

Nutrition Consensus Report: Research, Recommendations and Real World

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Presenter Disclosure Information

In compliance with the accrediting board policies, the American Diabetes Association requires the following disclosure to the participants:

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ADA Nutrition Consensus Report

Diabetes Care

1



Nutrition Therapy for Adults With Diabetes or Prediabetes: A Consensus Report

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This Consensus Report is intended to provide clinical professionals with evidence-based guidance about individualizing nutrition therapy for adults with diabetes or prediabetes. Strong evidence supports the efficacy and cost-effectiveness of nutrition therapy as a component of quality diabetes care, including its integration into the medical management of diabetes; therefore, it is important that all members of the health care team know and champion the benefits of nutrition therapy and key nutrition messages. Nutrition counseling that works toward improving or maintaining

Consensus Report Committee

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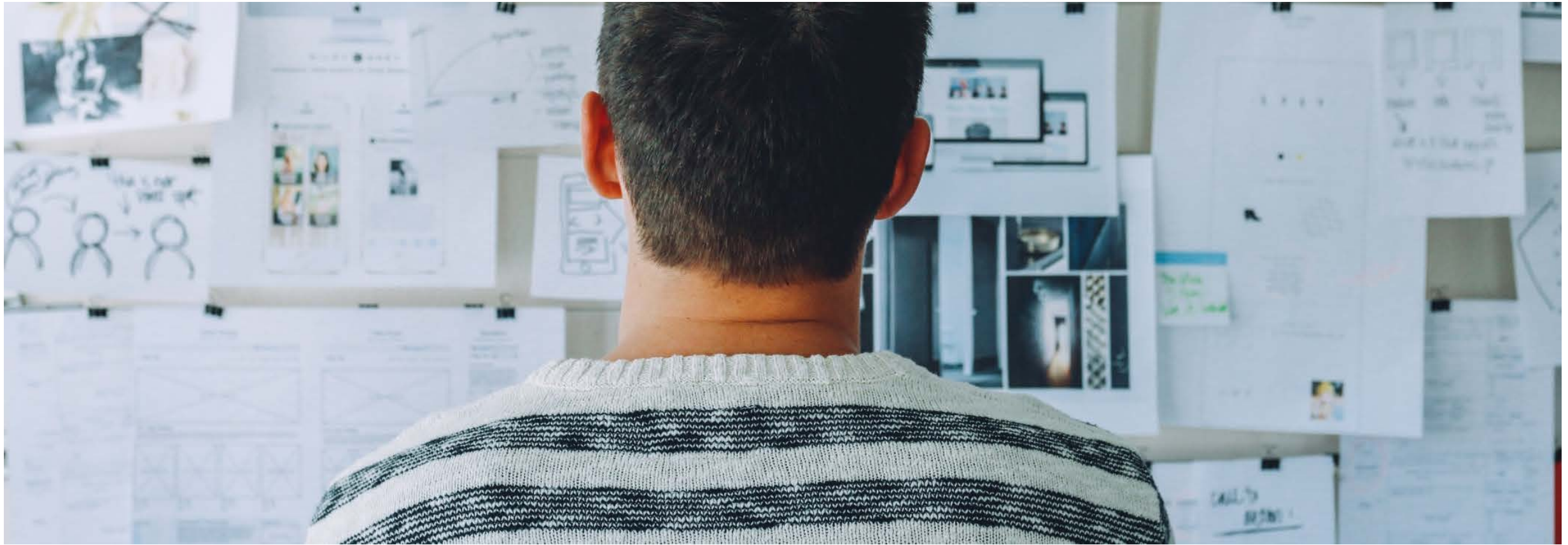
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How Were the Nutrition
Recommendations Developed?

Article Selection

Used 2013 ADA Nutrition Therapy Recommendations for the Management of Adults with Diabetes as a starting point

Overall search criteria:

- Articles published between January 1, 2014 and February 28, 2018
- Adults with T1D, T2D or prediabetes
- Outpatient, community or metabolic ward setting
- At least 10 people per dietary group
- At least 50% retention rate
- Consensus paper includes >300 references...

