9 - 2.5 = very active, typical daily activities plus at least 60 minutes of daily moderate activity, plus an additional 60 minutes of vigorous activity or 120 minutes of moderate activity.

Physical Activity: Scope of Practice for RDNs

- ▶ Assess Physical Activity Level and “usual” activity as part of the energy balance recommendation
- ▶ Acknowledge (document) any given individual limitations to PA
(medical, physical, psychological, physiological, and behavioral, social, etc.).
- ▶ Encourage small increments in usual activity based on baseline level and assessment
- ▶ Define and set achievable goals with client
- ▶ Suggest ways to safely encourage physical activity. Start with increasing steps (walking)
- ▶ Track progress and limitations
- ▶ Evaluate PA level and its role in adjusting the Energy Balance Equation for Weight Maintenance and Weight Changes relative to time
- ▶ Know your limitations.....Refer to exercise specialists and/or get referral or evaluations by physicians when needed
- ▶ **Track/Evaluate**
- ▶ **Collaborate...Integrate....Refer when indicated!**

5. Providing Practical Methods And Interpretations:

Physical Activity (~20-30% of Energy Expenditure)



PEDOMETER:

1 MILE = ~ 2000 –2500 STEPS =~ 100 KCAL

Benefits of PA:

- Increases EE**
- Builds LBM**
- Improves well-being**
- Reduces overall morbidity**

NOTE: Ron Sutton, CEO Accusplit:

- Pedometer is set at a **DEFAULT** of 110 steps/per minute.. Recommended to start as standard level.
- Cadence can be set at 100 to 130 steps per minute, but further evaluation and individual interpretations are needed to accommodate individual stride length and weight for more accurate kcal adjustments.

St. Jeor Estimation Table (Steps to Miles to kcal)

	100 kcal/mile	110 kcal/mile	120 kcal/mile+
BMI	20-25	25-30	30-35
Sex (LBM)	F	F/M	M
Age	40-60+	30-40	20-30
Activity Level	Low/Avg	Avg	High

Conversion Table (BMI, Sex, Age, AL to kcal/mile)

Steps	Mileage	Kcal (See Table below)
2,000-2,500	~1 mile (2250 steps/mi)	~100-130 kcal
(6173) steps / 2250 steps/mile	= 2.7 miles X 100 kcal	= +270 kcal

Goal is to help people meet MVPA guideline AND reduce sedentary time*

	Physically Active	Not Physically Active
Sedentary	Achieves ≥ 150 min/wk of MVPA <u>but</u> sits for long periods during the day	Does not achieve ≥ 150 min/wk of MVPA <u>and</u> is seated for long period during the day
Not Sedentary	Achieves ≥ 150 min/wk of MVPA <u>and</u> does not sit for long periods during the day*	Does not achieve ≥ 150 min/wk of MVPA <u>but</u> is not seated for long period during the day

*MV = ~ 22 minutes per day

*Unick, 2018

GOAL

Physical inactivity \neq sedentary behavior

Relative Value:

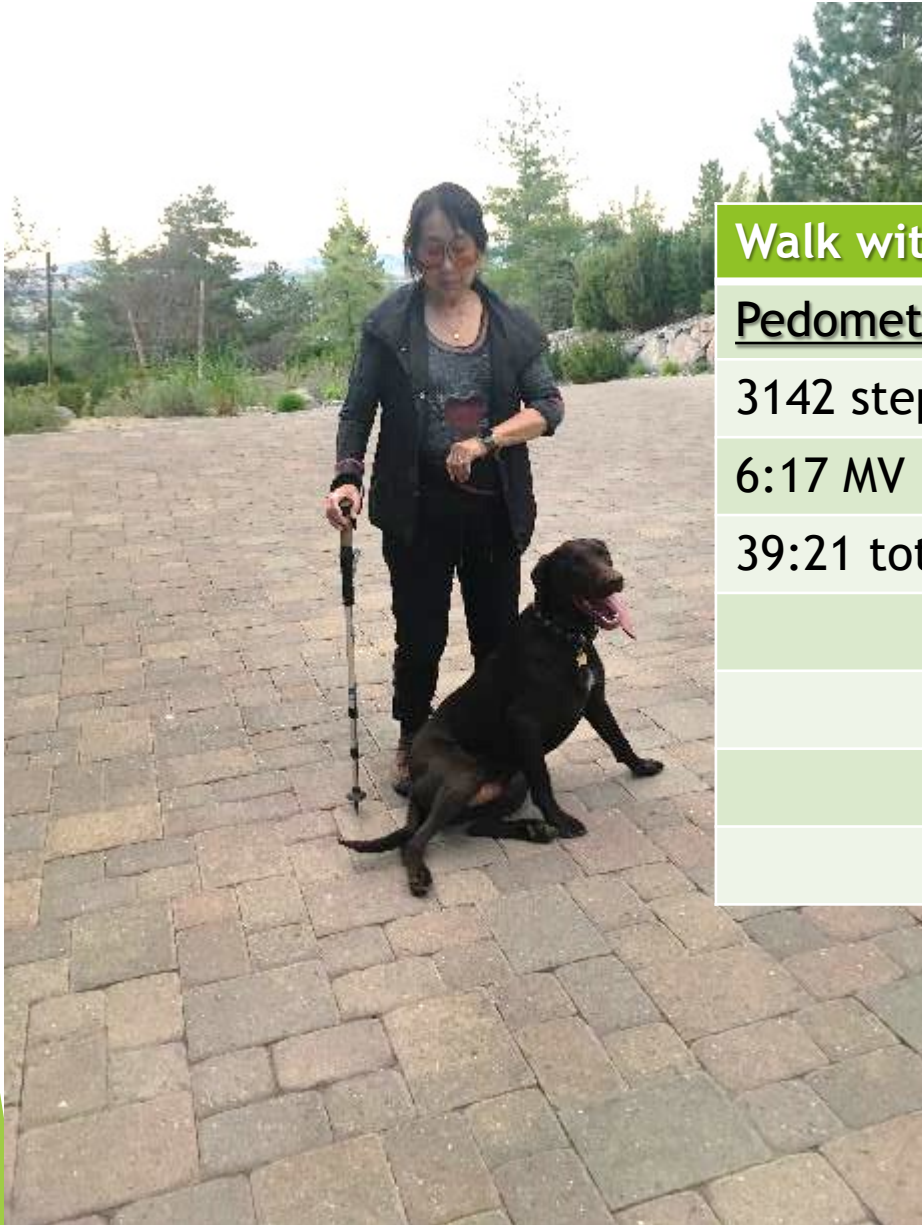
Advantages:

- ▶ Simplicity
- ▶ Cost
- ▶ Reliability
- ▶ Each user their own control
- ▶ Standardized use among centers
- ▶ Easy application and interpretation
 - Steps per day
 - Moderate to Vigorous (MV) activity (time)
 - Total Time
- ▶ Good for special populations
- ▶ Can be coordinated with other wearables!

Limitations:

- ▶ Not “high tech”
- ▶ Doesn’t provide as much information
- ▶ Doesn’t measure strength, endurance and other activity parameters
- ▶ Doesn’t track BP, Pulse, Heart Rate or other physiological parameters
- ▶ Isn’t coordinated with other web applications
- ▶ Doesn’t provide programmed feedback

COORDINATE WITH OTHER WEARABLES!



