Original article

A dietitian-first gastroenterology clinic results in improved symptoms and quality of life in patients referred to a tertiary gastroenterology service

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SUMMARY

Background: The Dietitian First Gastroenterology Clinic (DFGC) is an initiative that has been established in response to increased gastroenterology clinical demand resulting in increased number of patients waiting outside clinically recommended timeframes for specialist care. In this clinic, a dietitian is the primary contact for eligible patients referred to tertiary gastroenterology services and provides assessment and management strategies for patients under the clinical governance of a gastroenterology consultant. This service has previously been shown to reduce patient wait-times and induce excellent patient satisfaction. Evaluation of models of care need to consider patient health outcomes as a key indicator for overall health service effectiveness. The aim of this study was to determine the impact of DFGC on patient related health outcomes.
Methods: This study utilised a pretest-posttest design of patients seen in the DFGC who met the diagnostic criteria for irritable bowel syndrome using the Rome IV criteria Consenting participants completed the validated symptom-severity (IBS-SSS) and health-related quality of life (IBSQoL) assessments. Paired sample t-tests were used to analyse differences pre- and post-management in the DFGC. Univariate mixed effects analyses were conducted to examine associations between IBS-SSS, IBSQoL and patient demographics.
Results: A total of 80 of 122 patients seen in the DFGC were recruited and completed baseline data, with 60 (75%) completing follow up assessments. The average participant age was 35.6 years (75% female), and IBS subtypes; IBS—C 15.0%, IBS—D 38.3%, IBS—M 26.7% and IBS—U 20.0%. Participants experienced significant reductions in symptom severity based on IBS-SSS (300.1 vs 151.7; $p < 0.001$) independent of IBS subtype, age or gender, with 88% (53/60) experiencing a clinically significant improvement. Quality of life significantly improved for all IBS subtypes ($p < 0.001$) across all subscales except food avoidance ($p = 0.11$). There was a moderate negative correlation between the changes in symptom severity and quality of life (R = 0.432, $p = 0.001$).
Conclusions: Management in the DFGC provided positive patient health outcomes demonstrated by improvements in symptom severity and QoL.

1. Introduction

High quality health care requires timely access to services with scarce resources [1—3]. In gastroenterology, the demand for medical specialist care has continued to rise, making it challenging to provide services within clinically recommended times [4]. We have

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previously described the establishment and activities of a dietitian-first gastroenterology clinic (DFGC) model of care [5], which was implemented in response to increasing referrals whilst also aiming to improve quality of the patient experience. In the DFGC dietitians work in an expanded scope of practice and are primary contacts for eligible patients with clinical governance from a consultant gastroenterologist. Patients triaged to the DFGC are aged 18—50 years, with no category 1 features such as weight loss ($\geq$5% of body weight in previous 6 months), iron deficiency in men and post-menopausal women, unexplained iron deficiency in premeno-pausal women, abnormal imaging, persistent abdominal pain, abdominal mass, gastrointestinal bleeding, nocturnal diarrhoea, persistent vomiting, dysphagia, history of polyps and/or personal or family history of Barrett's oesophagus, gastrointestinal cancers or inflammatory bowel disease, positive immunochemical faecal occult blood test (iFOBT) and positive calprotectin [6]. Redirecting patients from gastroenterology waitlists to the DFGC has resulted in reduced waitlists, improved patient flow, high patient satisfaction whilst building capacity for gastroenterologists to see more urgent and complex cases [5].

The DFGC provides a safe model of care where a gastroenterology consultant screens general practitioner (GP) communication, with a trained dietitian identifying further concerning features not previously highlighted on (GP) referral. Approximately 10% of patients seen were expedited for gastroenterology specialist review with some patients found to have significant pathology [5]. The service allowed for earlier diagnosis and management for these patients. A significant proportion of patients captured in the DFGC criteria have functional gut disorders such as irritable bowel syndrome (IBS). IBS is prevalent worldwide [7] with many patients referred to secondary or tertiary gastroenterology services for further investigations and specialist management [8,9]. Consensus amongst gastroenterologists however is that investigations such as colonoscopies and gastroscopies, should be limited in the absence of concerning features [10—13]. Most patients who receive dietetic care for IBS report satisfactory control of symptoms and improved quality of life (QoL) [14,15]. Dietary and lifestyle management is considered first line treatment for IBS and referrals to tertiary gastroenterology services for further investigations may not significantly improve QoL for patients [16].

IBS sufferers are high users of health care and may re-present to services having not achieved resolution of symptoms after previous consultations [17,18]. The economic and humanistic burden of illness is high in comparison to healthy controls [18—21], thus development of models of care that provide efficient, effective and timely care for patients is important [20,21].

There are limited robust studies that have examined the impact of allied health primary contact roles on patient-related health outcomes, with improved outcomes mostly inferred through earlier intervention [22,23]. Whilst positive process-related outcomes have been demonstrated for the DFGC there is increased recognition of the importance of assessing the patient perspective and patient health-related outcomes to assist clinicians in providing more patient-centred health care [24].

The aim of this study was to determine the impact of the DFGC on health outcomes assessed by self-reported symptom severity and quality of life (QoL) for patients who reached the diagnostic criteria for irritable bowel syndrome.

2. Methods

2.1. Study design

This study used a single group pretest-posttest design [25]. This design was the best option for evaluating health outcomes, as there was no equivalent control group available for comparison. The study was reviewed and approved by the Gold Coast Health Service (**HREC/18/QGC/56).**

2.2. Participants and setting

Participants were recruited over a four-month period from May to September 2018 at Gold Coast University Hospital. All patients triaged to DFGC from the gastroenterology waitlist based on standardised criteria [6], who had functional symptoms with no category 1 features and normal investigations were screened for eligibility. Patients were eligible for inclusion if they met the diagnostic criteria for Irritable Bowel Syndrome based on the ROME IV criteria (IBS) [13], were aged between 18 and 50 years and had sufficient English proficiency. Eligible participants provided informed consent.

2.3. Management strategies

The dietitian performed a role considered as advanced practice or expanded scope which included being the primary contact clinician for eligible patients, along with ordering and interpreting pathology tests and referrals to other professionals. Management strategies were based on current evidence and expert recommendations and included dietary modifications (e.g adequate fibre, fluids, fatty foods, caffeine, spicy foods alcohol intake, low fodmap) and other lifestyle changes (e.g exercise), referrals to other appropriate health service providers as required, and liaison with GPs in relation to outcomes including suggestions for appropriate medication changes and testing [12]. Participants found to have to have laboratory testing outside the reference ranges were referred to the GP for appropriate treatment, or if required, reviewed by the gastroenterologist.

2.4. Data collection

Participants completed two questionnaires at initial assessment and at a follow up appointment post intervention. Data was recorded into a pre-designed spreadsheet (Microsoft Excel 2016 edition; Microsoft Corp, Redmond, Washington, USA) along with participant demographics, time in management and adherence to clinician dietary and lifestyle recommendations based on clinician assessment. Participants were subtyped according to the Rome IV criteria into the 4 categories IBS-D (diarrhoea-predominant), IBS-C (constipation-predominant), IBS-M (mixed diarrhoea and constipation) and IBS-U (unsubtyped). All patients had laboratory tests ordered by the dietitian based on Queensland Health Guidelines to exclude category 1 features [6]unless these had already been conducted by the GP.

2.5. Measures

2.5.1. Symptom severity measures

Change in symptom severity pre- and post-intervention was the primary outcome and was measured using the IBS-SSS questionnaire. The total IBS-SSS scale ranged from 0—500, where 500 indicated most severe symptoms. Symptom severity was categorised as remission, less than 75; mild, 75—174; moderate, 175—299; and severe 300 or greater and a change of over 50 points was considered clinically significant [26]. The questionnaire also included supplementary questions which included time off work due to IBS and time at work suffering from IBS. Only respondents who were currently employed (full time, part time or self-employed) or were work interested answered these supplementary questions These were then expressed as the number of weeks

per year and as a percentage of the employed time with higher scores showing more productivity loss.