Eating patterns section emphasized randomized trials when available

ADA Consensus Report. *Diabetes Care*. 2019; 42:731-754

What can I eat?



Adrift in a sea of nutrition information . . .
or misinformation???

People Make Decisions, Not Evidence





Consensus Recommendations

- Refer adults living with type 1 or type 2 diabetes to individualized, diabetes-focused MNT at diagnosis and as needed throughout the life span and during times of changing health status to achieve treatment goals.
- Coordinate and align the MNT plan with the overall management strategy, including use of medications, on an ongoing basis.

Goals of Nutrition Therapy

To promote and support **healthful eating patterns**, emphasizing **a variety of nutrient-dense foods in appropriate portion sizes**, to improve overall health:

- 1) Improve A1C, BP, cholesterol levels
- 2) Achieve/maintain body weight goals
- 3) Delay/prevent diabetes complications



Goals of Nutrition Therapy

To address **individual** nutrition needs based on

- personal and cultural preferences
- health literacy and numeracy
- **access** to healthful food choices
- willingness and ability to make behavioral changes
- **barriers** to change



Goals of Nutrition Therapy

To maintain the **pleasure of eating** by providing positive messages about food choices while limiting food choices only when indicated by scientific evidence.

Diabetes Care. 2019; 42:731-754



Are nutrition and diabetes education interventions effective in improving outcomes?

Strong evidence supports the efficacy and cost-effectiveness of nutrition therapy as a component of quality diabetes care, including its integration into the medical management of diabetes;

Therefore it is important that all members of the health care team know and champion the benefits of nutrition therapy and key nutrition messages.

Is MNT Clinically and Cost Effective?

Research supports the effectiveness of MNT interventions provided by RDNs for improving A1C with absolute decrease up to 2.0% in T2D and up to 1.9% in T1D at 3-6 months.





Macronutrients



However, people don't eat macronutrients, they eat food.

Consensus Recommendations

Evidence suggests that **there is not an ideal** percentage of calories from carbohydrate, protein, and fat for all people with or at risk for diabetes, therefore macronutrient distribution should be based on an **individualized** assessment of eating patterns, references, and metabolic goals.

Additional Consensus Recommendations

Sweeteners

Micronutrients

Insulin Dosing

Personalized
Nutrition

Sweeteners

- Lots of questions!
- Sugar-sweetened beverages (SSBs) contribute to increased risk of T2D
- **Replace sugar-sweetened beverages with water as often as possible**
- FDA continues to recognize several low calorie sweeteners as safe
- 2018 American Heart Association Scientific Advisory on low calorie sweeteners & cardio-metabolic risk factors and glycemia, supported by ADA

Micronutrients

- Without underlying deficiency benefits of multi-vitamin or mineral supplements on glycemia have not been reported by evidence
- It is recommended that MNT for people taking metformin include an annual assessment of vitamin B12 status
- Chromium, Vit D, and herbal supplement use such as cinnamon is not supported by evidence

Insulin Dosing

T1D and insulin-requiring T2D:

- Intensive insulin therapy – use of carb counting is an effective strategy
- Fixed insulin doses - consistent carb intake with respect to time and amount
- When consuming a meal that contains carb + high in fat or high in protein
 - Recommend dosing mealtime dose, not solely based on carbs
 - Use of SMBG or CGM to guide decision making

Personalized Nutrition

- Studies using personalized nutrition approaches to examine genetic, metabolomic, and microbiome variations have not yet identified specific factors that consistently improve outcomes in type 1 diabetes, type 2 diabetes, or prediabetes.

Role of Nutrition Therapy in Prevention and Management of Diabetes Complications:

Cardiovascular
Disease

Gastroparesis

Nutrition Therapy for Diabetes Complications

Diabetic Kidney Disease:

- **Protein:** Individuals with DKD (with albuminuria and/or reduced GFR) should aim to maintain dietary protein at RDA of 0.8 g/kg/body wt/day
- Reducing level below RDA is not recommended and does not alter glycemic measures, CVD measures, or the rate that GFR declines

What's the best eating
pattern for people with
diabetes and
prediabetes?

Eating Patterns to Manage Diabetes

- Evaluated in ADA Report:
 - Mediterranean-Style (Med-Style)
 - Vegetarian or Vegan
 - Low-fat
 - Very-Low Fat Ornish or Pritikin
 - **Low-Carb & Very-Low Carb**
 - DASH
 - **Intermittent Fasting**
 - Paleo

Helpful Resource – Table 3

Table 3--Eating patterns reviewed for this report

Type of eating pattern	Description	Potential benefits reported*
USDA Dietary Guidelines For Americans (DGA)	Emphasizes vegetables, fruits, grains, lower-fat dairy, a variety of proteins, and oils; limits saturated fats, added sugars, and sodium.	DGA added to the table for reference, not reviewed as part of this Consensus Report
Mediterranean-style	Emphasizes plant-based food (vegetables, beans, nuts and seeds, fruits, and whole intact grains), fish and other seafood, olive oil, some dairy and eggs.	<ul style="list-style-type: none"> • Reduced risk of diabetes • A1C reduction • Lowered triglycerides • Reduced risk of major cardiovascular events
Vegetarian or vegan	Plant-based vegetarian eating devoid of all flesh foods but including egg and/or dairy products; or vegan eating devoid of all animal-derived products.	<ul style="list-style-type: none"> • Reduced risk of diabetes • A1C reduction • Weight loss • Lowered LDL-C and non-HDL-C
Low-fat	Emphasizes vegetables, fruits, starches, grains, starchy vegetables, lean proteins, and low-fat dairy.; total fat ≤30%, saturated fat ≤10% of calories.	<ul style="list-style-type: none"> • Reduced risk of diabetes • Weight loss
Very low-fat	Similar to Low-fat but higher carbohydrate and lower fat (10% of calories).	<ul style="list-style-type: none"> • Weight loss • Lowered blood pressure

*Source: RCTs, meta-analyses, observational studies, nonrandomized single-arm studies, cohort studies.

Helpful Resource – Table 3 (cont.)

Table 3--Eating patterns reviewed for this report		
Type of eating pattern	Description	Potential benefits reported*
Low-carbohydrate	Emphasizes animal/plant proteins, vegetables low in carbohydrate, and fat from animal foods, oils, avocado; avoids starchy and sugary foods; total carb 26–45% of calories.	<ul style="list-style-type: none"> • A1C reduction • Weight loss • Lowered blood pressure • Increased HDL-C and lowered triglycerides
Very low-carbohydrate	Similar to low-carbohydrate pattern but further limits carbohydrate-containing foods to 20–50 g per day	<ul style="list-style-type: none"> • A1C reduction • Weight loss • Lowered blood pressure • Increased HDL-C and lowered triglycerides
Dietary Approaches to Stop Hypertension (DASH)	Similar to USDA	<ul style="list-style-type: none"> • Reduced risk of diabetes • Weight loss • Lowered blood pressure
Paleo	Emphasizes foods theoretically eaten regularly during early human evolution; similar to Low-carb	<ul style="list-style-type: none"> • Mixed results • Inconclusive evidence

*Source: RCTs, meta-analyses, observational studies, nonrandomized single-arm studies, cohort studies.

Summary Points: Eating Patterns

Type 1 diabetes

- No eating pattern has robust evidence
- Low-carb has very preliminary evidence of benefit

Type 2 diabetes

- Low-carb and Med-Style have the most evidence of benefit

Summary Points: Eating Patterns

Prediabetes and Reduce Risk of Type 2

- Most robust research: Med-Style low-fat, and low-carb
- PREDIMED trial, compared Med-style vs low-fat, resulted in a 30% lower relative risk with the Med-style
- Epidemiologic studies correlate Med-style, vegetarian, DASH eating plans with lower risk of developing T2D, with no effect for low carb
- Given limited evidence, unclear which eating plan is best

Eating Pattern Consensus

Recommendations: What is New.....

