



## Low Ratio, Slow Outpatient Initiation & Maintenance of Ketogenic Diet Therapy: Update and Practical Guidance for the RD

Jennifer Fabe BSc., MSc., RD



## Disclosures

- **Funding Source:** Office of Dr. Heather Arthur – Chief Scientific Officer Hamilton Health Sciences
- **Matthew's Friends Canada**
  - Medical advisory board member
  - Board member
- **KetoSuite** – Co-developer of software

## Objectives of the Presentation



**Summarize statistics** on patients who have been started on the medical ketogenic diet in Canada with the Low and Slow outpatient initiation method.



**Practice calculations** with patient examples using the Low and Slow outpatient initiation method in further detail.



**Address questions** about the Low and Slow Outpatient Initiation method.

## Update on Using Low Ratio, Slow Outpatient Initiation Method



### Sharing the Registered Dietitian (RD) Practice Perspective

#### Rationale for Development

- Challenges of Inpatient Initiation
- Challenges of Keto Ratio Titration Method

#### Overview of Low Ratio, Slow Outpatient Inpatient Method

- Steps of outpatient initiation
- Titration using % kcal macronutrients
- Exchange lists for Oral Feeding

#### Practical Perspectives

- Perspective on impact on RD practice



## RATIONALE FOR DEVELOPING THE LOW RATIO, SLOW OUTPATIENT INITIATION METHOD

- Offering a RD perspective -



### Inpatient Admissions for Initiations

#### 2001 - Inpatient admission 5 day duration (Rapid Daily Titration)

Day	Action
1	+/- fasting or Ketogenic diet (KD) begins
2	Ketogenic diet advanced in strength
3	Ketogenic diet advanced in strength
4	Ketogenic diet again advanced in strength
5	Ketogenic diet adjusted and/or maintained and discharged home, if stable

- Teaching of parents meal preparation and monitoring expectations
- Daily bloodwork and monitoring for metabolic fluctuations
- Once discharged home – RD would provide phone support and menu support intensely for approximately 4-6 weeks.



## Challenges of Inpatient Initiations

### Challenge to Keto Patient

- Rapid change to diet within days
- Diet may be more restrictive than perhaps necessary
- Side Effects of rapid initiation (hypoglycemia, acidosis, nausea, vomiting, diarrhea, etc)

### Challenge to the Keto Family

- Time away from work and home
- Learning within a hospital environment – unfamiliar kitchen facilities, distractions, limited foods compared to home



## Challenges of Inpatient Initiations (cont.)

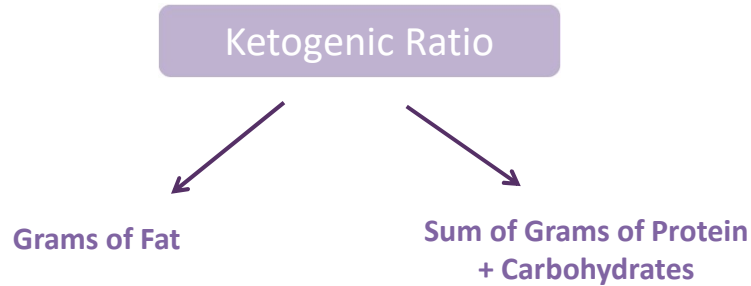
### Challenge to Hospital

- Bed availability
- Extended length of stay
- Cost of admission

### Challenge to Registered Dietitian (RD)

- Less efficient use of time due to concurrent outpatient responsibilities (eg. Clinic appointments, phone support, menu calculations)
- Overtime hours

## Challenges of Titrating via Ketogenic Ratios

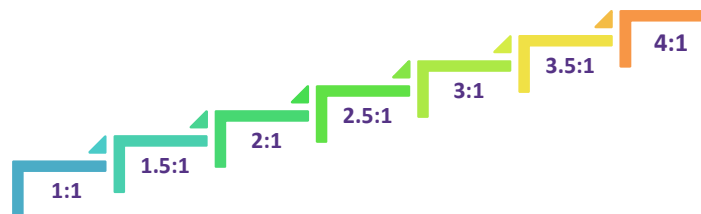


- Advance to predetermined goal ketogenic ratios which is typically 3:1 or 4:1 ratio

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## Challenges of Titrating via Ketogenic Ratios (cont.)



