

# Development of a Theory-based App to Promote Gut Health for Celiac Disease: MyHealthyGut

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## Background

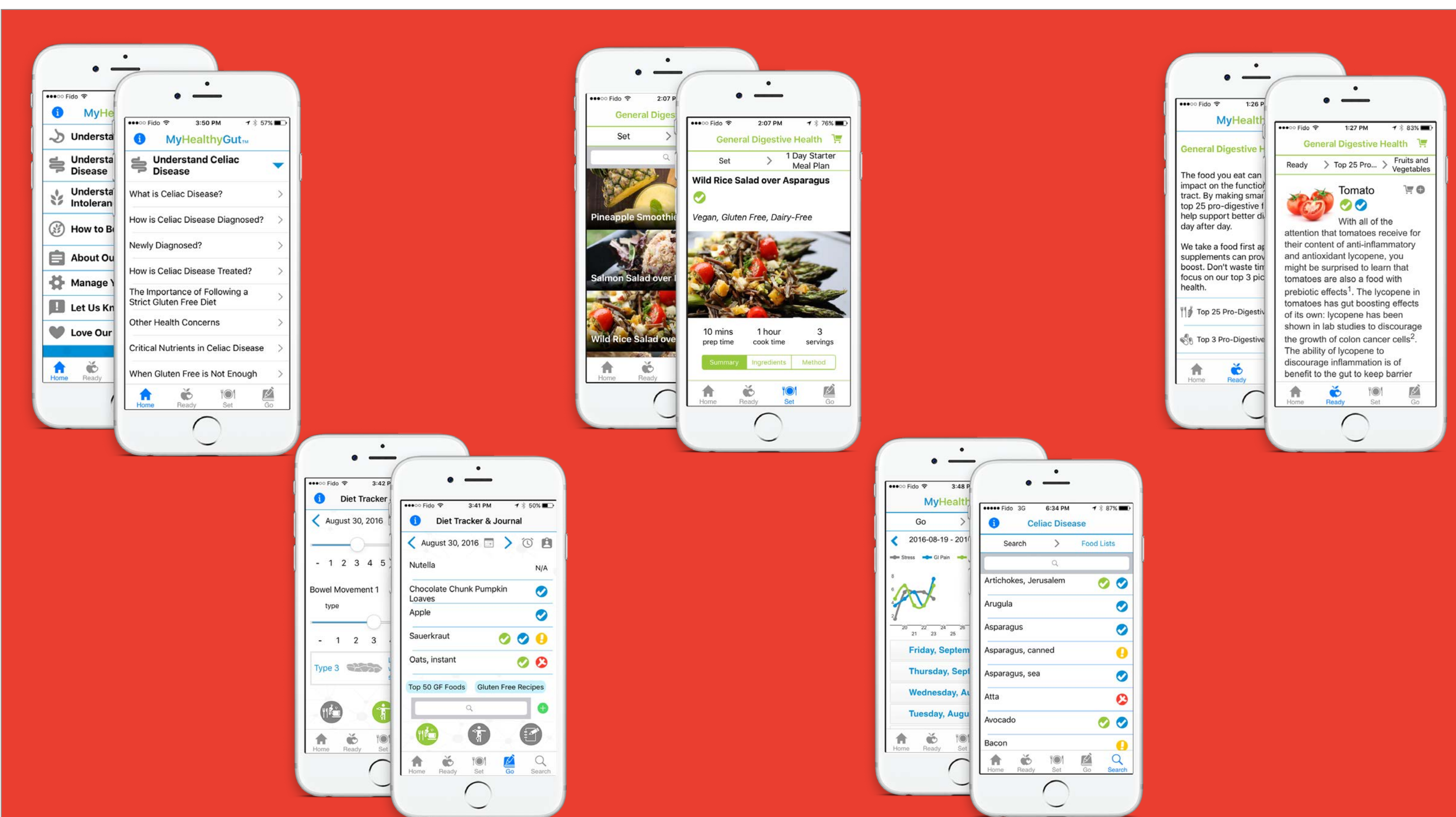
- Celiac disease is a chronic condition that can impact all aspects of an individual's life, and is prevalent in 1% of the North American population (Ludvigsson et al., 2013).
- Currently the only treatment is to follow a strict gluten-free diet in order to prevent symptoms as well as decrease the risk of long-term health consequences such as infertility, osteoporosis, and intestinal and bowel cancers (Green & Cellier, 2007).
- Drawing from the mobile health (mHealth) literature, the use of technology to self-monitor behaviours is gaining empirical evidence as an effective and efficient means to assist in self-monitoring dietary behaviours and disease symptoms (Burk et al., 2011; Cafaszzo et al., 2012).

## Purpose

- The overall goal of this study was to design and pilot test a smartphone app, MyHealthyGut, which was created to improve overall gut health and promote effective self-management of celiac disease.
  - The purpose of Part 1 was to gather feedback from end-users (adults with celiac disease) regarding the desired functions and content of an app for celiac disease.
  - The purpose of Part 2 was to pilot test the MyHealthyGut app with end-users and health care providers.

## Method

- Part 1** - 118 adults ( $M_{age} = 39.25$  yrs, 91.5% female, 95.8% Canadian) diagnosed with celiac disease completed an online questionnaire pertaining to self-regulation strategies, perceived need for a smartphone app to help manage celiac disease, desired functions and features in an app and tone of the health content of the app.
- Part 2** - 12 Calgary-based adults (86% female,  $M_{age} = 49.43$  yrs,  $SD = 8.28$  yrs) with celiac disease attended focus groups after beta testing the app for a 1-week period. 7 healthcare professionals provided online feedback about the app after using it for a 1-week period.
- Questions.** Questions focused on the functionality, ease of use, and content of the app, discussion of the feedback raised by prior focus groups and overall satisfaction with the app.



**Figure 1.** The final product after incorporating feedback from focus groups.

## Results - Part 1

- Over 90% of participants indicated a need for an app for celiac disease. The majority of participants used diet as the sole strategy to manage celiac disease (Table 1).
- Ease of use, available functions, nutritious GF recipes and cost were the top four most important perceived factors to 40-60% of participants for an app to manage celiac disease.
- Over 25% of participants also indicated it was important to have a list of the top 100 GF foods and evidence-based supplements, the ability to track symptoms and cooking tips.

**Table 1.** Current Celiac Disease Management Strategies & Perceived Need for an App (n = 118)

Strategies	Always (Daily)	Often (Weekly)	Sometimes (1-2x/mth)	Rarely (>1x/mth)	Never
Diet	113	2	1	1	0
Supplements	42	14	13	9	38
Physical Activity	28	42	14	16	15
Mind-Body Therapies	9	9	7	18	69
Medication	8	1	12	18	74
Other	4	0	0	3	78
	Yes	No			
Perceive need for app to assist in mgt of celiac disease?	107	11			

## Results – Part 2

- Focus group participants suggested revisions to the app pertaining to functionality and ease of use (e.g., clearly marked way-finding buttons, enhance onboarding), improving the symptom journaling feature, and app content (e.g., add information on irritable bowel syndrome).
- The majority of healthcare professionals reported positive perceptions of the app and reported similar revisions to content, functionality and ease of use.

**Table 2.** Summary of Findings from Online Questionnaire with End-Users (n = 12)

Question	Response	Further Information
How easy is the MyHealthyGut app to use?	$M = 3.60, SD = 0.91$	1 ( <i>extremely difficult</i> ) – 5 ( <i>extremely easy</i> )
How likely are you to use the MyHealthyGut App to help you manage your Celiac disease in the future?	$M = 2.46, SD = 1.12$	1 ( <i>very unlikely</i> ) – 5 ( <i>very likely</i> )
How satisfied are you with the following features? - Diet tracking - Symptom journaling - 7 day meal plan content - Meal planning - Cooking tips - Supplements - 100 recommended foods	$M = 3.07, SD = 1.27$ $M = 2.80, SD = 1.15$ $M = 3.07, SD = 1.22$ $M = 3.07, SD = 1.22$ $M = 3.00, SD = 1.41$ $M = 3.40, SD = 0.99$ $M = 3.40, SD = 1.30$	1 ( <i>very unsatisfied</i> ) – 5 ( <i>very satisfied</i> )
How much do you agree with the following statement? The MyHealthyGut App will improve my health.	$M = 4.00, SD = 0.92$	1 ( <i>strongly disagree</i> ) – 5 ( <i>strongly agree</i> )
What was your first reaction to the MyHealthyGut App?	$M = 1.20, SD = 0.94$	1 ( <i>very negative</i> ) – 5 ( <i>very positive</i> )
How would you rate the quality of the MyHealthyGut App overall?	$M = 3.33, SD = 1.23$	1 ( <i>very low quality</i> ) – 5 ( <i>very high quality</i> )
How well did the MyHealthyGut App meet your needs?	$M = 2.27, SD = 1.22$	1 ( <i>not at all well</i> ) – 5 ( <i>extremely well</i> )
How likely would you be to purchase the MyHealthyGut App?	$M = 2.73, SD = 1.28$	1 ( <i>very unlikely</i> ) – 5 ( <i>very likely</i> )
How likely are you to use the MyHealthyGut App to monitor your diet and/or track symptoms?	$M = 3.07, SD = 1.16$	1 ( <i>very unlikely</i> ) – 5 ( <i>very likely</i> )

**Table 3.** Healthcare Professional Feedback (n = 7)

Question	Response	Further information
What was your overall impression of the MyHealthyGut app?	Positive = 5 Negative = 2	
Does the nutrition information provided in the app fall in line with what you advise your patients?	Yes n = 5 No n = 2	1 HCP suggested too many high FODMAP foods 1 HCP said she was not well enough informed – the app provided more information
Is there evidence-based nutrition information that is missing in the app guidance?	Yes n = 1 No n = 6	1 HCP suggested recommending foods lower in FODMAPs
Would you recommend the app to another healthcare provider?	Yes n = 5 No n = 2	1 HCP said she was “still up in the air, depends on cost.” 1 HCP said she thought it would be better suited as a website
How easy is the MyHealthyGut app to use?	$M = 3.86$ ; $SD = 0.90$	2 HCPs reported low satisfaction due to difficulty navigating the app
How satisfied are you with the diet tracking feature in the MyHealthyGut app?	$M = 3.86$ ; $SD = 0.70$	
How satisfied are you with the symptom journaling feature in the MyHealthyGut app?	$M = 3.71$ ; $SD = 0.76$	
How satisfied are you with the meal plan content feature in the MyHealthyGut app?	$M = 3.14$ ; $SD = 1.36$	1 HCP reported low satisfaction due to some recipes high in FODMAPs
How satisfied are you with the educational information in the MyHealthyGut app?	$M = 3.86$ ; $SD = 1.46$	1 HCP reported low satisfaction due to too much content on the app, felt better suited for a website
How satisfied are you with the food recommendations feature in the MyHealthyGut app?	$M = 4.43$ ; $SD = 0.58$	
What are the top 3 things (e.g., functionality, content, usability) that need to be changed or modified and why?		Recipes – lower in FODMAPs, easier (n = 2) Content – more on gluten free cooking (n = 2) Bar code scanning (add functionality) (n = 1) Journaling – add ability to track exercise, dining out, timing of symptoms, sleep (n = 1) Improve navigation (n = 1) No changes (n = 1) Add more content & visuals (n = 1) Change from app to website due to too much content (n = 1)
What are the top 3 things (e.g., functionality, content, usability) that you liked about the app and why?		Good content (n = 5) Easy navigation (n = 5) Recipes (n = 2) Psychosocial content (n = 1) Symptom tracker (n = 1)
Note. Means are for scales on a scale of 1 (low) – 5 (high). FODMAPs = fermentable oligosaccharides, disaccharides, monosaccharides, and polyols.		

## Conclusion

- Health-related mobile applications make smartphones useful tools in providing point of care to the user.
- Participants reported a need for the MyHealthyGut app, listed desired content, features and functions and provided feedback to revise the content, features and functions of Version 1.0 of the MyHealthyGut app.
- MyHealthyGut is the first evidence-based app that may be helpful in empowering users to effectively self-manage celiac disease and promote general gut health.

## References & Acknowledgements

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