Walk with Dog: 6/13/2018 (~ ONE HOUR)

Pedometer

3142 steps

6:17 MV

39:21 total time

Apple Watch

1:00:58 minutes

1.14 mi total distance

107 active cal

182 total cal

53' 03 mi pace

99 bpm

72 degrees

“ Energy Requirements for Weight Maintenance: Role of the Energy Gap, Physical Activity and Exercise” *

Importance of Exercise for Weight Loss Maintenance (93% of Participants in the Weight Loss Registry Exercise regularly(Avg 60 min/day)

To keep weight off (MV ~150 min/wk or about 22 min/day)

Energy Gap for 100 kg person...Wt loss

- 10% (10 kg) BW = ~200 kcal/day

-15% (15kg) BW = ~300 kcal/day

Small changes approach (~100 kcal/day stop weight gain) = ~2000 steps

Avg Steps/day U.S. Men 5940 and women 5276

Recommended Intervention gradual increase

~2000 steps at a time.



James O. Hill, PhD, Professor and Chair
Dept. of Nutrition Sciences Director,
UAB Nutrition Obesity Research Center,
Birmingham, AL

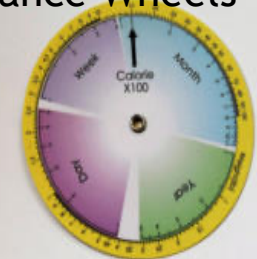
6. Simplify, Innovate and Improve “Estimates” of Energy Intake

- 1 to 7- day Food/Activity records (usual patterns)*
- Recalls
- Questionnaires
- Average weight gain/loss in past 1,3,6 or 12 months



**+1 lb/month ~ 3500kcal/4 weeks =
~ 875 kcal/wk/7 days = + 125 kcal/day**

The MSJE Calorie Balance Wheels



Limitations in Estimating Dietary Intake*

- ▶ Type of food record (questionnaires, food frequencies, 24-hour recalls, 1-7 day food records, etc.)
- ▶ Accuracy issues (database used, accommodations made for recipes, missing foods, variability, inconsistency, restaurant/takeout, etc.)
- ▶ Bias & error: compliance, usual intake, memory dependency, estimation of portions
- ▶ Time consuming
- ▶ High cost for analyses
- ▶ Etc.

*** Need some kind of Biomarker to assess adherence (practical?)**

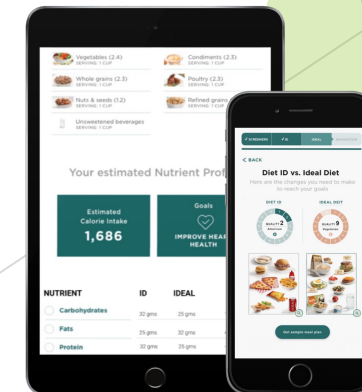
*** Need to simplify, increase effectiveness, decrease time/cost and improve individualization?**

Introducing Technological Advances....A Digital Toolkit Do We Need to Count Calories?

- ▶ Emphasizes **diet quality** and dietary patterns (over 30 and expanding)
- ▶ Image-based: relies on **pattern recognition** rather than recall
- ▶ **Simplifies** dietary assessment: avoids calorie counts or meal logging/tracking
- ▶ **Evidence-based, goal-driven, personalized** nutrition recommendations
- ▶ Recommendations tailored to individual's eating preferences
- ▶ Validated against the food frequency questionnaire and 24-hour recall
- ▶ Tracks the progress of diet quality over time (along with weight)
- ▶ Sample meal plans, educational handouts, and optional RDN coaching
- ▶ Use of Diet ID is reimbursable using standard assessment and CPT codes
- ▶ HIPAA compliant
- ▶ **Affordable, fast assessment spares RD time and cost**
- ▶ Admin portal for client records, reports, risk stratification, more
- ▶ Applicable for “general” weight maintenance guidance and disease risk reduction (coaches, etc.)



David Katz, M.D.
Founding Director, Yale Griffin
Prevention Research Ctr
Hamden, CT



NUTRIENT	ID	IDEAL
Carbohydrates	32 gms	25 gms
Fats	25 gms	32 gms
Protein	35 gms	25 gms

7. Evaluate Caloric Equivalents of Weight Changes:

Does 3500 kcal = one pound???

- ▶ RATIONALE - 1950's (theoretical and not evidence based):

1 lb. fat = 454 g X 9 kcal/g = 4086 kcal at ~15% hydration (adipose) - 613 kcal = ~3471 kcal

1 lb. protein = 454 g X 4 kcal/g = 1816 kcal at ~75% hydration (LBM) - 1362 = ~ 454 kcal

- ▶ Variability in the “accuracy” of predictions

dynamic, interrelated changes need to be considered

differences between individuals

adaptation to changes in energy balance (weight loss/gain?) over time

nature of weight loss/gain (adipose tissue, lean body mass, water?)

weight change over time is not linear and affected by many factors (PASSIVE Compensatory effects

“ Body may reach a steady state (~100 kJ/d per kg of weight change) reflecting only a 10 kcal change in energy intake/day?” (Energy Gap, etc.)

Dynamic changes hard to estimate

The ASN/ILSI panel recommended that the 3500 kcal per pound rule should no longer be used?

..... IT DEPENDS....Humans are not bomb calorimeters!

Is the Energy Density of Weight Change 3500 kcal/lb?

- ▶ 3500 kcal/lb is highly variable and not absolute
- ▶ Varies with weight change and composition
 - ▶ Water = 0 kcal/lb
 - ▶ Glycogen = 450 kcal/lb (increases with CHO consumption)
 - ▶ FFM (LBM) = 550 kcal/lb (water 73%)
 - ▶ Fat Mass = 4300 kcal/lb
- ▶ The Day to Day Fluctuations are from 1 to 3 lbs.
- ▶ Energy Density of Weight increases with duration of weight loss
- ▶ Women lose higher % fat mass (men 10% less)
- ▶ Energy Density of weight gain similar to weight loss.



Dale Schoeller, Ph.D., Professor & Chair
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Rationale For Using A Portable Office To Expand Nutrition Service Options



Barbara Scott, RDN, MPH
Associate Professor
University of Nevada
Reno School of Medicine
Reno, NV

- Make personalized nutrition assessment and Medical Nutrition Therapy **more accessible to more people;**
- Maintain focus on disease treatment and management while **expanding to wellness and prevention;**
- Continue to bring the importance and effectiveness of sound nutrition practices into the **public eye;**
- **Move** into new environments where people already are while also **increasing income and independence;** and
- **Demonstrate effectiveness** of good nutrition in achieving positive health outcomes and cost savings.

Description Of **BB Manual** And “EB And Health Assessment/Recommendation Forms” To Be Available On Our Website And **MSJE Wheels And Charts And Energy Wheels And The Consumer EB PROJECTS - SCOTT/ST. JEOR**



THE BASIC BLACK BAG™ Portable Office & Toolkit Includes...

- A signature plaque with your name and credentials to attach to your own portable roller bag
- General health: Blood Pressure Monitor and Pulse Oximeter
 - Weight and body composition assessment: Bioimpedance Scale (for weight and body composition) Stature Meter, Tape Measures, Skinfold Calipers
- Energy assessment: MSJE Calculator “Wheels” (BMI, Energy Estimation, Calorie Balance)
- Fitness: Hand Dynamometer, Step Counters (Pedometer)
- **User’s manual**

THE ST JEOR Dietitian's BLACK BAG™ Portable Nutrition Office Starter Kit

Includes:

- ▶ **User's Manual**
- ▶ **Personalized name plate**
- ▶ **Blood pressure monitor**
- ▶ **Pulse Oximeter**
- ▶ **Tape Measures**
- ▶ **Wall Mounted Stadiometer**
- ▶ **Skinfold Calipers**
- ▶ **Body Composition Scale**
- ▶ **Hand Dynamometer**
- ▶ **Pedometer**
- ▶ **Data Tracking and Client Feedback Forms**



Energy Balance and Health Assessment

Client Name: _____ Gender: _____ Age: _____

Male		
Height		
Weight		
BMI		
Blood Pressure		
Systolic		
Pulse Rate BPM		
% MCV Saturation		
Body Composition		
Method Used		
% Lean		
% Fat		
% Body Skinfold		
Mid Upper Arm		
Circumference		
Mid Arm Muscle		
Circumference		
Wrist		
Circumference (cm)		
Hand Grip Strength		
Estimation of Resting Energy Expenditure (REE)		
Calculating REE		
Using Mifflin		
Method of REE		
Met. Eq.		
MUSCLE % of IBC		
<small>Reference Values: Males 80% & 90% are greater than 90% (1) confirms pretest conditions, (2) per actual measurements, (3) confirm test administration and subject has eaten normal meal... from application for use at: http://www.energybalanceinitiative.com</small>		
Estimation of Physical Activity		
Activity Level		
Steps/Day		
Additional for		
volitional activity		
Estimation of Total Energy Expenditure (REE + Activity)		
Calories expended		
per day		
Estimation of Total Dietary Energy Intake		
Method Used		
Calories Per Day		
Estimation of Energy Balance		
Calories Intake less		
Total Energy		
Expenditure		

Energy Balance and Health Assessment Summary

Client Name: _____ Date: _____

Health Goal(s)

Height, Weight & BMI

Blood Pressure, Pulse & Oxygen Saturation

Body Composition

Muscle (lean) vs Fat

Wrist Circumference

Hand Grip Strength

Estimation of Resting Energy Expenditure (REE)

Calories needed per day for resting

Estimation of Physical Activity

Calories needed per day for activity

Estimation of Total Energy Expenditure (REE + Activity)

Total calories needed per day

Estimation of Total Dietary Energy Intake

Calories Consumed (Per Day)

Estimation of Energy Balance

Calories In - Calories Out

Summary and Recommendations to Achieve Health Goal(s)

Your next appointment

For more information and special pricing for conference attendees:
energybalanceinitiative.com

8. The BLACK BAG™: Putting it all Together! A Portable Office and Tool Kit*



GO FAR!!!

Be Pro-Active To Fight Harmful Fads & Practices*

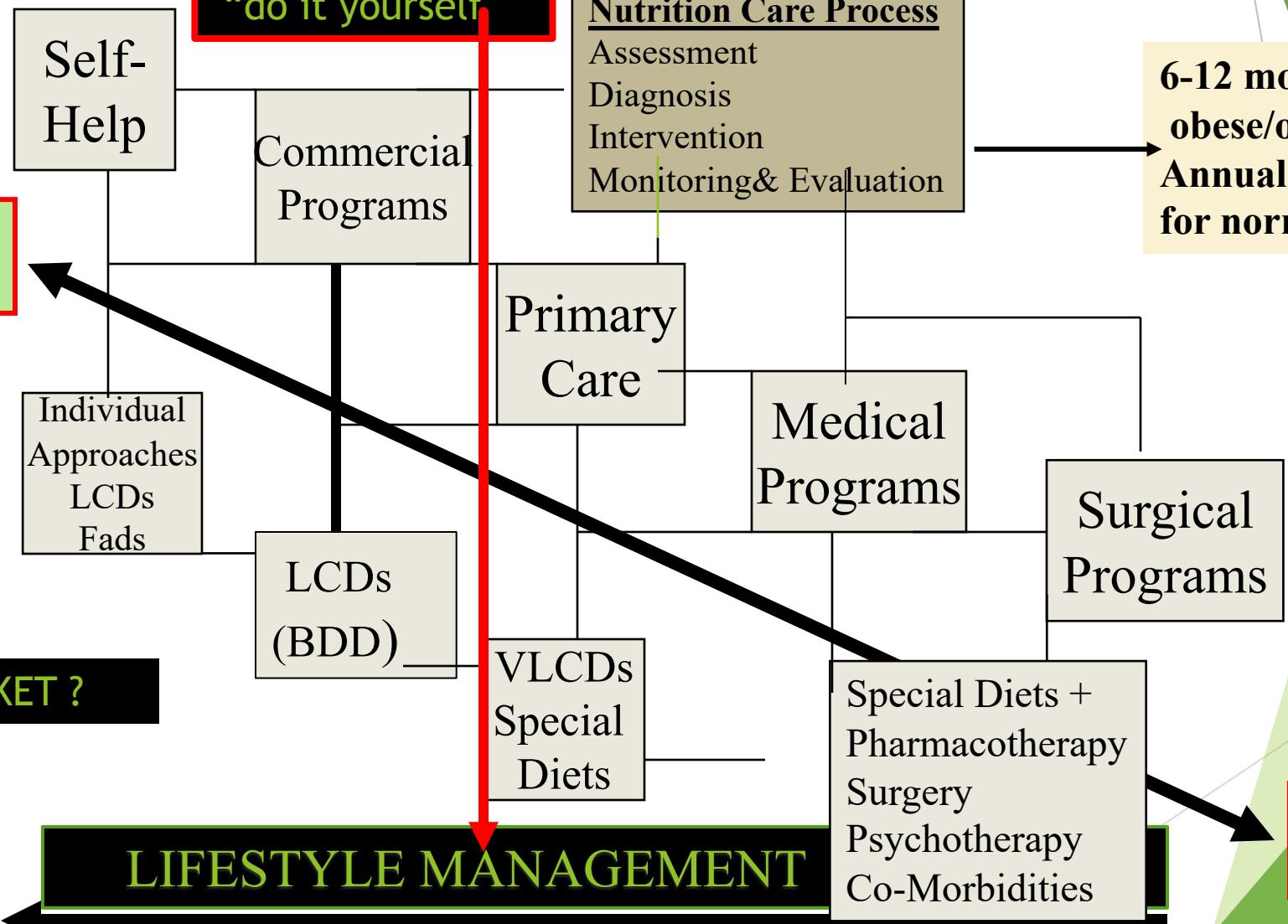
Spectrum of Care for "Weight Management"

-90% Population "do it yourself"*

RECRUITMENT + Nutrition Care Process
Assessment
Diagnosis
Intervention
Monitoring & Evaluation

6-12 months for obese/overweight Annual Visits for normal weight

± Weight Maintenance



***"SELF PAY" MARKET ?**

***REIMBURSEMENT ?**

LIFESTYLE MANAGEMENT

Diet/Nutrition + Physical Activity + Habit Change

*St. Jeor, 2019)

**“GO FAR”
ENERGIZE YOUR
PRACTICE!!!**

Selected References: Energy Balance Initiative: Introduction: Workshop 1

1. Mifflin MD, St. Jeor ST, Hill LA, Scott BJ, Daugherty SA, Koh YO: A new predictive equation for resting energy expenditure in healthy individuals. *Am J of Clin Nutr* 1990;51:241-247.
2. Frankenfield, D, Roth-Yousey, L, Compher, C. for the Evidence Analysis Working Group. A Comparison of predictive equations for resting metabolic rate in healthy nonobese and obese adults: A systematic Review. *J Am Diet Assoc.* 2005;105:775-789.
3. St. Jeor ST, Brunner RL, Harrington ME, Scott BJ, Cutter GR, Brownell KD, Dyer AR, Foreyt JP. Who are the weight maintainers? *Obesity Research* 1995;3(Suppl 2):249S-259S.
4. St. Jeor ST, Brunner RL, Harrington ME, Scott BJ, Daugherty SA, Cutter GR, Brownell KD, Dyer AR, Foreyt JP. A classification system to evaluate weight maintainers, gainers and losers. *J Am Diet Assoc* 1997;97:481-488.

Calculators and forms on our website: genquestnutrition.com.

Visit: energybalanceinitiative.com for program information.