2.5.2. Quality of life measures

The secondary outcome was the change in quality of life which was measured using the IBSQOL, a 34 question IBS-specific questionnaire which assesses overall QoL via eight subscales (dysphoria, interference with activity, body image, health worry, food avoidance, social reaction, sexual reaction and other relationships). Each question was negatively framed and was measured on a 5-point Likert scale with the highest response indicating the worst quality of life. Scores for each question were reversed so that as IBSQOL scores increased, quality of life increased. Item scores were combined to obtain eight domain scores and overall score with a range of 34–170. All final raw scores were then transformed to a 100-point scale [27]. A decrease of 10 points or more before transformation was considered a clinically meaningful improvement [28].

2.5.3. Sample size

The study was powered to detect a clinically significant reduction in symptom severity of 50 points on the IBS symptom severity scale [26]. Based on a pilot study, at least 60 participants, were required assuming a SD of the difference of 105.1, using a 2-tailed, paired t-test, with 95% power and $\alpha = 0.05$. Recruitment continued until 80 participants had been enrolled to account for potential drop outs.

2.5.4. Data analysis

Prior to analysis, a data entry accuracy check of 10% against source data was conducted by a second investigator. Data was checked for normality prior to analysis using histograms. Change from baseline in symptom severity, quality of life (including individual subscales) and BMI were assessed using paired t-tests. Pearson's correlation coefficient was used to test the relationship between primary and secondary outcomes post treatment. A series of univariate analyses was used to examine associations between change in symptom severity and quality of life with other patient characteristics including gender (independent samples t-test) and IBS type (one-way ANOVA). All statistical analyses were conducted using IBM SPSS Statistics for windows version 24(IBM Corp., Armonk, N.Y., USA), with level of significance set at $p < 0.05$.

3. Results

During the four-month study period, 122 patients were seen in DFGC and of these 83 (68%) met the diagnostic criteria for IBS. Thirty − five (29%) patients did not meet the Rome IV IBS criteria. Seventeen were managed for reflux in the DFGC and eight met the diagnostic criteria for functional diarrhoea or functional constipation with no other concerning features. Ten participants were found to be outside the above mentioned diagnostic criteria or had abnormal laboratory tests after initial assessment in DFGC. These participants were then seen in the gastroenterology clinic and diagnosed with coeliac disease, inflammatory disease, fatty liver or were still undergoing further investigations. The remaining 4 (3%) patients had insufficient English proficiency for inclusion in the study.

A retention rate of 75% was achieved, with final data collection made for 60 of 80 enrolled participants (Fig. 1). Most participants enrolled in the study were women (75%) with mean age of 35.6 years. Participants were categorised into IBS types with IBS-D the
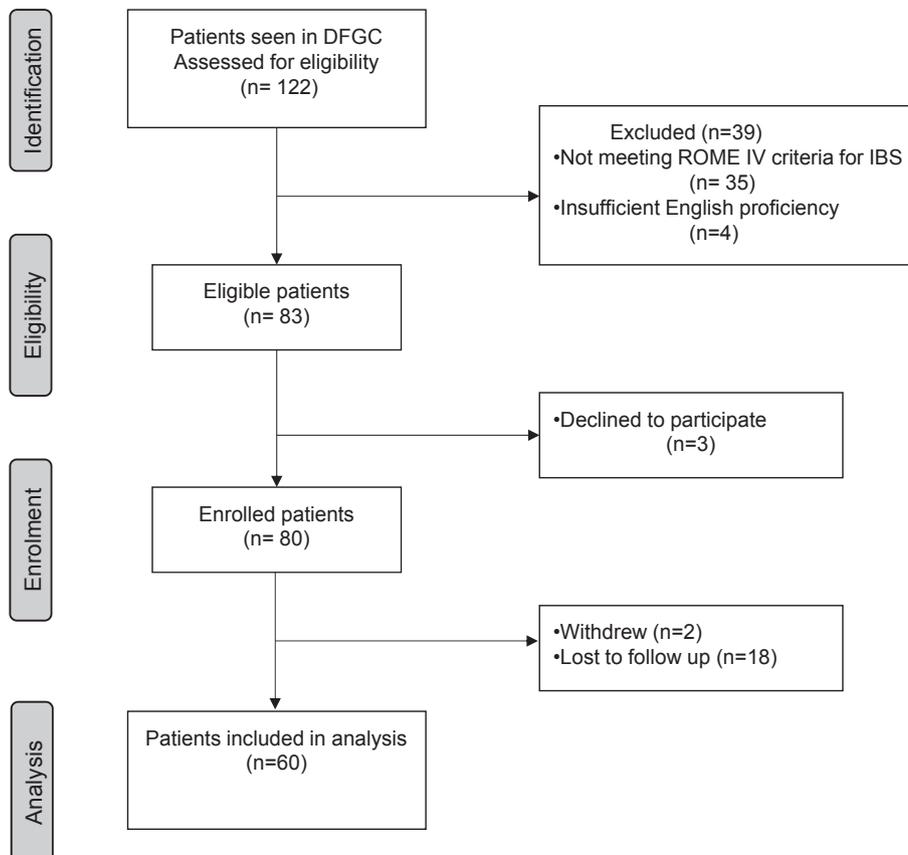

Fig. 1. Flow chart of study selection and analysis.

most common, representing around 40% (23/60) of presentations (Table 1). The participant characteristics at baseline are described in Table 1.

The average time between initial and follow up appointment was 71 days (range 34—148), reflecting the pragmatic realities of clinic appointment and patient availability, rather than time to treat. Participants who completed questions about work productivity reported 7.9% (average 4.1 weeks off work/year) work absenteeism and 72.9% of the time (37.9 weeks) where they were at work with IBS symptoms.

Participants displayed a significant reduction in symptom severity after management in the DFGC ($p < 0.001$) (Fig. 2a). This result did not differ with age ($p = 0.736$) or gender ($p = 0.535$). Further, this improvement was observed for all four IBS types (Table 2), with no significant difference in response between these ($p = 0.894$). All participants recorded an improvement in symptom severity on discharge, with this change reaching clinical significance (over 50 points) in 88% (53/60) of participants. On presentation, the vast majority of participants (95%, 57/60) were experiencing moderate to severe symptoms. On follow up, less than 40% (23/60) remained in these categories, and one third of participants (20/60) were in clinical remission (Fig. 2b).

Participants reported a significant increase in QoL after management in the DFGC ($p < 0.001$), from an average of 59.5 on presentation to 73.5 on follow up out of a possible converted score of 100. Significant increases were recorded for all subscales ($p < 0.01$), except for food avoidance, where the increase was small and not statistically significant ($p = 0.11$) (Fig. 3). Eighty five percent of participants had an improvement in QoL with 63% (38/60) patients having clinically meaningful improvement. Average quality of life at baseline and post management did not differ between IBS types

Table 1
Participant demographics on study enrolment, reported as means ± SD (range) unless otherwise specified.

Characteristic	Participants
Number, n (%)	60 (100)
Age, years (range)	35.6 ± 8.1 (21—49)
Female, n (%)	45 (75)
Men, n (%)	15 (25)
Smoking status	
Current smokers, n (%)	4 (6.6)
Ex-smokers, n (%)	10 (16.4)
Non-smokers, n (%)	47 (77)
Weight, kg	73.6 ± 18.0 (45—116)
BMI, kg/m2	26.4 ± 5.9 (17—40)
Underweight, <18.5, n (%)	3 (5.0)
Healthy weight, 18.5—24.99, n (%)	29 (48.3)
Overweight, 25—29.99, n (%)	13 (21.7)
Obese, >30, n (%)	15 (25.0)
IBS subtype	
IBS-C, n (%)	9 (15)
IBS-D, n (%)	23 (38.3)
IBS-M, n (%)	16 (26.7)
IBS-U, n (%)	12 (20)
Workforce productivity[a]	
Work absence due to IBS, weeks n = 49	0 IQR 0—2 (0—52)
	Mean = 4.09
	7.9 ± 21.6[c]
Work attendance suffering IBS, weeks n = 46[b]	52 IQR 27.5—52 (0—52)
	Mean = 37.91
	72.9 ± 36.06[c]

[a] Analysis for data provided by employed/work-interested participants only. Median, mean and IQR (range) shown.
[b] The reduced number for work attendance while suffering IBS is due to exclusion of two participants who were unable to hold any employment due to IBS, and missing data for one participant.
[c] Scores are expressed as percentages, with higher scores indicating more productivity loss.

