MONASH University

Module 6
Summary Factsheet

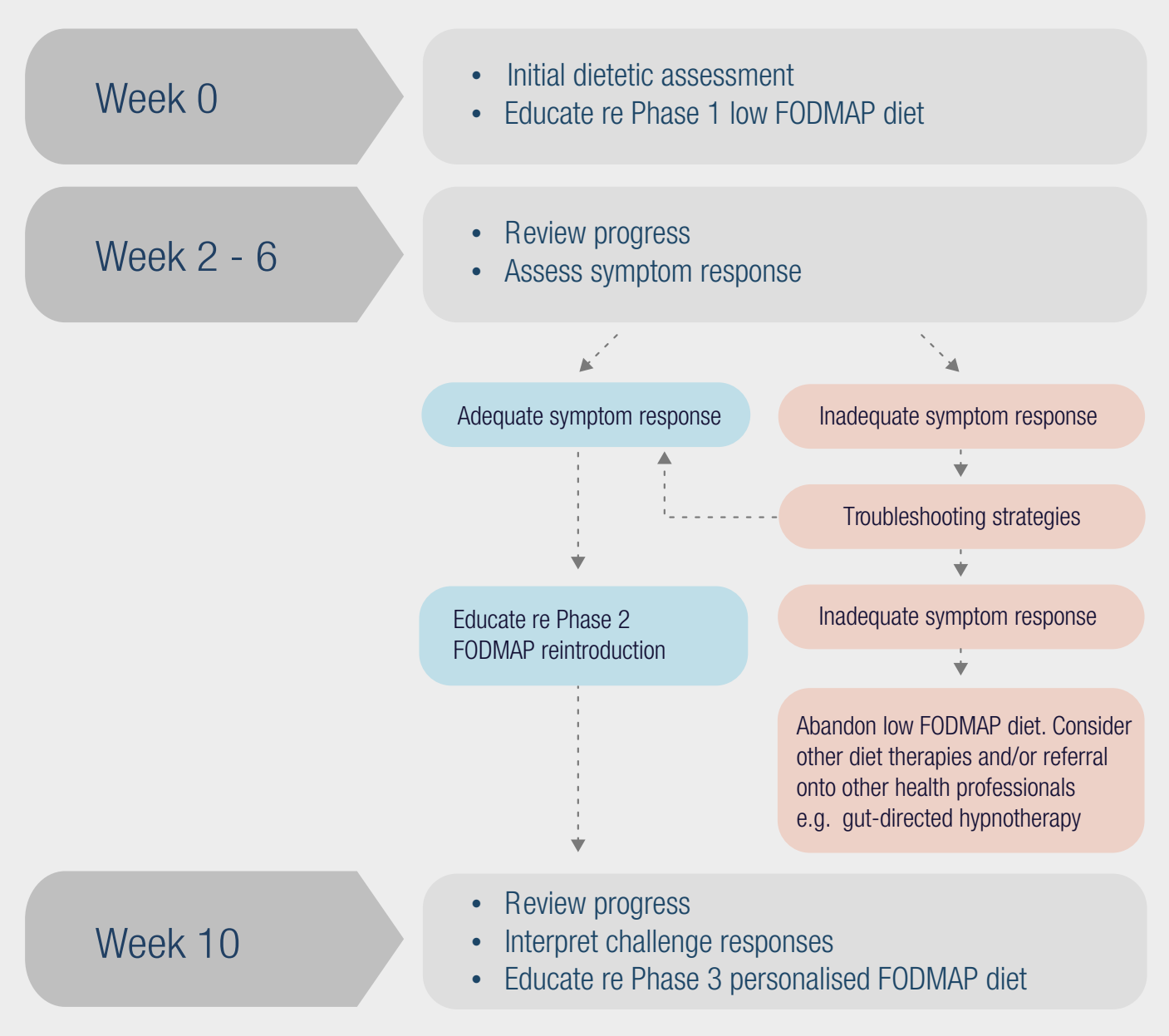

Figure 1: Suggested Dietetic management plan for the use of the low FODMAP diet

1. Purpose and rationale for Phases 2 and 3

- To identify specific foods and FODMAPs that trigger IBS symptoms, as well as those that are well tolerated.
- To construct a minimally restrictive, 'personalised' FODMAP diet for the long-term. Foods containing well tolerated FODMAPs are included in the diet, while poorly tolerated foods and FODMAPs are restricted, but only to a level that provides adequate symptom relief.

Phases 2 and 3 are important for a number of reasons:

- to identify specific foods and FODMAPs that trigger IBS symptoms
- to reduce dietary restrictions that may adversely affect quality of life (QOL).
- to increase prebiotic intake
- to ensure nutritional adequacy

Some of these points are expanded on below.

1.1 Ensuring adequate prebiotic intake

'Prebiotic' refers to 'a selectively fermented ingredient that changes the composition and/or activity of the gastrointestinal microbiota, thus conferring benefit(s) upon host health'[1].

Fructans and GOS are known to have prebiotic actions and a low FODMAP diet may reduce prebiotic intake. To minimise changes in gut microbiota, patients should include some prebiotic fibres (fructans and GOS) during their Phase 1 low FODMAP diet. This may be achieved by including low FODMAP or 'green serves' of fructan and GOS containing foods (Table 1).

Table 1 - Prebiotic rich foods that can be consumed in a low FODMAP or 'green' serve

FRUIT AND VEGETABLES	GRAINS AND CEREALS	LEGUMES AND LENTILS
Fruit (banana, pomegranate, rambutan, currants, dried paw paw, raisins) **Vegetables cooked and cooled** (potato, beetroot, butternut pumpkin, savoy cabbage, corn, snow peas, cassava, taro)	**Grains** (oats, puffed amaranth, buckwheat kernels, rice and corn cous cous, burghal, wheat bran) **Pasta cooked and cooled** (spelt / wheat) **Bread** (gluten free multigrain, wholemeal)	**Pulses** (Red / green lentils, canned lentils, canned chickpeas, butter beans, lima beans, mung beans) **Nuts** (almonds, hazelnuts)

1.1.1 Nutritional adequacy

Nutrients that may be of particular concern on a low FODMAP diet include calcium, iron, fibre and natural prebiotics[2-4].

Calcium intake may be restricted due to limits on lactose intake. However, patients can achieve a low lactose, calcium rich diet, by:

- Including lactose-containing dairy products in small amounts, spread over the day
- Choosing specialty lactose-free dairy products or dairy products naturally low in lactose
- Choosing calcium fortified plant based milks

A reduction in **fibre** intake is due to restrictions on the intake of bread and cereal products, fruit, vegetables, nuts, and pulses. Patients may need specific advice about including low FODMAP, high fibre foods in their diet, and about suitable fibre supplements (see Module 5 for tips to ensure an adequate fibre intake on a low FODMAP diet).

2. Evidence to support Phase 2 and 3 protocols

Although Phases 2 and 3 of the FODMAP diet are actively promoted by dietitians worldwide, there are limited data to support specific protocols (Table 2).

Table 2 - Current evidence for the reintroduction phase

Martin et al, 2015, United Kingdom[5]	Assessed long term dietary intake and level of FODMAP reintroduction in patients with IBS. Follow-up questionnaires provided to 100 patients at 6-18 months following initial education	• 62% had satisfactory relief on the low FODMAP diet. • Of those, 71% continued to have satisfactory relief, one year after reintroduction • 68% continued to avoid high FODMAP foods at least 50% of the time
Gibson et al, 2016, Australia [6]	Follow-up questionnaire at 6 months post treatment	• Those who had remained on a strict or adapted FODMAP diet at 6 months experienced greater symptom relief 6 weeks compared to those who had abandoned the diet
Maagaard et al, 2016, Denmark [7]	Retrospective questionnaire at a median follow-up time of 16 months (2-80)	• 32% IBS were on the diet for < 3 months • 47% IBS stayed on the diet until follow-up • 54% used the diet on and off depending on symptom severity, while the rest were continuously on the diet • 84% lived on an adapted version, where some foods rich in FODMAPs were reintroduced in varying amounts according to individual tolerance level • 16% followed the diet by the book without deviations • Wheat, dairy products and onions were the foods most often not reintroduced • Weight loss occurred in 29% of patients, while 7% gained weight
O'Keeffe et al, 2017[8]	Follow up questionnaire 6-18 months after low FODMAP diet education	• At baseline, 6 weeks and 6-18 months post low FODMAP diet education there were 12%, 61% and 57%, reporting satisfactory relief of IBS symptoms, respectively • 82% followed a 'personalised' FODMAP diet 6-18 months post low FODMAP diet education

2.1 Timing - when to commence Phase 2

- Phase 2 can be initiated if adequate symptom improvement is achieved after 2 to 6 weeks on the Phase 1, low FODMAP diet.
- Phase 3 can be commenced once all the challenges are completed in Phase 2.

3. Reintroduction methods

There are 2 main methods that may be used to reintroduce FODMAPs:

- challenge approach
- traffic light approach

3.1 The challenge approach

Using a challenge approach, patients remain on a low FODMAP diet (as per phase 1), but undertake a series of FODMAP 'challenges' to determine which FODMAPs they tolerate and which trigger symptoms. The challenges involve reintroducing a food rich in 1 FODMAP subgroup, daily for 3 days and monitoring symptom response.

In many patients, the challenge approach provides the clearest and most efficient means of understanding FODMAP tolerance. It typically takes patients ~6 to 8 weeks to complete Phase 2 using a challenge approach (Figure 2).

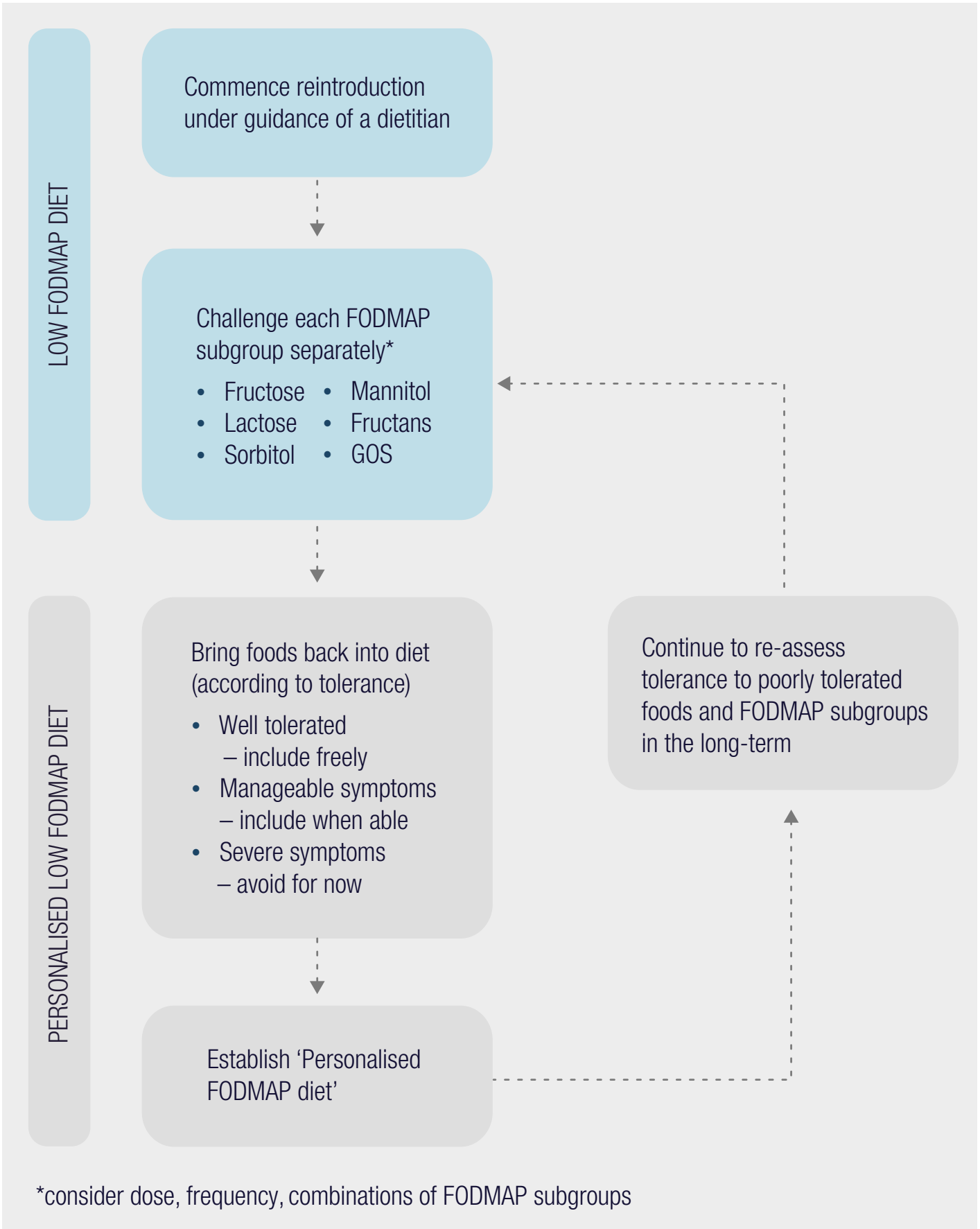

Figure 2: FODMAP reintroduction flowchart

3.1.1 Method (frequency of challenges, foods to use, serving sizes)

Generally speaking, most patients should:

- Wait until symptoms are well controlled before beginning each challenge
- Remain on a low FODMAP diet (as per Phase 1) while completing each challenge
- Complete challenges one-at-a-time, over a 3 day period (see Table 3 for suggested challenge foods).
- Once tolerance to each subgroup is established, encourage patients to assess their tolerance to larger doses, increased frequency and different combinations of FODMAP subgroups.
- Use the Diary in the Monash FODMAP app (or Table 3) to identify challenge foods and doses. Start with the day 1 (amber serve), then if tolerated progress to the day 2 (red serve), day 3 (red serve / full serve). **Remember that challenge doses can be titrated up or down depending on tolerance (Figure 3).**
- Include a 2-3 day 'washout' period between challenges
- Record challenge foods eaten and symptom response using a paper diary or the Diary in the Monash FODMAP app (Figure 4).

Table 3 - Suggested challenge foods

	SUGGESTED FOOD	DAY 1 – AMBER SERVE	DAY 2 – RED SERVE	DAY 3 – RED SERVE	OTHER POSSIBLE CHALLENGE FOODS
EXCESS FRUCTOSE	Honey Mango	1½ tsp ¼ mango	2 tsp ½ mango	1 tbsp 1 mango	Sugar snap peas Orange juice Asparagus Boysenberry Fig (fresh)
LACTOSE	Cow's milk Yoghurt	¼ cup ½ small tub	½ cup 1 small tub	1 cup 1 cup	Custard Ricotta Cream Icecream Evaporated milk
SORBITOL	Avocado Apricot	¼ small ½ small	½ small 1 small	¾ medium 2 small	Blackberries Yellow peach Plum Lychee Fresh coconut Coconut milk
MANNITOL	Button mushroom Cauliflower	½ small 2 small florets	2 small 4 small florets	4 small 8 small florets	Celery Sweet potato White cabbage (sauerkraut)
FRUCTOSE + SORBITOL	Red apple Packham pear	¼ medium ¼ medium	½ medium ½ medium	1 medium 1 medium	Cherries Tinned apricots Nashi pear Dried pear
FRUCTAN (GRAIN FOODS)	Cous cous (wheat) Pasta (wheat)	¼ cup (cooked) ⅖ cup (cooked)	½ cup (cooked) 1 cup (cooked)	1 cup (cooked) 1½ cup (cooked)	Pumperkickle bread Barley flakes Gnocchi Semolina
FRUCTAN (ONION/ GARLIC)*	Onion Garlic	⅛ onion ¼ clove	¼ onion ½ clove	½ onion 1 clove	Leek (bulb only) Artichoke (globe) Spring onion (bulb only) Raisins Grapefruit Dates Dried fig Dried pineapple Dried mango
GOS*	Chickpeas (canned) Green peas	½ cup ⅛ cup	⅖ cup ¼ cup	1 cup ½ cup	Cashews Pistachios Black beans Borlotti beans Haricot beans Navy beans Silken tofu Soy milk (from soy beans)

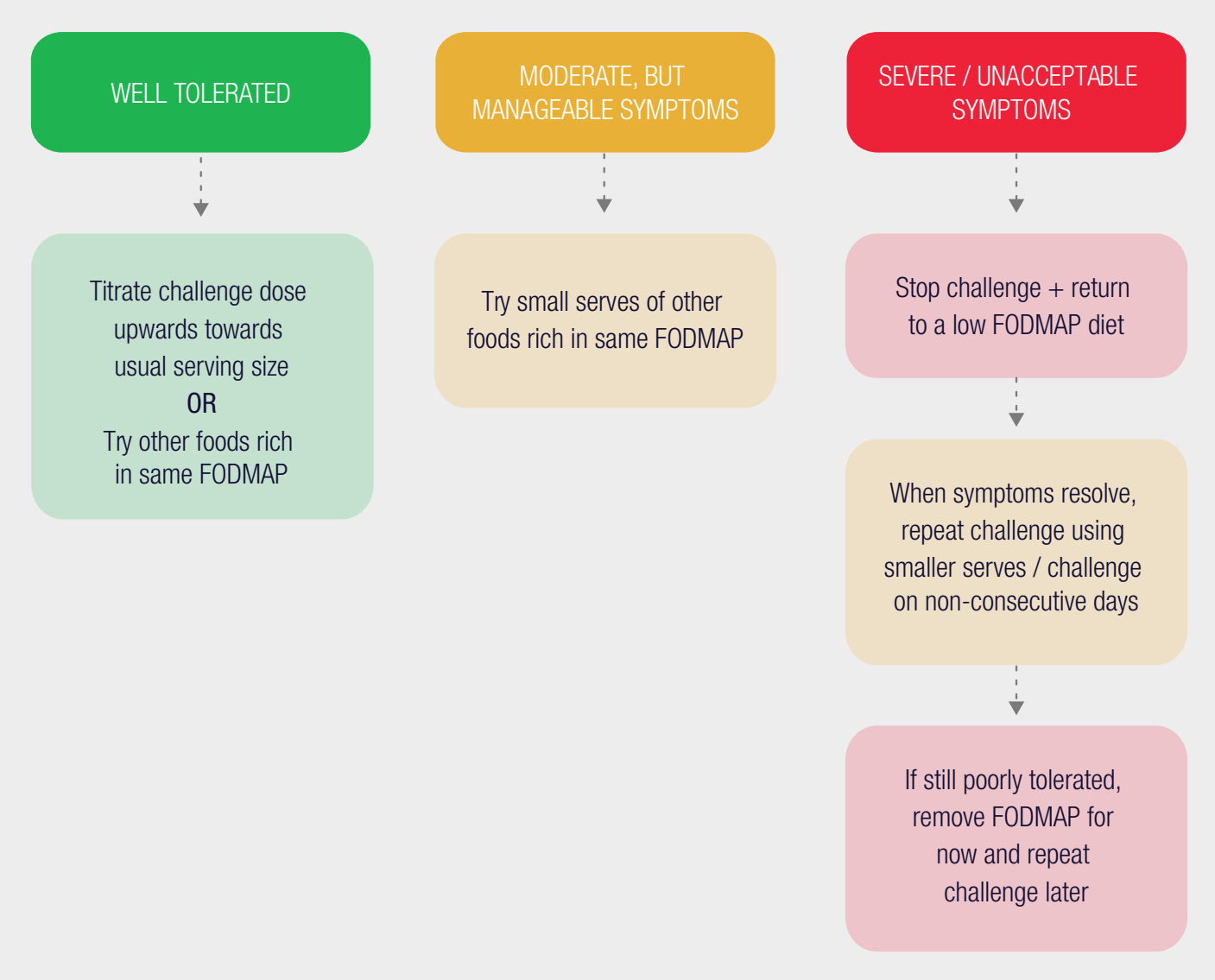

Figure 3: Interpreting challenge responses

	Food	Amount	Symptoms (circle)			
Day 1 *moderate*	Cow's milk	¼ cup	none	mild	moderate	severe
Day 2 *high*	Cow's milk	½ cup	none	mild	moderate	severe
Day 3 *usual*	Cow's milk	1 cup	none	mild	moderate	severe

Dietitian's advice: Patients should be able to tolerate one serve of high lactose food per sitting (~½ cup milk equivalent). Tolerance may also be improved if lactose rich foods are consumed in smaller serves and spread out across the day.

Figure 4: Sample challenge diary

Box 1 - 'Simplified' challenge

A 'simplified' challenge approach can be used in patients who achieved a good level of symptom control using a 'simplified' low FODMAP diet in Phase 1.

The 'simplified' challenge approach uses the challenge protocol described above, but patients would only challenge foods and FODMAPs that were restricted in Phase 1.

Using a simplified challenge approach, only very high FODMAP foods that were restricted in Phase 1 should be challenged. Each challenge should occur over 3 days, with a 2-3 day washout period in between.

Below is an example of the foods that a patient may have excluded from their diet in Phase 1, categorised by FODMAP subgroup.

- Fructans - garlic, onion, wheat bread
- GOS - chickpeas, cashews
- Excess fructose - Honey
- Fructose and sorbitol - apple, pear
- Lactose - cows' milk
- Sorbitol - avocado
- Mannitol - mushroom

Using this example, the patient may be instructed to include 1 of the restricted foods (e.g. honey) daily for 3 days. The day 1, 2 and 3 challenge doses can be based on the serving sizes recommended in the Monash FODMAP app (also listed in the table below). However, if their preferred challenge food is not listed here, they can challenge using:

» 1/3 their usual serve on day 1

» 2/3 their usual serve on day 2

» full usual serve on day 3.

As per the 'challenge approach' to Phase 2, the challenge dose and frequency (using a simplified approach) can be titrated up or down to established a threshold level of tolerance.

3.2 Traffic light approach

An alternate approach to the reintroduction phase involves using the Monash University Low FODMAP diet app[9]. Using the 'traffic light approach', the patient is advised to eat mostly 'green' serves of foods during Phase 1. Then, during the reintroduction phase, they would trial 'amber' serves of food, and if tolerated, include 'red' serves of food to gradually increase their FODMAP intake[9].

The traffic light approach may be best suited to patients who:

- find the challenge approach too rigid and complex.
- struggle with more structured challenges due to time constraints, unpredictable meal patterns or frequent eating out, or
- feel anxious about the reintroduction phase.

Method

The 'traffic light' approach to Phase 2 is less structured than the challenge approach. Using a traffic light approach, patients gradually include more moderate 'amber', then high 'red' FODMAP serves in their diet.

Ideally, patients should reintroduce specific FODMAP subgroups, one by one. For example, if the patient chooses to start with sorbitol, they would include amber of sorbitol rich foods (that were restricted from their diet in phase 1), and if tolerated, progress to red serves of sorbitol rich foods. Dietitians need to use their food composition knowledge (and refer to the Monash App and Table 3) to direct patients to sorbitol rich foods suitable for reintroduction (e.g. blackberries, avocado, apricot, peach, plum, lychee, fresh coconut, coconut milk).

4. Individualising Phase 2

It is often necessary to modify the re-challenge phase to suit individual patients. Factors that may be considered when deciding how to individualise the re-challenge phase include:

4.1 Level of initial FODMAP restriction

If patients achieved adequate symptom control using a 'simplified' approach to Phase 1, they only need to challenge foods and FODMAPs that were initially restricted.

4.2 Order of challenges

Patients may prefer to challenge suspected well tolerated FODMAPs earlier and suspected triggers (such as onion and garlic) later.

4.3 Starting challenge dose

- Patients suspected of being highly sensitive to FODMAPs or anxious about FODMAP challenges, can start with a smaller challenge doses
- If patients strongly suspect they tolerate certain FODMAPs, or if they want more definitive answers regarding FODMAP tolerance, larger challenge doses can be used.
- Some challenges (e.g. fructan challenge using onion or garlic) may also be better tolerated if the challenge food is consumed less frequently (e.g. second daily).

4.4 Anxiety about the re-challenge phase

If patients are anxious about the reintroduction process, dietitians may need to modify Phase 2 to counteract the effects of negative symptom expectations on symptom response. Anxious patients may benefit from a slower reintroduction process that:

- starts with smaller serves (e.g. amber serve or ½ amber serve)
- challenges on non-consecutive days, and/or
- uses blinded challenges to minimise nocebo responses.

4.5 Food preferences

Consider the patient's preferences and usual dietary intake when selecting a challenge food. For instance, challenging lactose using 1 cup of milk provides irrelevant information if they would rarely drink more than ½ cup milk in one sitting.

Patients can also be encouraged to make up their own challenges. This is useful if they regularly consume foods untested for FODMAP content.

4.6 Breath test results

If the patient had a positive lactose breath test result, it is still worth challenging lactose. This is because the dose of lactose used in breath testing exaggerates what would be consumed in a typical serve of dairy.

4.7 Timing

Encourage patients to avoid challenging on days when they have social events or eating out plans, as these may confuse the interpretation of challenge results.

4.8 Nutritional requirements

Table 5 provides examples of special dietary requirements that might influence re-challenge phase.

DIETARY REQUIREMENT	IMPLICATIONS FOR THE REINTRODUCTION / PERSONALISATION PHASES
Vegetarian / vegan	• Spend additional time challenging protein rich foods (e.g. legumes, lentils, tofu, tempeh, milk alternatives, dairy foods, nuts, grains and cereals) to establish a level of tolerance*
Diabetes	• Spend additional time challenging low GI, fibre rich carbohydrate foods that to establish a level of tolerance (particularly relevant during the fructan and GOS challenges)*
Food preferences	• If a patient regularly eats mushrooms but never eats cauliflower, use mushrooms to challenge mannitol
Other food intolerances	• If the patient believes fatty or spicy foods trigger symptoms, avoid these during the reintroduction phase. • If a patient has imposed other dietary restrictions (e.g. gluten, salicylates, glutamates or capsaicin), and notices considerable symptom improvement on a low FODMAP diet, reassess tolerance to these food components. Symptoms may have been incorrectly attributed to one of these food components.

* Remember tolerance may be influenced by the dose, frequency or variety consumed

5. Phase 3 Personalised FODMAP diet

In Phase 3, the focus shifts from restricting FODMAP intake, to expanding FODMAP intake (according to tolerances established in Phase 2) and minimising dietary restrictions. As much as possible, patients should be encouraged to eat healthily and according to nutritional guidelines. Minimising dietary restrictions helps to optimise nutrition, increase food enjoyment, enhance the social aspects of eating and possibly, improve QOL.

In Phase 3, dietitians play a key role in:

- Helping patients to understand challenge responses
- Constructing a 'personalised' FODMAP diet - bringing well tolerated foods and FODMAPs back into the diet and restricting the diet only to a level that is absolutely necessary to maintain symptom control.

5.1 Interpreting the challenge diary

In Phase 2, patients should have recorded challenge foods eaten and symptom responses. Take time to review this information with the patient as doing so will help them better understand their FODMAP tolerance and how to expand their diet in Phase 3 (figure 5).

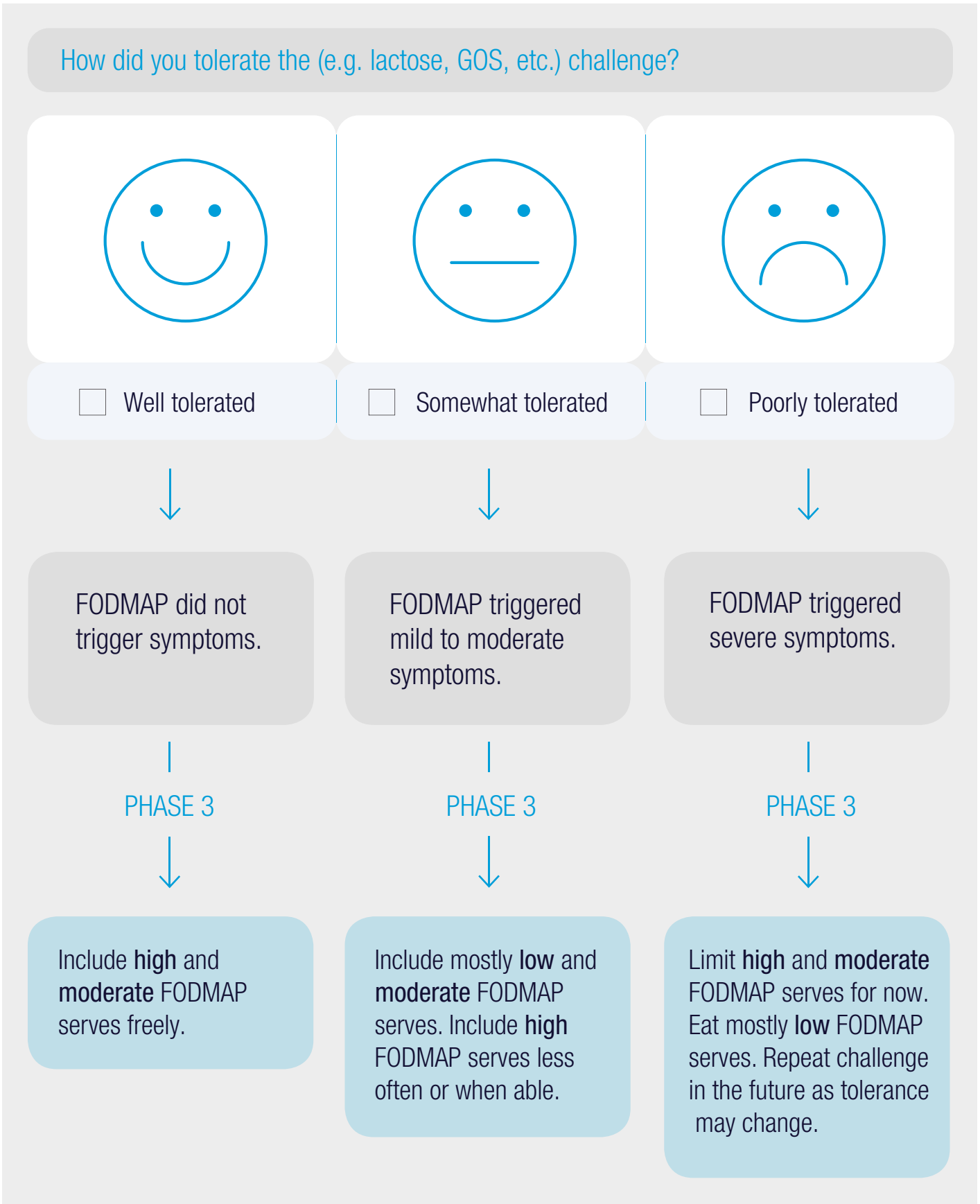

Figure 5: Interpreting challenge results in phase 3

5.2 Using filters in the Monash FODMAP App

When Filters on the Monash FODMAP App are enabled and set to 'well', 'somewhat' or 'poorly', the food guide adjusts to display a green or red traffic light next to serving sizes that the patient can and cannot tolerate. This feature is extremely useful in Phase 3 as it guides patient to the types and quantities of food that can be included in their personalised FODMAP diet, based on challenge results in Phase 2 and their personal FODMAP sensitivities.

