NEW ZEALAND DEVELOPED MEDICALIZED KETOGENIC THERAPY (MKT) TECHNOLOGY GLOBAL APP SUITE

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Drivers for change

ACCESSIBILITY & ADHERENCE

The main drivers for change are the traditional barriers to MKT delivery; Accessibility to a service or suitably trained and experienced registered dietitian, and adherence to the ketogenic diet (KD).

Accessibility to MKT in New Zealand is location-based, and admission criteria are limited to paediatric refractory epilepsy. Adequately trained and experienced specialist ketogenic dietitians take time and support to develop. Low-frequency high-complexity patients require significant ketogenic dietitian time to monitor and manage[1].

A KD is not an easy diet and with meals and recipes of up to 90% fat can be challenging to consume, potentially causing nausea or constipation[2]. Patients struggle to create appropriate KD recipes and meals and require significant training[3]. Patients & practitioners struggle to balance recipes and meals to food prescriptions or ratios and to swap ingredients. Some carers find the mathematics too arduous and abandon the therapy. Up to 30% discontinue prior to 3-4 months in randomised controlled trials[1]. Some UK centres report 25% discontinue prior to 3 months (Ketogenic Dietitians Research Network data from 19 UK centres).

KETOGENIC ALGORITHMIC CHALLENGE

Over one hundred years, we see attempts to mitigate the two traditional challenges to delivering MKT. Some attempts have been practice changes, some digital tools. However well-intentioned, they all suffer from the same problem; the ketogenic algorithmic challenge. This arises from the fact all foods have a macronutrient profile of fat, protein, and carbohydrate, and a meal or recipe must balance to a target food prescription of fat, protein and carbohydrate. For patients on an MCT KD, the fourth prescription number specifies the amount of MCT. Treatment for medium-chain triglyceride calculations is not the same as regular food profiles.

Example macronutrient food prescription:

	Total Fat (g)	Protein (g)	Carbs (g)	MCT (g) (Component)	Ratio	Total-Fat	MCT	Kcal (daily)
Daily Prescription Totals	32	5	4	0	3.6 : 1	89.2%		323.0

The following is a tiny recipe example. Each ingredient has a fat, protein, and carbohydrate food profile expressed as grams per 100g of product.

Ingredient	*Product (g)*	*Fat (g)*	*Protein (g)*	*Carbohydrate (g)*
Apple, cooking, flesh, stewed	100	0.26	0.25	10.31
Avocado, flesh, raw, combined varieties	100	26.6	2	0
Yoghurt, Greek Style, DeWinkel	100	7.5	5.1	5.17

Use a calculator and see if you can calculate how much product will make the Fat, Protein, Carbohydrate column-totals match the prescription to 0.1g accuracy!

Even with the aid of specialised online calculators, manually adjusting ingredients requires significant judgement and is a time consuming task without any gurantee of success or a proportionately balanced recipe. To achieve instantly and proportionately balanced recipes requires thousands of itterative algorithm calcualtions per second converging towards a solution.

Balanced	Quantity (grams)	1 Serving	Fat	Protein	Carbohydrate
Apple, cooking, flesh, stewed	10.2	0 g – 24 g	0.0	0.0	1.1
Avocado, flesh, raw, combined varieti...	104.0	0 g – 120 g	27.7	2.1	0.0
Yoghurt, Greek style, DeWinkel	57.0	0 g – 72 g	4.3	2.9	2.9
Totals:	171.2 g		32.0 g	5.0 g	4.0 g

Solution Herea

HEREA

Planning the South Island service led to a unique approach, a herea (weaving together) of people, process and technology that defines the framework of practice. We consider the herea in the context of this whakataukī, adapted from an original proverb attributed to Tāwhiao of Ngāti Mahuta and Waikato Tainui (Mead, 1983).

Kotahi te aho ka whati;
ki te kāpuia e kore e whati
One strand of flax is easy to break,
But many strands together will stand strong.