Table 2
Change in primary and secondary outcomes with management in the DFGC, reported as means ± SD.

| Measure	Pre	Post	P value
IBSSSS			
Total	300.1 ± 79.7	150.1 ± 109.2	P < 0.001
IBS-C	336.7 ± 73.2	177.4 ± 134.9	P = 0.003
IBS-D	302.7 ± 90.8	141.4 ± 107	P = 0.008
IBS-M	323.4 ± 65.2	177.1 ± 117.1	P < 0.001
IBS-U	241.3 ± 47.2	110.3 ± 74.2	P < 0.001
IBSQOL			
Total	59.5 ± 22.4	73.5 ± 20.4	P < 0.001
IBS-C	58.6 ± 25.5	76.5 ± 21.7	P = 0.021
IBS-D	59.2 ± 21.4	69.9 ± 20.9	P < 0.001
IBS-M	54.2 ± 20.9	70.3 ± 21.7	P < 0.001
IBS-U	67.8 ± 24.2	82.4 ± 15.3	P = 0.015
BMI, kg/m2			
Total	26.37 ± 5.9	26.19 ± 5.8	P < 0.001

($p = 0.48$ and $p = 0.31$ respectively). All IBS types recorded improvements in quality of life, with no difference between these groups (P = 0.54). There was a moderate negative correlation between the changes in symptom severity and quality of life (R = 0.432, $p = 0.001$) with those participants experiencing the greatest reduction in symptom severity showing the highest improvement in quality of life.

Most participants (83%; 50/60) were assessed as adhering or partially adhering to the dietary and lifestyle recommendations provided. There was a small but statistically significant reduction in BMI with management in the DFGC ($p < 0.001$). The average BMI of participants reduced from 26.4 kg/m2 to 26.2 kg/m2, corresponding to an 0.5 kg average weight loss per person (73.6—73.1 kg).

4. Discussion

Increased demand for gastroenterology medical resources has resulted in a greater need for novel, efficient and effective models of care that help meet patient needs. We have previously demonstrated that the DFGC model of care has process effectiveness, reducing gastroenterology waitlists and patient wait times, while simultaneously providing high patient satisfaction levels [5]. In the current study, we demonstrate that the DFGC provides positive patient-related health outcomes.

The patients assessed in this study showed both statistically and clinically significant improvements in symptom severity and overall quality of life after management in the DFGC. This study examined patients who met diagnostic criteria for IBS accounting for 70% of patients seen in the DFGC. The average symptom severity scores of patients halved with management. Previous estimates of IBS prevalence within each clinically meaningful sub group have been put at ~40% mild, ~35% moderate, ~25% severe [29]. These proportions contrast with the IBS population seen in DFGC, where at baseline majority of patients reported moderate to severe symptoms, and over 50% of the patients falling into the severe category. This difference may be due to differences in medical assistance seeking by patients experiencing the worst symptoms, and subsequent referral rates to secondary or tertiary care. After management in the DFGC, there was an overall shift in symptom severity, with half of patients reporting mild symptoms or being in clinical remission. Less than 10% of patients continued to report severe symptoms. Prior to establishment of this service, eligible patients in our region had lengthy wait times for specialist medical care (~280 days) [5].We have now demonstrated that a DFGC can provide positive patient health outcomes with much shorter wait times than a traditional, medical specialist-first model of care. It is widely accepted that earlier and clear diagnosis helps reduce
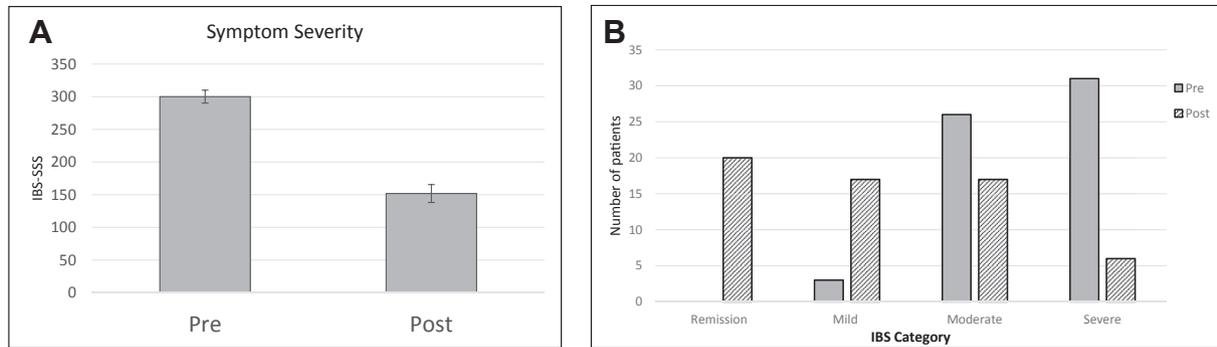
Fig. 2. Change in symptom severity with management in the DFGC. A) Mean IBSSSS score for all participants before and after management, error bars show 95% confidence intervals. B) Change in clinical categorization of IBS severity of participants with management.
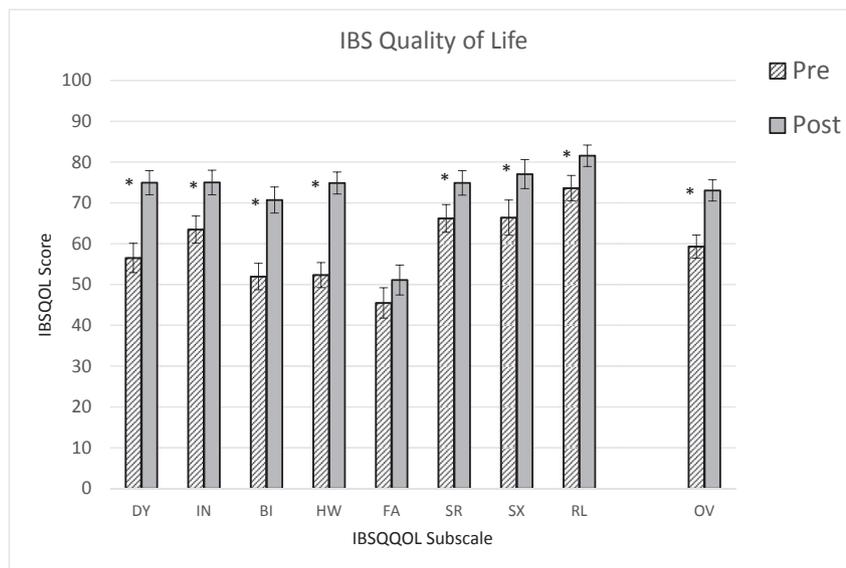
Fig. 3. Change in quality of life with management in the DFGC, as assessed with the IBSQOL. The eight subscales are DY, dysphoria; IN, interference with activity; BI, body image; HW, health worry; FA, food avoidance; SR, social reaction; SX, sexual reaction, RL, other relationships. OV represents the overall IBSQOL score. Error bars show 95% CI for difference between pre-post scores for each subscale and overall scores. * Indicates each subscale that reached statistical significance pre- and post-management in the DFGC p < 0.01.

patient frustrations. This may reduce health care utilisation and futile investigations allowing patients to engage in management strategies that provide adequate symptom relief earlier [30]. The risk of not diagnosing a different or more severe disease in this model has been thoroughly considered and mitigated by the establishment of strong clinical governance frameworks. All referrals are screened by a consultant gastroenterologist for concerning features. In the DFGC dietitians work in an extended scope of practice role having undergone training to order laboratory tests and identify any category 1 features not initially highlighted on the GP communication. The dietitians continue to work under the clinical governance and ongoing supervision by a consultant gastroenterologist.

The high symptom burden previously reported in studies [31] was reflected in our results, with patients reporting low quality of life on initial presentation. After management in the DFGC, participants showed significantly improved quality of life across all domains of the IBSQOL except for the food avoidance domain. QoL in this domain did not differ pre- and post-management, even though the dietary recommendations that are generally considered effective for IBS management can be restrictive, and require patients to make significant changes to their usual dietary patterns

[32,33]. It is possible that patients were already avoiding some foods to manage their symptoms and receiving advice on how to do this more effectively did not negatively impact their experiences. IBS may increase a patient's indirect health costs because of missed work or reduced productivity associated with attending work whilst being unwell. The current study replicates the high rates of absenteeism, and work attendance whilst suffering shown elsewhere for IBS populations [34].

Initial management of IBS focuses on lifestyle and dietary habits as symptom management strategies. A small proportion of patients were assessed as not being adherent to the recommendations made by the clinician. Despite this, these patients still reported improvement in symptom severity and quality of life after being seen in the DFGC. This indicates the complexities and multifactorial nature of IBS management. It is possible that for some patients, having a clear diagnosis along with education on causes, natural history and different treatment strategies for IBS, in conjunction with reassurance that more sinister pathology had been ruled out by gastroenterologist screening and dietitian assessment, was sufficient to realise the positive shifts in symptom severity and QoL demonstrated in this study. Other factors that may contribute to positive health outcomes in this population include clinician

understanding of patient goals, active listening, empathy and validation of symptoms, whilst setting realistic expectations [35,36], and these may also have played a role in the outcomes seen with management in our DFGC.

Participants in this study were predominantly female in line with usual gender ratios for IBS sufferers [37]. At baseline, on average participants were above the healthy weight range which is consistent with previous observations in IBS cohorts [38], as well as the average BMI of Australians in this age group [39], There was a small but statistically significant reduction in BMI after DFGC management which highlights another potentially positive health effect that lifestyle, particularly dietary strategies, might have for this patient group.

This study has demonstrated that patients seen in a DFGC clinic have positive health outcomes, however study findings should be interpreted in light of its limitations. In this study, only patients diagnosed with IBS were included and their health outcomes assessed. This patient group was selected as they comprise a significant proportion of patients seen in DFGC (~70%), and validated tools are available to assess both symptom severity and quality of life in this population. The lack of sensitive tools to assess health outcomes of a broader range of gastroenterology patients [40] restricted our ability to report on the health outcomes of other patients. Although this study had a high retention rate, it is possible that participants lost to follow up may have experienced less positive health outcomes. Alternatively, it is also possible that those individuals found attendance at a follow up appointment to be unnecessary, having received sufficient support at their initial consultation in the DFGC.

Another limitation of the study is that there was no control group. It is therefore possible that the improvements seen pre- and post-management in the DFGC could have been due a high placebo effect. Kaptchuk et al. demonstrated that contextual benefits (placebo effects) which included improvement in QoL and symptom severity could be realised by patients in response to observation and assessment, administration of a therapeutic ritual, positive patient—practitioner interaction with progressive improvement when these components were incrementally combined [41]. These components are incorporated as part of management in the DFGC which might explain positive outcomes demonstrated regardless of whether patients did or did not adhere to guidance provided. The placebo response in IBS clinical trials are highly variable (16—71.4%) however lower placebo effects have been demonstrated when Rome IV criteria is fulfilled as part of the study entry criteria [42] as was the case in this study.

Comprehensive evaluation of new models of care requires examination from all stakeholder perspectives (patient, clinician and health care provider) [43]. This study has demonstrated the effectiveness of a DFGC in patient management, examining short term patient-related outcomes including symptom severity and QoL. Future work should examine whether these health improvements are sustained over a longer time as well as in different population groups. A survey of re-presentation or re-referral rates for patients who have received management in a DFGC may provide further insight into the longer-term effectiveness of this model of care. Limited studies have examined the cost effectiveness of allied health-first models of care in comparison to traditional medical models of care. A robust economic evaluation of the DFGC would be invaluable in providing a more holistic view of the true impact and effectiveness of this model of care.

5. Conclusion

Patients with symptoms of IBS that are referred to specialist gastroenterology service experience significant symptom burden with impaired health related quality of life. Management of these patients in a dietitian first gastroenterology model of care results significant improvement in patient symptoms and quality of life. This further supports extended scope of practice dietetic models of care in gastroenterology that have been shown to reduce wait lists and wait times and now have demonstrated positive patient health outcomes.

Statement of Authorship

RC, RM, LB, RA devised the project devised the project, the main conceptual ideas and proof outline. RM and VL reviewed literature. VL recruited participants and collected data. RA, VL and RM analysed and interpreted the data, and drafted the manuscript. All authors read and approved the final manuscript.

Conflict of interest

None declared.

Patient consent

Consent was obtained from all study participants.

Ethics approval

Gold Coast Hospital and Health Service Ethics Committee (reference: (**HREC/18/QGC/56).**

Data sharing statement

Due to our institutional restrictions, there are no data that can be shared. However, further information can be obtained from the corresponding author.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.clnesp.2019.05.016.

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