- Reducing overall carbohydrate intake has the most evidence for improving glycemia
 - And may be applied in a variety of eating patterns
- Low- and very-low-carbohydrate eating plans are viable approaches for select adults with type 2 diabetes who...
 - Are not meeting glycemic targets
 - Wish to reduce antiglycemic medications

Very low-carbohydrate eating plans – as defined in Consensus Report

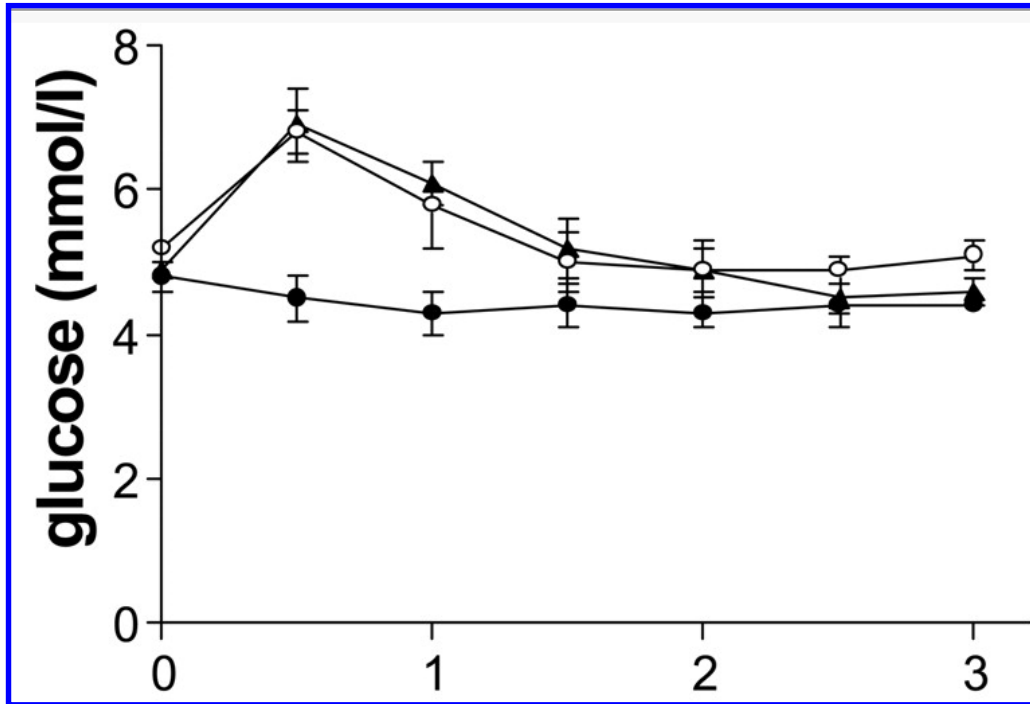
- <26% of kcal from carbohydrate
- Often has a goal of 20 to 50 g of non-fiber carbohydrate: “keto” diets
- High fat - typically 65-80% of total kcal



Low Carb / High Fat Diet Rationale: The Role of Insulin

- Dietary carbohydrate (sugar or starch) raises serum glucose and insulin
- A carbohydrate restricted (high fat) diet reduces the diet contribution to serum glucose, which then lowers insulin levels
- Insulin is a potent stimulator of lipogenesis (fat storage) and a potent inhibitor of lipolysis (fat burning)
- Lowering insulin levels leads to burning of stored body fat, raising serum ketones and lowering body weight

Glucose and Insulin Response to 300 kcal Meal After 10 days on Diet

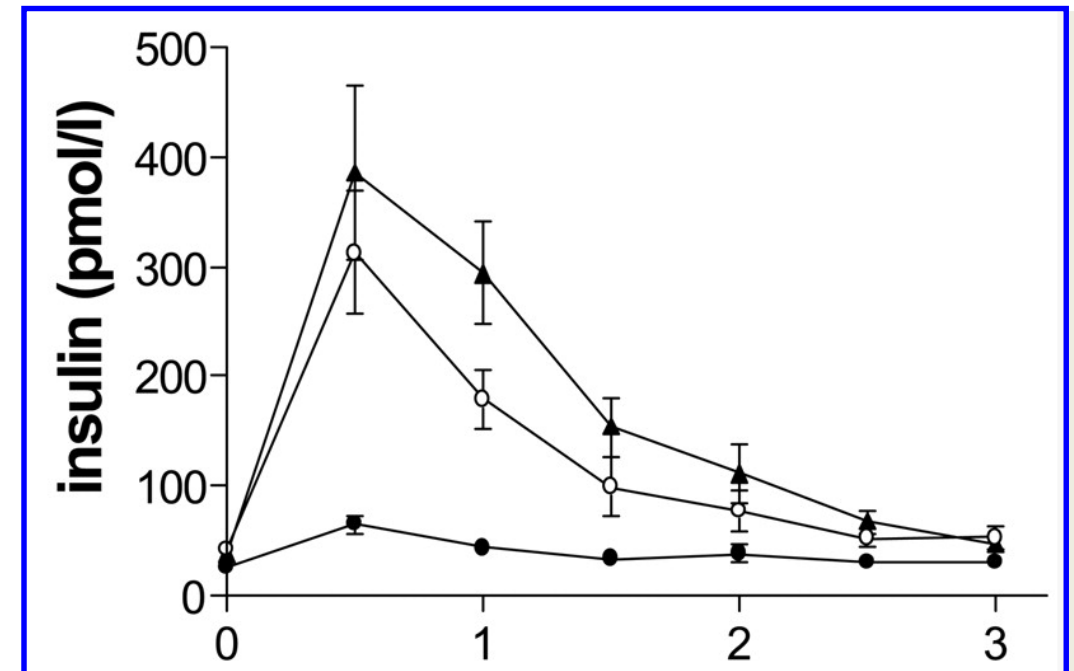


- ▲ High-carb diet
- Intermediate-carb diet
- Low-carb diet

*Glucose AUC lowest for low-carb diet ($p = .001$).

*Insulin AUC different for each diet ($p = .001$)

Bisschop, J Clin Endocrinol Metab, 2003.

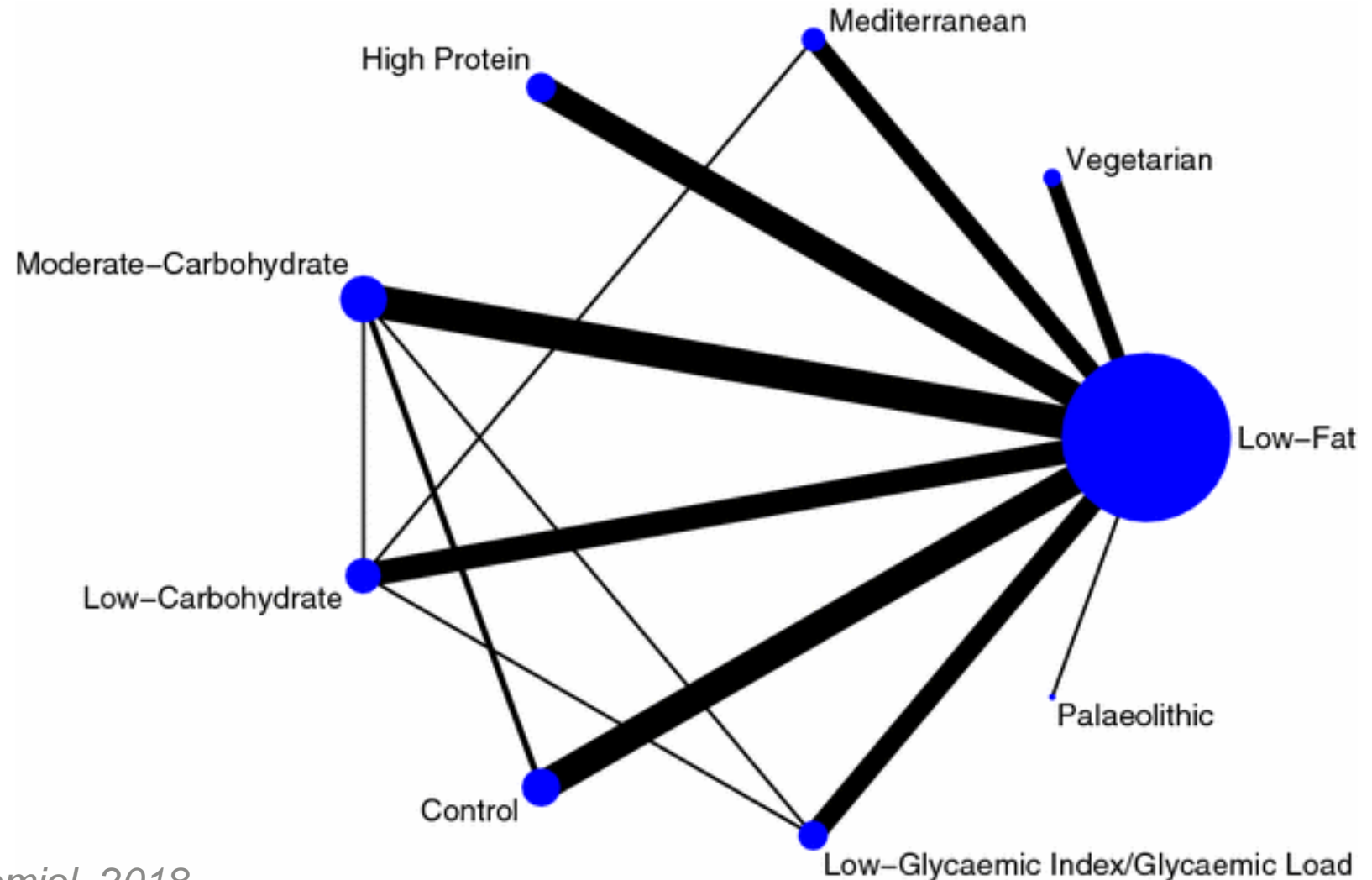


Network Meta-analysis Comparing Diet Effects on Glycemia in Type 2 DM*

- Size of nodes: proportional to total N allocated to each diet

- Width of lines: proportional to number of studies of each direct comparison

*minimum duration of 12 weeks



Network Meta-analysis Comparing Diet Effects on Glycemia in Type 2 DM

- 56 trials enrolling 4937 participants comparing 9 diets
- “For reducing HbA1c, the low-carbohydrate diet was ranked as the best dietary approach (SUCRA: 84%), followed by the Mediterranean diet (80%) and Paleolithic diet (76%) compared to a control diet.”

Nutritional Ketosis vs Ketoacidosis

- Ketone bodies: molecules that deliver energy
- Ketones can be used by all cells except erythrocytes, cornea, lens, retina
- Beta-hydroxybutyrate levels increase when dieting
 - Fed state 0.1 mmol/L
 - Overnight fast 0.3 mmol/L
 - **Nutritional ketosis** **0.5–3 mmol/L**
 - > 20 days fasting 10 mmol/L
 - **Diabetic ketoacidosis** **25 mmol/L**
- Serum pH did not decrease below 7.37 in a study performing arterial blood gas analyses

Meckling KA, Can J Physiol Pharmacol, 2002; Coleman MD, J Am Diet Assoc, 2005; Yancy WS, Eur J Clin Nutr, 2007.

Medication Adjustment Recommendations

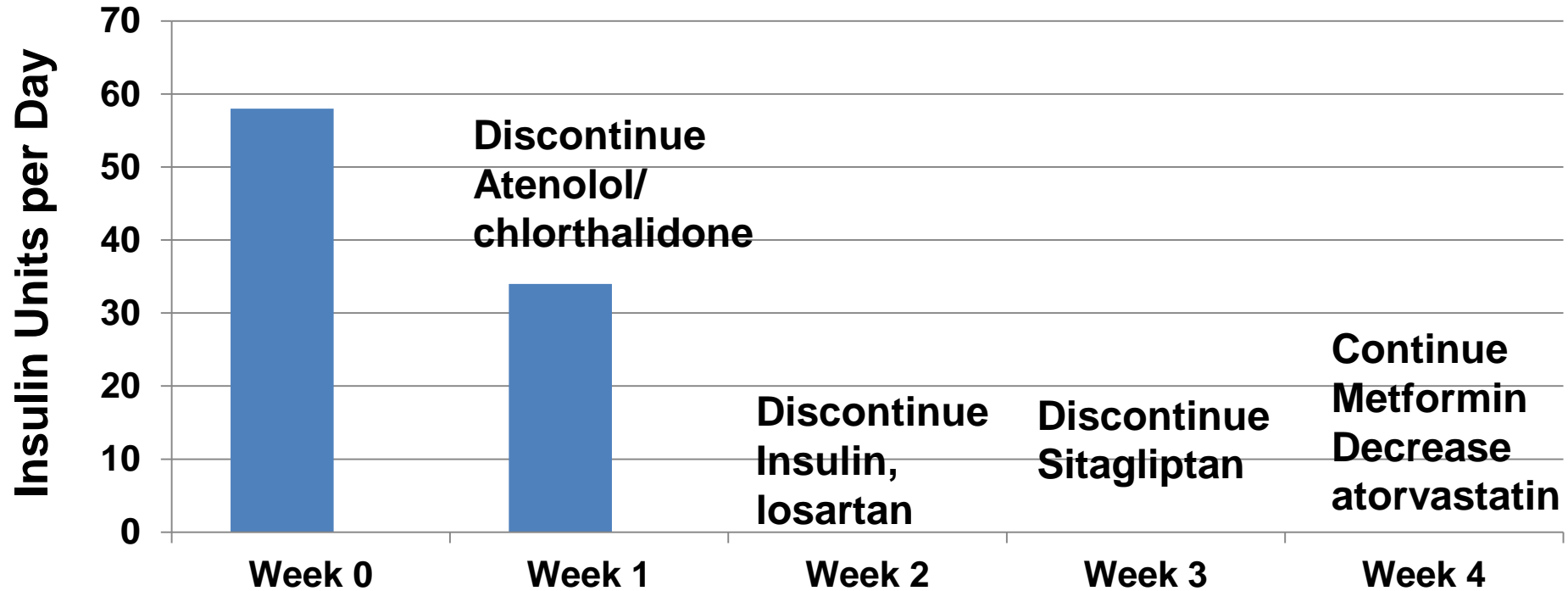
- **Need to be in close contact with patient and provider**
 - Appointments every 1-4 weeks initially
 - Ability to contact clinician outside of visits and after hours
- Blood glucose monitoring is imperative
 - If on insulin or hypoglycemic agents (sulfonylureas, meglitinides)
 - Continuous glucose monitoring is especially helpful
- What to adjust for T1D or T2D patients:
 - Reduce doses of insulin--typically by half if A1c near goal
 - Reduce by half or stop sulfonylureas and meglitinides (in T2DM)
 - Stop SGLT-2 inhibitors, which increase risk of euglycemic ketoacidosis
- Hypertension: monitor BP and orthostatic symptoms
 - Adjust meds preemptively

A Balancing Act

- “Keto flu”
 - Symptoms: headaches, fatigue, lightheadedness, muscle cramps
 - Cause: water and sodium loss from glycogen use and reduced insulin levels
 - Management:
 - Hydrate-give fluid goal of half patient’s weight in ounces of fluid per day
 - » Example: $200 \text{ lbs} \div 2 = 100 \text{ ounces} \sim 12 \text{ cups}$
 - Replenish sodium, particularly at initiation--broth is an efficient source
- Constipation-many options (docusate, milk of magnesium, psyllium, PEG)
- Low-carb eating pattern currently **not recommended** with:
 - CKD
 - Pregnancy
 - Disordered eating

Patient SB

67 yo man with diabetes, high cholesterol, hypertension



	Week 0	Week 1	Week 2	Week 3	Week 4
Weight	248		236		231
Glucose	190-300				84-110
TG	284				68
HDL	34				42
LDL	53				36
Hb A1c	10.5				8.4

Client RJT

64 yo woman with sleep apnea, diabetes, fatty liver, hypertension, mild CAD

	Low-fat, reduced-calorie plan			Very low carbohydrate plan		
	2007	2010	2011	2013	2016	2018
Weight	200	199	182	151	144	138
BP meds	Atenolol Clonidine Lisinopril	Carvedilol HCTZ Lisinopril	Carvedilol HCTZ Lisinopril	Carvedilol HCTZ Lisinopril	Carvedilol Lisinopril	Lisinopril
DM meds	Metformin Pioglitazone Exenatide	Metformin Pioglitazone	Metformin Pioglitazone	Metformin	Metformin	
Lipid meds	Colesevelam Niacin	Colesevelam Niacin	Colesevelam Niacin Fish oils	Pitavastatin Fish oils	Fish oils	Fish oils
Hb A1c	7.5	7.2	7.2	5.6	5.5	5.4
ALT	91	94	61	17	19	21
Trig	277	198	299	85	69	84
CRP	1.34	1.08	1.04	0.42		

Low Carb Take Home Points

- Lower carb intake leads to reduction in calories and insulin levels
- Body fat breaks down into ketones, used for energy
- Because of early diuresis, adequate intake of fluid and salt is important
- If carbohydrate is added back, it should be done gradually
- Blood pressure and blood triglycerides decrease, HDL increases
- LDL does not typically increase BUT it can in some people
- Blood sugar decreases profoundly, so medications must be reduced at start!
- **To date** – no long-term studies have examined whether Low Carb diet lowers cardiovascular disease events or mortality

Intermittent Fasting



Intermittent Fasting Key Methods

5:2

Normal eating 5 days a week.
Two fasting days of 500-600 calories.

24-Hour

No food for 24 hours,
1-3 days per week.

**Time-
Restricted**

Consume day's calories during an 8-12
hour block each day, fast the
remaining 12-16 hours.

Intermittent Fasting Evidence Review

- Four studies in T2DM patients
 - Small samples (≤ 63 participants)
 - Short durations (≤ 20 weeks)
 - Additional study since the review (N=137, 12 months)
- Key findings
 - Weight loss and A1c reduction occur, similar to continuous calorie reduction
 - Insulin/sulfonylureas adjustments are required to minimize hypoglycemia

Additional Consensus Recommendations

People with diabetes and prediabetes should be screened and evaluated during DSMES and MNT encounters for disordered eating, and nutrition therapy should accommodate these disorders.

Diabetes Remission

- ADA definition
 - Maintain euglycemia (complete remission) or prediabetes level of glycemia (partial remission) with no diabetes medication for at least 1 year

Trial	Intervention	Remission outcome	Rates	
			Intervention	Control
Look AHEAD	Low-fat, 1200 to 1800 kcal/d, partial meal replacements	At least partial, at 1 year	11.5%	2.0%
DiRECT*	VLCD using full meal replacements	Full, at 1 year	46%*	4.0%
Esposito et al.	Low-carb Mediterranean, 1500 to 1800 kcal/d	At least partial, at 1 year	14.7%	4.7%

*Remission rates related to magnitude of weight loss—86% if weight loss $\geq 15\%$.

Buse JB, Diabetes Care, 2009; Gregg EW, JAMA, 2012; Lean ME, Lancet, 2018; Esposito K, Diabetes Care, 2014.

Two Overarching Messages of Consensus Statement

A variety of eating patterns are acceptable for management of diabetes

- Emphasize non-starchy vegetables.
- Minimize added sugars and refined grains.
- Choose whole grains over highly processed foods to the extent possible

Weight management has great potential for preventing diabetes and improving diabetes outcomes

- Eating plan with energy deficit
- Enhanced physical activity
- Medication and/or surgery, if indicated

Thank you!