5.3 Reminders for patients

- Some symptoms are normal
- Stress and anxiety can exacerbate symptoms
- Symptoms and food tolerance change over time
- FODMAPs are natural prebiotics
- A FODMAP diet should only be as strict as their symptoms require
- IBS symptoms may flare from time to time (see figure 6)

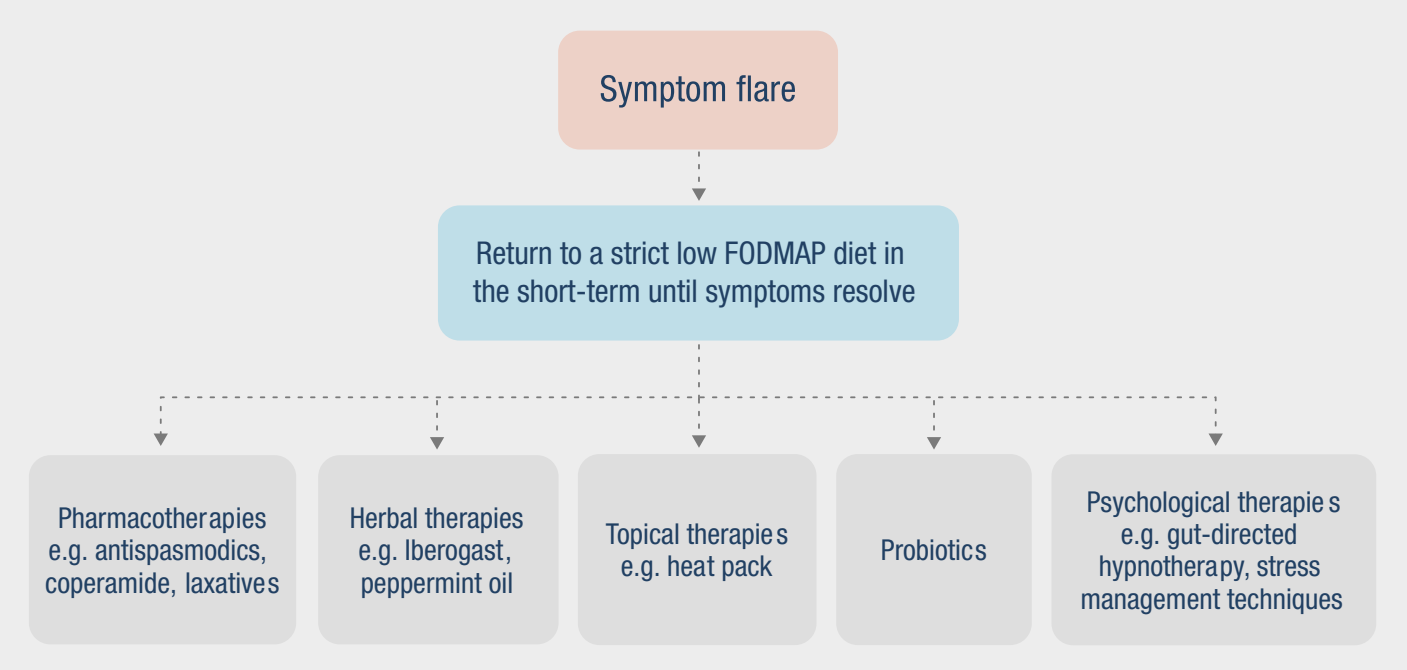

Figure 6: Strategies for managing a symptom flare

6 The diet long term

The low FODMAP diet is intended to be a short-term diet that helps patients identify the type and amount of FODMAPs they can tolerate.

Long term, a personalised diet with minimal FODMAP restriction should be followed to ensure nutritional adequacy.

Evidence suggests that long term, many patients can achieve adequate symptom control, by restricting only a small number of foods.

References

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9. Tuck CJ, Ly E, Bogatyrev A, Costetsou I, Gibson PR, Barrett JS, Muir JG (2017). Fermentable short chain carbohydrate (FODMAPs) content of common plantbased foods suitable for vegetarian- and vegan-based eating patterns. Journalof human nutrition an dietetics. Submitted.