Ketogenic Ratio = grams of fat : sum of grams protein + carbohydrate

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## Challenges of Titrating via Ketogenic Ratios (cont.)

### Challenge for Registered Dietitian:

- ❑ Difficult to compare the KD prescription when describing in ketogenic ratios.  
Ratios do not adequately describe grams of protein and carbs.

KD Ratio	Fat grams	% kcal from fat	Protein grams	% kcals from protein	Carb grams	% kcal from carbs
3 to 1	116	87%	14 g	4.7%	24.7 g	8.3%
3 to 1	116	87%	28 g	9.3%	10.6 g	3.5%

Sample Calculation 4 year old boy, 15 kg, 1200 kcal/day



## OVERVIEW OF LOW RATIO, SLOW OUTPATIENT METHOD

- Offering the practical RD perspective -

## Overview of Low Ratio, Slow Initiation Outpatient Method



### STEP 1: PRE KETO

- All patients screened for inborn errors of metabolism that are contraindicated for ketogenic diet.
- Outpatient teaching and assessment with registered dietitian and ketogenic diet team.
- Pre-ketogenic diet history 5 days collected from family.
- Ketogenic bloodwork and baseline ECG.

## Overview of Low Ratio, Slow Initiation Outpatient Method



### TITRATION STEP 2

**Advance % kcal from fat by 10-15%**  
(i.e. 70-75% kcal from fat)

- Protein meets minimum of DRI
- Calculate fat and carbohydrate grams to determine final decision of KD prescription
- Consider adding MCT oil

**Keto Ratio is a result NOT a goal**

- Duration: 7-14 days OR
- Maintain at this step as if seizure control is acceptable & in agreement with your KD Team

#### Home Monitoring

Blood Sugars  
Blood Ketones  
Urine Ketones  
Bowel Movements  
Seizure Control

#### Local Lab Monitoring

(if deemed needed)  
Acidosis Bloodwork

## Overview of Low Ratio, Slow Initiation Outpatient Method



### TITRATION STEP 3

**Advance % kcal from fat by 5-10%**  
(i.e. 75-80% kcal from fat)

- Protein meets minimum of DRI
- Calculate fat and carbohydrate grams to determine final decision of KD prescription
- Consider adding or adjusting MCT oil

**Keto Ratio is a result NOT a goal**

- Duration: 7-14 days OR
- Maintain at this step if seizure control is acceptable & in agreement with your KD Team

#### Home Monitoring

Blood Sugars  
Blood Ketones  
Urine Ketones  
Bowel Movements  
Seizure Control

#### Local Lab Monitoring

(if deemed needed)  
Acidosis Bloodwork

## Overview of Low Ratio, Slow Initiation Outpatient Method



### TITRATION STEP 4

**Advance % kcal from fat by 5-10%**  
(i.e. 80-90% kcal from fat)

- Protein meets minimum of DRI
- Calculate fat and carbohydrate grams to determine final decision of KD prescription
- Consider adding or adjusting MCT oil

**Keto Ratio is a result NOT a goal**

- Continue to support and fine tune diet

#### Home Monitoring

Blood Sugars  
Blood Ketones  
Urine Ketones  
Bowel Movements  
Seizure Control

#### Local Lab Monitoring

(if deemed needed)  
Acidosis Bloodwork



## Overview of Low Ratio, Slow Initiation Outpatient Method



### Ketogenic Team Role/Involvement

- Decide calories for appropriate growth
- Decide protein and carbohydrate to support palatability and efficacy
- Registered Dietitian to create menus to best fit the ketogenic diet prescription to optimize palatability
- Registered Dietitian provides weekly or biweekly monitoring and support via phone and email with caregivers
- Multidisciplinary Clinic Visit at 3 months, 6 months post-initiation and every 6 months thereafter

## Overview of Low Ratio, Slow Initiation Outpatient Method



### Titration via % calories from macronutrients

Example: 1200 calories, 4 year old male, weight 15 kg

Diet STEP	% calories from fat	% calories from carbohydrate	% calories from protein	Grams of fat	Grams of carbohydrate	Grams of protein
Regular Diet	33%	53%	14%	44 g	159 g	42 g
STEP 1	60%	31%	9 %	80 g	93 g	27 g
STEP 2	70%	21 %	9 %	93 g	63 g	27 g
STEP 3	80%	11%	9 %	107 g	33 g	27 g

**Comment:**

Providing % calories from macronutrients is more precise in the description of the ketogenic diet prescription to your patient and your medical team than ratios.

Low Ratio, Slow outpatient initiation method (Fabe et al 2014, 2016) – McMaster Children's Hospital



## UPDATE ON USING LOW RATIO, SLOW OUTPATIENT INITIATION METHOD

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### Update Since 2018 Presentation: Safety & Tolerability Similar Results To Preliminary Analysis



Ketogenic Diet Therapy: Low Ratio Slow Initiation In a Canadian Outpatient Setting – Safety and Tolerability – 1 Year Follow-up

Poster authored by Jennifer Fabe, BSc, MSc, RD  
Co-Authors: Gabriel M. Ronen, MD  
McMaster Children's Hospital, Hamilton Health Sciences, Hamilton, Ontario, Canada

#### Feeding Delivery:

- 19 tube fed exclusively
- 13 oral fed
- 13 combo oral/tube

	Pre -Keto (n = 45)	1 Month (n = 45)	3 Months (n= 44)	6 Months (n = 42)	1 year (n = 42)	
Mean % kcal from fat (range of %)	38.0% (21.5-44.0)	76.8 % (58.0-89.0)	81.9 % (58.0-91.0)	83.6% (60.0-92.0)	81.4% 60.0-92.0	
Mean % kcal from carbs (range of %)	46.3% (36.0-62.4)	14.1% (3.8-32.0)	9.5 % (1.5-30.0)	8.4% (1.5-30.0)	9.8% (1.5-30)	
Mean KD ratio	0.22 to 1	1.78 to 1	2.1 to 1	2.34 to 1	2.44 to 1	
% Seizure Frequency Reduction	<50% Reduction		40.0%	34.0%	28.6%	23.8%
	50-90% Reduction		51.0%	36.0%	38.0%	45.2%
	>90% Reduction		9.0% (2 seizure free)	30.0% (3 seizure free)	33.4% (4 seizure free)	31% (3 seizure free)
Number of anti-seizure medications	3.2		3.3		3.3	

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## Further Updates on Low and Slow Method Evaluation of Food Exchange Meal Plan



Low ratio slow initiation using food exchange meal plan method: safety, tolerability & patient retention rate within a Canadian outpatient setting

Poster authored by Jennifer Fabe, BSc, MSc, RD  
Co-Authors: Nicole Turner, MPH, RD and Brandon Meaney, MD  
McMaster Children's Hospital, Hamilton Health Sciences, Hamilton, Ontario, Canada

### Purpose

Evaluate safety, efficacy, retention rate of patients initiated via non-fasting outpatient 'Low and Slow' KD method using 'Food Exchange Meal Plan' method at McMaster Children's Hospital.

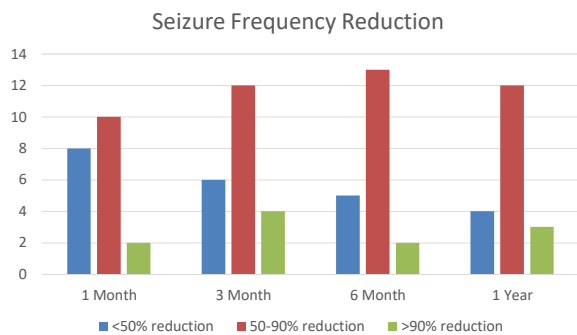
### Methods

Retrospective analysis of 20 children (age 1.5-16 years) who had been initiated on the non-fasting outpatient 'Low and Slow' KD method. Inclusion: 50% of calories taken orally and implemented 'Food Exchange Meal Plan' method from initiation. Measures of acidosis, hypoglycemia, ketosis, seizure frequency, patient retention rate & reasons for discontinuation were collected at 1, 3, 6 and 12 months.

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## Preliminary Data Analysis Sample of 20 patients that received greater than 50% of their nutrition orally



### Retention Rate

	1 month	3 months	6 months	1 year
Number of patients continuing with the Food exchange meal plan method	20	20	20	19
Number discontinued	0	0	0	1
Reason for discontinuation	--	--	--	Diet was not effective for seizure control

Acknowledgements: K.Girardi, J.Leduc for support in data collection  
Chief Scientific Officer: Dr.Arthur for support in data entry / collection/ analysis

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## IMPLEMENTING KETOGENIC DIET MACRONUTRIENT GOALS INTO PRACTICAL PLAN FOR PATIENT

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### Low and Slow Outpatient Initiation with “Food Exchange Meal Plan”



#### Goals:

- Lowest effective KD prescription
  - Flexible meal plan for child and family
  - Saves RD time from preparing detailed menus and recipes
- 
- Using approved Food Exchange List, menus can be created until the Meal Plan prescription provided by RD
  - Add foods to Food Exchange List to support cultural preferences and food availability
  - Longer windows of time between each titration enables determination of seizure control
  - Smaller and more even titration of KD reduces common side effects of induction
  - Child and caregiver adjust to diet at home at a slower pace
  - More efficient use of RD time
  - Reduce hospital cost

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## Brief Case Study example of 'Low and Slow' Outpatient Initiation

4 year old boy, 15 kg and requires 1200 kcal/day to support growth  
Myoclonic atonic epilepsy - 30 seizures weekly (GTC, atonic)



		Fat	Protein	Carbs	Ratio
Pre-Keto		46 g 33% kcal	43 g 14 % kcal	164 g 53%	0.22 to 1
Week 1	Titration 1	80 g 60% kcal	18 g 6% kcal	102 g 32.6%	0.66 to 1
Week 2 + 3	Titration 2	92.3 g 69.3%	28 g 9.3% kcal	64.3 g 21.4%	1.0 to 1
Week 4 + 5	Titration 3	102.8 g <b>77.1%</b>	32 g 10.6% kcal	36.6 g <b>12.2% kcal</b>	1.5 to 1 <b>(85% Seizure Reduction)</b>
Week 6	Sub Step to Titration 3	102.8 g <b>67.1% LCT</b> <b>10.1% MCT</b>	32 g 10.6% kcal	36.6 g <b>12.2% kcal</b>	1.5 to 1 <b>(Seizure Free)</b>
<b>1 year</b>	<b>Remained STEP 3</b>	<b>Same % kcal from fat, protein and carbs but increased kcal to support growth.</b>			<b>Seizure FREE</b>

1 Hypoglycemic event

No Acidosis via repeated measurements

No nausea, vomiting or diarrhea

Urine Ketones 4-16 mmol/L

Usual sugars 3-4 mmol/L

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## General Rules to Add Food to Food Exchange List

	Calories	Grams of Food = 1 Exchange
<b>Protein</b>	10-80 kcal / portion	3.0 – 5.0 grams protein / portion (can be less or more in the ketogenic diet prescription as long as calories stay within recommended range)
<b>Carbohydrate</b>	No range but will likely range between 0.5 – 50 kcal / portion	2.8 – 3.0 grams carbohydrate / portion
<b>Fat</b>	41 – 45 kcal / portion	5 grams of fat / portion (with 0 – 1.5 grams of carb / fat portion)
<b>COMBINATION FOOD</b>		Meets Criteria for 2 or 3 of the above

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## Example: Food Exchange Meal Plan Prescription for Ketogenic Diet (12 year old girl)



Per MEAL	Pre Keto Diet	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6
<b>Fat Exchange</b>	3 ½	6	7 ½	7 ½	7	6	5
<b>Carbohydrate Exchange</b>	16 ½	10	6	5	3	3	3
<b>Protein Exchange</b>	4 ½	1 ½ - 2 ½	1 ½ - 2 ½	1 ½ - 2 ½	1 ½ - 2 ½	1 ½ - 2 ½	1 ½ - 2 ½
<b>MCT Oil (mL)</b>	0.0	0.0	0.0	0.0	6	11	15
<b>Fluids (including water)</b>	--	300	300	300	300	300	300
<b>Calories per meal</b>	445 kcal	442 kcal	449 kcal	438 kcal	441 kcal	445 kcal	445 kcal
<b>% kcal from FAT</b>	35.4%	61%	75%	77%	82.7%	71%	78.5%
<b>% kcal from CHO</b>	44.5%	36.2%	16%	13.6%	11%	12%	12%7

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## Suggested Ketogenic Diet Protocol



### Suggested Ketogenic Diet Protocol Overview of Steps (Example for Teaching only)

MEALS	Step 1	Step 2	Step 3
<b>Fat Exchange</b>	2 ½	3	4
<b>Carbohydrate Exchange</b>	12 ½	8	5
<b>Protein Exchange</b>	1 ½	1 ½	1 ½
<b>MCT oil</b>	0.0 ml	3.5 ml	5.5 ml
<b>Fluids (including water)</b>	275	275	275
SNACKS	Step 1	Step 2	Step 3
<b>Fat Exchange</b>	0	1	1 1/3
<b>Carbohydrate Exchange</b>	6	4	2 ½
<b>Protein Exchange</b>	1 ½	1 ½	1 ½
<b>MCT oil</b>	0	0	0
<b>Fluids (including water)</b>	275	275	275
Meals & Snacks	Step 1	Step 2	Step 3
<b>Duration of Step</b>	1-2 weeks	1-2 weeks	1-2 weeks

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# Carbohydrate, Protein & Fat Exchange List

Sample Only



## CARBOHYDRATE, PROTEIN & FAT EXCHANGE LIST

Carbohydrate Choices (3.0 grams carbohydrates)			
FRUIT			
Item	Weight (grams)	Common Measure	Source
Apple, with skin	25.0 g	54.2mL slices (3.5 – 4Tbsp) or 1/7 of a medium apple	Canadian Nutrient File (CNF)
Apple, dried	6.0 g		Not on CNF
Applesauce, unsweetened	32.2 g	31.2mL (2 Tbsp)	CNF
Banana	15.0 g	23.7mL slices (1 Tbsp + 1 3/4tsp) or 15.8mL mashed (1Tbsp) or 1/8 of a medium banana	CNF
Banana, dried	4.5 g	10.6mL or 2tsp	CNF
Blackberries	70.3 g	115.6mL (1/3cup + 2Tbsp + 1tsp)	CNF
Blueberries, fresh	24.9 g	40.6mL (2Tbsp + 2tsp) or 18 berries	CNF
Blueberries, frozen unsweetened	30.5 g	46.6mL (3Tbsp)	CNF
Cantaloupe	39.5 g	58.4mL cubes (1/4 cup)	CNF
Grapes, green or red	17.0 g	3-4 grapes or 26.6mL (1Tbsp + 2tsp)	CNF
Honeydew melon	35.0 g	48.6mL cubes (3Tbsp + 3/4tsp)	CNF
Kiwi fruit, fresh	24.9 g	1/3 of a medium kiwi	CNF
Mandarin orange	26.0 g		Not on CNF

Protein Choices		
FISH AND SHELLFISH		
Cod, atlantic, cooked	41 g	CNF
Cod, pacific, cooked	50 g	CNF
Lobster, cooked	50 g	CNF
Salmon, chinook, raw	30 g	CNF
Salmon, chum, raw	40 g	CNF
Salmon, coho, raw	41 g	CNF
Salmon, pink, raw	35 g	CNF
Salmon, sockeye, raw	31 g	CNF
Shrimp, steamed	42 g	About 8 medium shrimp
Sole fish sticks, High Liner brand, cooked	21.4 g	Highliner
Tilapia	36 g	CNF
Tuna, albacore, raw	30 g	CNF
Tuna, albacore white, Starkist brand (in water)	43 g	1/2 of a 3 oz can (1.5oz) Starkist
EGG		
Egg, raw, mixed well	50 g	50 mL

## COMBINATION FOODS EXCHANGE LIST

Item	Weight (grams)	Carbohydrate Exchanges	Protein Exchanges	Fat Exchanges	Source
Iceberg lettuce	23.3 g	0	1	1	CNF
Iceberg lettuce	24.1 g	0	1	1	CNF
Iceberg lettuce	25.2 g	0	1	1	CNF
Iceberg lettuce	20.8 g	0	1	1	CNF
Iceberg lettuce	21.0 g	0	1	1	CNF
Iceberg lettuce	20.0 g	0	1	1	CNF
Iceberg lettuce	35.2 g	0.5	1	1.5	CNF
Iceberg lettuce	19.5 g	0	1	1	CNF
Iceberg lettuce	27.0 g	0	1	1	CNF
Iceberg lettuce	20.0 g	0	1	1	CNF
Iceberg lettuce	16.8 g	0	1	1	CNF
Iceberg lettuce	24.9 g	0	1	1	CNF
Iceberg lettuce	20.8 g	0	1	1	CNF
Iceberg lettuce	20.6 g	0	1	0.5	CNF
Iceberg lettuce	21.3 g	0	1	1	CNF
Iceberg lettuce	54.6 g	0.5	1	2.5	CNF
Iceberg lettuce	19.5 g	0	1	1	CNF
Iceberg lettuce	44.4 g	0	1	1	CNF
Iceberg lettuce	18.6 g	0	1	1	CNF

Fat Choices		
Laughing Cow soft cheese—Creamy Swiss Original *	22 g	1 wedge
Philadelphia cream cheese—Chive and Onion	21.4 g	1 Tbsp + 1 1/2 tsp
Philadelphia cream cheese—Dill	18.8 g	1 Tbsp + 1/2 tsp
Philadelphia cream cheese—Garden Vegetable	20 g	1 Tbsp + 1 tsp

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Acknowledge: Bonnie Huang RD, Claudia Marcela Gonzales (Nutritionist—Columbia), Nicole Turner RD and Nadine Nevland RD

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## Example: Food Exchange Meal Plan Prescription for Ketogenic Diet (12 year old girl)

Background: Weight 22.5 kg, Oral Feeding. Requirements: 1230 – 1335 kcal/day; 22.5 g protein;



Per MEAL	Pre Keto Diet	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5	STEP 6
Fat Exchange	3 1/2	6	7 1/2	7 1/2	7	6	5
Carbohydrate Exchange	16 1/2	10	6	5	3	3	3
Protein Exchange	4 1/2	1 1/2 - 2 1/2	1 1/2 - 2 1/2	1 1/2 - 2 1/2	1 1/2 - 2 1/2	1 1/2 - 2 1/2	1 1/2 - 2 1/2
MCT Oil (mL)	0.0	0.0	0.0	0.0	6	11	15
Fluids (including water)	--	300	300	300	300	300	300
Calories per meal	445 kcal	442 kcal	449 kcal	438 kcal	441 kcal	445 kcal	445 kcal
% kcal from FAT	35.4%	61%	75%	77%	82.7%	71%	78.5%
% kcal from CHO	44.5%	36.2%	16%	13.6%	11%	12%	12%

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Suggest to start with Carbohydrate choices

Carbohydrate Choices (3.0 grams carbohydrates)			
FRUIT			
Item	Weight (grams)	Common Measure	Source
Apple, with skin	25.0 g	54.2mL slices (3.5 – 4Tbsp) or 1/7 of a medium apple	Canadian Nutrient File (CNF)
Apple, dried	6.0 g		Not on CNF
Applesauce, unsweetened	32.2 g	31.2mL (2 Tbsp)	CNF
Banana	15.0 g	23.7mL slices (1Tbsp + 1.3/4tsp) or 15.8mL mashed (1Tbsp) or 1/8 of a medium banana	CNF
Banana, dried	4.5 g	10.6mL or 2tsp	CNF
Blackberries	70.3 g	115.6mL (1/3cup + 2Tbsp + 2Tsp)	CNF
Blueberries, fresh	24.9 g	40.6mL (2Tbsp + 2tsp) or 18 berries	CNF
Blueberries, frozen unsweetened	30.5 g	46.6mL (3Tbsp)	CNF
Cantaloupe	39.5 g	58.4mL cubes (1/4 cup)	CNF
Grapes, green or red	17.0 g	3.4 grapes or 26.6mL (1Tbsp + 2tsp)	CNF
Honeydew melon	35.0 g	48.6mL cubes (3Tbsp + 5/4tsp)	CNF
Kiwi fruit, fresh	24.9 g	1/3 of a medium kiwi	CNF
Mandarin orange	26.0 g		Not on CNF
Strawberries	53.0 g	4.4 medium strawberries or	CNF
Whole Wheat bread—100%	7.6 g	1/5 of a slice of bread	Product website
Whole Wheat			

	STEP 1	STEP 2
Carbohydrate	10 Choices	6 Choices
Protein	6 Choices	1 ½ - 2 ½ choices
Fat	6 choices	7 ½ choices
	<b>MEAL EXAMPLE</b>	<b>MEAL EXAMPLE</b>
Carbohydrate Choice	1 slice whole wheat bread (36.5 g) = 5 choices  2/3 med banana (~75 g) = 5 carb choices	½ slice whole wheat bread (18.3 g) = 2 ½ choices  1/3 med banana (37.5 g) = 2 ½ carb choices  53 g strawberries (~ 4 med strawberries) = 1 choice
Protein Choice		
Fat Choice		

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Next move onto Protein choices...

Protein Choices			
FISH AND SHELLFISH			
Cod, atlantic, cooked	41 g		CNF
Cod, pacific, cooked	50 g		CNF
Lobster, cooked	50 g		CNF
Salmon, chinook, raw	30 g		CNF
Salmon, chum, raw	40 g		CNF
Salmon, coho, raw	41 g		CNF
Salmon, pink, raw	35 g		CNF
Salmon, sockeye, raw	31 g		CNF
Shrimp, steamed	42 g	About 8 medium shrimp	CNF
Sole fish sticks, High Liner brand, cooked	21.4 g		Highliner.com
Tilapia	36 g		CNF
Tuna, albacore, raw	30 g		CNF
Tuna, albacore white, Starkist brand (in water)	43 g	½ of a 3 oz can (1.5oz)	Starkist.com
EGG			
Egg, raw, mixed well	50 g	50 mL	CNF
TOFU & SOY PRODUCTS			

	STEP 1	STEP 2
Carbohydrate	10 Choices	6 Choices
Protein	1 ½ - 2 ½ Choices	1 ½ - 2 ½ choices
Fat	6 choices	7 ½ choices
	<b>MEAL EXAMPLE</b>	<b>MEAL EXAMPLE</b>
Carbohydrate Choice	1 slice whole wheat bread (36.5 g) = 5 choices  2/3 med banana (~75 g) = 5 carb choices	½ slice whole wheat bread (18.3 g) = 2 ½ choices  1/3 med banana (37.5 g) = 2 ½ carb choices  53 g strawberries (~ 4 med strawberries) = 1 choice
Protein Choice	1 egg (~50 g) (1 protein choice)	1 egg (~50 g) (1 protein choice)
Fat Choice		

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## Finally add your fat choices...

FAT CHOICES			
Whipping cream, 35% MF (store-bought or homemade)	15 g	1 Tbsp liquid 2 Tbsp whipped	CNF
Coconut Milk (regular)	60 g	4 Tbsp	Product website
VEGETABLES			
Avocado (from California or Mexico)	35.0 g	1/4 of an avocado 2 Tbsp + 1 tsp puree (36mL)	CNF
Olives, black	42 g		
Olives, green	33 g	About 8 medium olives 1/2 cup chopped or sliced (58.7mL)	CNF
SPREADS			
Butter, regular	6 g	1 1/2 tsp (6.25mL)	CNF
Margarine—regular fat	6 g	1 1/5 tsp (6mL)	
Peanut butter—smooth regular	10 g	2 tsp	Product website
OILS			
Oil—canola, olive, safflower, sunflower, walnut, avocado, or Blue Menu omega-3 blend	5 g		

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	STEP 1	STEP 2
Carbohydrate	10 Choices	6 Choices
Protein	1 1/2 - 2 1/2 Choices	1 1/2 - 2 1/2 choices
Fat	6 choices	7 1/2 choices
	MEAL EXAMPLE	MEAL EXAMPLE
Carbohydrate Choice	1 slice whole wheat bread (36.5 g) = 5 choices  2/3 med banana (~75 g) = 5 carb choices	1/2 slice whole wheat bread (18.3 g) = 2 1/2 choices  1/3 med banana (37.5 g) = 2 1/2 carb choices  53 g strawberries (~ 4 med strawberries) = 1 choice
Protein Choice	1 egg (~50 g) (1 protein choice)	1 egg (~50 g) (1 protein choice)
Fat Choice	Whipping Cream 35% MF (6 Tbsp = 90 ml = 6 fat choice)  Margarine 1 1/5 tsp (=6 g) = 1 fat choice  Peanut Butter Regular = 2 tsp (=10 g) = 1 fat choice	Whipping Cream 35% MF (7 1/2 Tbsp = 112.5 ml = 7 1/2 fat choice)  Margarine 1 1/5 tsp (=6 g) = 1 fat choice  Peanut Butter Regular = 2 tsp (=10 g) = 1 fat choices



## Advantages of Food Exchange Lists

1. Provides families a wide variety of choices or food substitutions if they need it.
2. Offers independence to families to create own meals.
3. Can adapt to local food availability
4. \*\*Time saving tool for RD – frees up time from making meal and snack recipes
5. \*\* RD working more at top of scope of practice – still works on setting ketogenic diet prescription but much less time in supporting the meal/snack recipes
6. Scale or household measures are possible with some foods

## Disadvantages of Food Exchange Lists

1. Some families prefer less decision making & more RD support for menu creation
2. If family struggles with fractions (e.g. 1/2 exchange) – RD needs to adjust ketogenic diet food exchange prescription to include whole numbers
3. Not all foods are translatable to household measures easily. May still require scale if requires preciseness.

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## Exchange Lists – Food included



- Generic foods: created from country specific database
- Brand name foods: commonly found foods
- Manually/Spreadsheet calculated and compiled historically. Upfront labor intensive but sustainable once database established



- \*\*\* Progressing onto software to improve time efficiency for RD and practicing at the top scope of their practice
- \*\*\* Using technology to support meal & recipe balancing, & generate exchange lists quickly for both RD or patient users

Countries currently included: Canada and New Zealand (Christchurch)

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Matthew's Friends Canada endorsed:  
Acknowledging RDs: Charlene Tan-Smith, Claudia Marcela Garcia, Bonnie Huang, Nadine Nevland, Nicole Turner for support of Exchange List creation  
Andrew Smith for the technology support

Product	Product weight	Fat Exchanges	Protein Exchanges	Carb Exchanges
Bluebird cereal, mixed grain, clusters & nuts, sweetened, ready to eat, Cluster Grain, Sunburst, compatible, fortified vitamins B1, B2, B3 & Biotin, 8.5g	7.17g	0.87gP	0.8gP	1.0mg
Bluebird cereal, mixed grain, clusters & nuts, sweetened, ready to eat, Cluster Grain, Sunburst, compatible, fortified vitamins B1, B2, B3 & Biotin, 8.5g	3.333.37g	0.0gP	0.0gP	1.0mg
Bluebird cereal, mixed grain, clusters & nuts, sweetened, ready to eat, Cluster Grain, Sunburst, compatible, fortified vitamins B1, B2, B3 & Biotin, 8.5g	15.78g	0.13gP	0.1gP	1.0mg
Bluebird cereal, mixed grain, clusters & nuts, sweetened, ready to eat, Cluster Grain, Sunburst, compatible, fortified vitamins B1, B2, B3 & Biotin, 8.5g	15.47g	0.13gP	0.1gP	1.0mg
Bluebird cereal, mixed grain, clusters & nuts, sweetened, ready to eat, Cluster Grain, Sunburst, compatible, fortified vitamins B1, B2, B3 & Biotin, 8.5g	11.87g	0.13gP	0.1gP	1.0mg

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## Summary



### Low Ratio, Slow Outpatient Initiation Method

- Remains the current standard of practice at McMaster Children's Hospital in Hamilton, ON, Canada. It continues to be regularly reviewed for safety & tolerability.
- Method has been trained in countries of similar health care funding model: New Zealand (Christchurch) and other Canadian centres.

### Low Ratio, Slow Outpatient Initiation Method & Use of Food Exchange List Meal Preparation Method

- Preliminary study suggests that it supports high sustainability.

### Food Exchange Lists

- Support for RDs and Keto Families who need support with maintaining and sustaining oral feeding can be achieved using meal plan - food exchange lists.
- Upcoming software KetoSuite supports independence of patients, and will hopefully support sustainability on ketogenic diet.
- Existing software like EKM, KetoDietCalculator, MyKetoPlanner™, and many others can be helpful in supporting your exchange lists

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DANKE!  
THANK YOU!  
MERCİ!  
GRAZIE!  
GRACIAS!  
DANK JE WEL!

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## Questions?

Please put your questions in the Q&A box on the right hand side of the screen

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