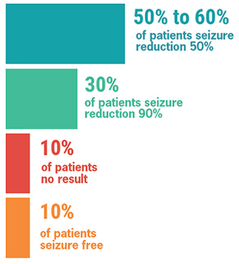
PEOPLE

Delivery of MKT requires a multidisciplinary approach within the People strand of the herea. The team may consist of - clinical lead Registered Dietitian specifically trained and experienced in ketogenics, Neurologists, Allied Health Assistant, Keto Nurse, Pharmacist, Māori Health Advisor and Phlebotomist.

PROCESS

The New Zealand South Island service has followed the lead of registered dietitian specialising in ketogenics - Jennifer Fabe at McMaster Childrens Hospital, Canada. Jennifer is a pioneer of the Low and Slow community initiation methodology[4]. The method is safe, requires fewer resources and fewer overnight stays in hospital.
Classic or Modified Ketogenic Diets are versions of the diet requiring accuracy and strict adherence. Patients have individual ketone production and individual responses to ketones with 50% experiencing reduction of seizures of over 50%[1]. With ketosis achieved, where required, the diet may be relaxed.

International results*:



Classic Ketogenic Diet:

TECHNOLOGY

KetoSuite™ has mitigated the ketogenic algorithmic challenge, saving patients and practitioners hours of work and eliminating calculation errors.

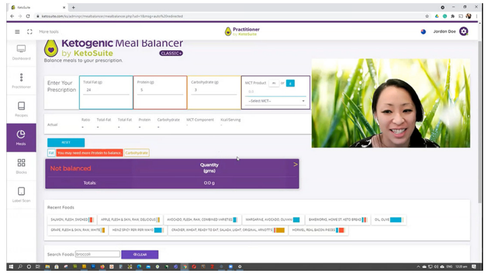
The development of KetoSuite involved a short development feedback loop with two ketogenic registered dietitians as co-founders. With instant auto-balancing of meals and instant proportionate auto-balancing of recipes, the suite justifies being referred to as second-generation ketogenic digital technology tools.

Macro food prescriptions are entered as specific values for fat, protein, and carbohydrate for classic KD. An alternative macro foods prescription entry allows for optional values and ranges to suit other KDs such as MKD, MAD, LGIT. MCT is entered as a fourth prescription value to ensure medium-chain triglyceride calculations are made accurately.

The suite includes a food choice exchange list wizard practitioners and patients utilise to create a custom list anytime.

Patient and practitioner accounts are tailored to deliver different tools, with practitioners able to recommend and manage recipes directly into linked patient accounts. There is also a practitioner only macronutrient food prescription builder used to create patient specific prescriptions based on their characteristics. Prescriptions are created to RDIs in minutes.

Country specific food databases are currently available for the UK, Canada and New Zealand. All users can scan custom foods and submit them for registered dietitian approval into their country-specific database. This scalable approach makes custom added foods available to everyone in that country. The suite is cloud-based, served over Hypertext Transfer Protocol Secure (HTTPS) Secure Sockets Layer (SSL) and backed up daily.



Meal Balancers
Automatic meal balancers for all KD types. Enter personal food prescription, add recently used foods to create a meal.

Scan Products
Registered Dietitians approve user-submitted foods before adding to country-specific databases available to everyone.

Recipe Book / Recipe Balancers
Browse and manage your recipes, practitioner recommended, or publically available. Automatic recipes balancers for all KD types.

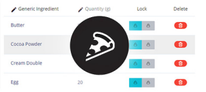
Food Block Choice Lists
Create a list using your block sizes. Then simply search and add foods to your auto-generated custom choices list.

Manage Patients
Practitioners can recommend recipes directly to their patient's accounts

KetoSuite

Patients Practitioners Hospitals

Recipe Wizard
Create your own recipes ready to balance to your food prescription.



Strategic partnership with The Brydie Lauder Charitable Trust

Platform, device and browser agnostic. Runs on everything!

Endorsed by Matthews Friends UK / Global

Endorsed by Matthews Friends Canada

Acknowledgements
http://health.webmanagement.co.nz - infographics used by permission

References
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Conflict of Interest: Charlene Tan-Smith, Jennifer Fabe, Andrew Smith are co-founders of FabeSmith Limited (t/a KetoSuite)

International Trial Hospital Sites: