


## ORIGINAL ARTICLE

# Delivering inflammatory bowel disease care across distance

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**Key words**

telehealth, telemedicine, inflammatory bowel disease.

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**Abstract**

**Background:** Inflammatory bowel disease (IBD) patients living in regional or remote Queensland are often disadvantaged by limited access to IBD specialist care. Telehealth clinics could potentially address this disparity and improve patient outcomes.

**Aim:** We report the impact of the Royal Brisbane and Women's Hospital (RBWH) IBD telehealth clinics from March 2011 to December 2017, including patient satisfaction and healthcare activity.

**Methods:** Patient satisfaction surveys were collected prospectively between March 2011 and March 2012. Healthcare activity was assessed through occasions of service (OOS), number of enrolled patients on biologics and IBD related admissions to RBWH.

**Results:** Overall, 3764 OOS were completed including 576 new patient and 3188 follow-up visits. Mean age at first telehealth visit was 44 years (range: 16–87 years). The IBD telehealth clinics were well accepted with 99% of the first 153 patients surveyed choosing to continue with telehealth and 94% rated the telehealth experience as very good or excellent. The net number of patients under active review increased from 125 patients in 2011 to 345 patients in 2017. Enrolled patients on biologics also increased from 9 patients in 2011 to 63 patients in 2017. There was an initial dip in annual IBD related admissions to RBWH in 2011 but these have progressively increased over time although the average length of inpatient stay annually has remained stable.

**Conclusion:** The RBWH IBD telehealth clinics have shown that telemedicine is well received and can be used successfully to deliver IBD specialist care to patients living in regional or remote areas.

**Introduction**

Australia has one of the highest prevalence and incidence rates of inflammatory bowel disease (IBD) in the world.<sup>1</sup> Approximately 1 in 250 people aged 5–49 years are affected by IBD nationally.<sup>2</sup> The national total IBD related hospital costs are estimated to be in the order of \$100 million *per annum*. In 2012, the productivity losses attributable to IBD as well as financial and economic costs associated with the management of IBD were estimated at over \$380 million and \$2.7 billion respectively.<sup>2</sup>

In Queensland, it is estimated that 18% of IBD patients live in outer regional or remote areas.<sup>2</sup> However, IBD services are concentrated in the metropolitan South East corner together with multiple small regional centres, leaving vast areas with no local specialist

gastroenterology/IBD care. As a result, IBD patients in outer regional or remote areas often have to travel long distances for specialist appointments or are receiving short term management of their IBD which is often inconsistent and inadequate.

Telemedicine has been used in the management of a number of chronic diseases such as asthma, diabetes, hypertension and heart failure.<sup>3</sup> Current roles of telemedicine include teleconsultation/telehealth (remote delivery of care), telemonitoring (tracking patient symptoms using wearable and mobile devices) and teleeducation (augmenting patient and provider education using technology platforms).<sup>4</sup> Randomised trials on the use of telemonitoring in IBD patients were promising.<sup>5–7</sup> Additionally, telehealth visits offer a low cost and convenient alternative to face-to-face clinic appointments for IBD patients without compromising quality of care.<sup>8</sup>

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Conflict of interest: None.

The Royal Brisbane and Women's Hospital (RBWH) is a tertiary hospital in Brisbane, Australia with an established gastroenterology unit. It has provided a fly in/fly out gastroenterology service that includes a monthly specialist IBD clinic to Bundaberg (360 km from RBWH, approximately 4.5 h by car or 55 min by air) since 2001. However, IBD patients living in Central Queensland generally have to travel to Brisbane to attend specialist IBD clinics. Therefore, there was still a significant gap in IBD specialist care in Wide Bay and Central Queensland. The RBWH IBD telehealth programme commenced in March 2011 in an attempt to address this issue. We report the impact of the RBWH IBD telehealth clinics from March 2011 to December 2017 including patient satisfaction and healthcare activity.

## Methods

### Telehealth model

The RBWH IBD telehealth clinics consist of one IBD telehealth clinic per week each for Bundaberg and Rockhampton (613 km from RBWH, approximately 7 h by car or 65 min by air). They are funded by the State Government. Our telehealth model was conceived based on the hub and spoke model<sup>9</sup> with the central hub being the IBD multidisciplinary team at RBWH and satellite teams at Bundaberg Base Hospital to cover Wide Bay and Rockhampton Base Hospital to cover Central Queensland respectively (Fig. 1). The satellite teams are manned locally on a part time basis by a dedicated IBD telehealth nurse and an administration officer. Equipment needed for telehealth including hardware, software, connectivity and technical support is available at RBWH and both satellite sites, supplied by Queensland Health (the funder of public hospitals in Queensland). IBD patients have access to local physicians and general surgeons at their respective base hospitals along with both public and private pathology and radiology services. Some patients might still have to travel significant distances to reach the respective base hospital. Patients who live a significant distance from each satellite site (defined on a case by case basis and generally regarded as any land journey longer than 2 h) would have a telehealth consultation using their local health care or general practitioner facility with a three-way link. Prior to each telehealth visit, patients were given a reminder in the form of a letter or a phone call. The telehealth visits occur in dedicated outpatient rooms for telemedicine and are attended by a Gastroenterologist (the RBWH IBD Telehealth Fellow or Consultant), the RBWH IBD telehealth nurse, the Bundaberg or Rockhampton IBD

nurse and the patient. There are opportunities for cases to be discussed at our weekly IBD clinical meeting at RBWH. IBD patients are brought down to RBWH as elective admissions if they are complex, need surgical consultation and/or intensive therapy. Patients new to the telehealth clinics between March 2011 and March 2012 were invited to fill out a patient satisfaction telehealth survey (Supporting Information Appendix S1) at the end of their telehealth appointments.

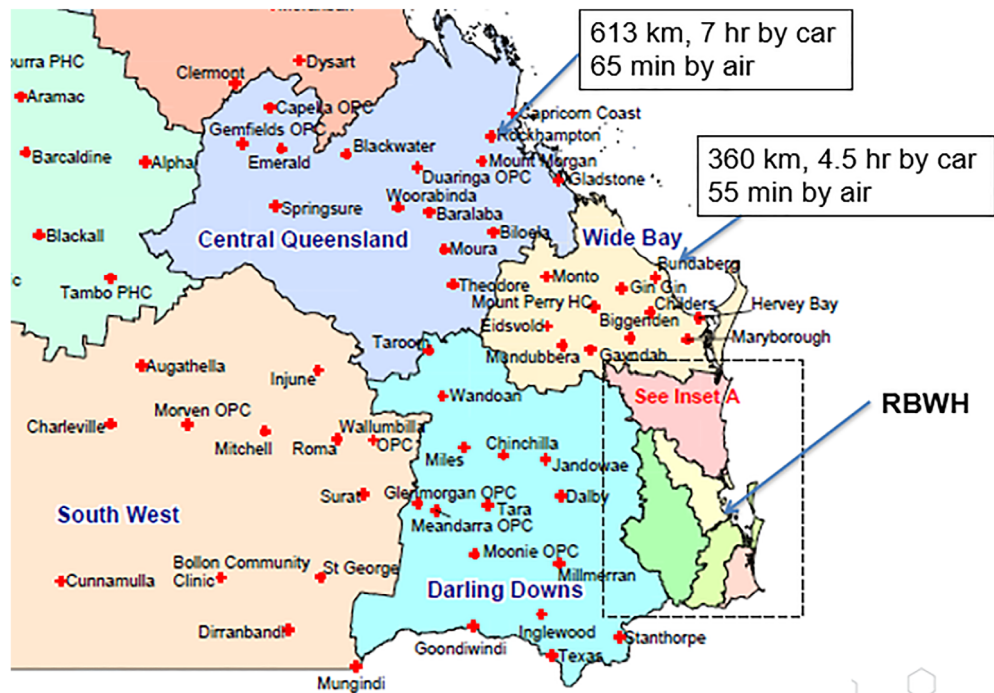
### Data collection and analysis

This is a descriptive study with prospective and retrospective data collection on patients who have attended the RBWH IBD telehealth clinics via Bundaberg and Rockhampton Base Hospitals from March 2011 to December 2017. Ethics approval for this research was obtained through the RBWH ethics committee. Patient satisfaction surveys were collected prospectively from patients new to the telehealth clinics between March 2011 and March 2012. Patient characteristics including age, gender, diagnosis and biologic use were recorded. A review was made of the RBWH IBD telehealth clinic activity registry data from March 2011 to December 2017 to document occasions of service (OOS). Discharges from RBWH involving patients with postcodes corresponding to Wide Bay or Central Queensland with documented International Classification of Disease Tenth Revision (ICD 10) codes corresponding to Crohn disease (K50.x) or ulcerative colitis (K51.x) for the period between 1 January 2009 and 31 December 2017 were reviewed to determine the annual number of IBD related hospital admissions and length of hospital stay. Admissions were classified as either planned or unplanned. Admissions to RBWH with length of stay of 1 day or less were excluded. Outcomes of interest were analysed using simple descriptive statistics.

## Results

### Patients attending RBWH IBD telehealth clinics

Overall, 576 patients attended the RBWH IBD telehealth clinics from March 2011 to December 2017. Three hundred and fourteen (55%) patients were female. Mean age at first telehealth visit was 44 years (range: 16–87 years). The most common IBD diagnosis was ulcerative colitis ( $n = 274$ ; 48%), followed by Crohn disease ( $n = 197$ ; 34%), indeterminate colitis ( $n = 24$ ; 4%), microscopic colitis ( $n = 9$ ; 1.5%), Behcet disease ( $n = 2$ ; 0.3%) and eosinophilic colitis ( $n = 1$ ; 0.2%). Sixty-nine (12%) patients were referred with a history of or a suspected



**Figure 1** Map of the Royal Brisbane and Women's Hospital (RBWH) catchment area and telehealth sites in Rockhampton and Bundaberg.

**Table 1** Enrolled Royal Brisbane and Women's Hospital inflammatory bowel disease (IBD) telehealth patients on a biologic for IBD by year

	2011	2012	2013	2014	2015	2016	2017
Infliximab	7	9 <sup>†</sup>	10	14	24 <sup>‡</sup>	33 <sup>§</sup>	36 <sup>¶</sup>
Adalimumab	2	5 <sup>†</sup>	5	11	11 <sup>‡</sup>	12	17 <sup>¶</sup>
Vedolizumab	0	0	0	0	1	8 <sup>§</sup>	11
Patients on a biologic (total)	9	13	15	25	35	50	63

<sup>†</sup>One patient switched from infliximab to adalimumab in 2012.

<sup>‡</sup>One patient switched from adalimumab to infliximab in 2015.

<sup>§</sup>Three patients switched from infliximab to vedolizumab in 2016.

<sup>¶</sup>One patient switched from infliximab to adalimumab in 2017.

diagnosis of IBD but were found not to have IBD. Overall, 83 (14%) enrolled patients were on a biologic to treat IBD while under the care of the RBWH IBD telehealth clinics. The number of enrolled patients on biologics increased from 9 patients in 2011 to 63 patients in 2017 (Table 1).

### Occasions of service

There were 3764 completed OOS over this period including 576 new patient and 3188 follow-up appointments. The majority of new patients to the RBWH IBD telehealth clinics in 2011 were transitioned from existing face-to-face IBD clinics at RBWH and Bundaberg Base Hospital respectively. In subsequent years, patients transitioned to the telehealth clinics from these face-to-face

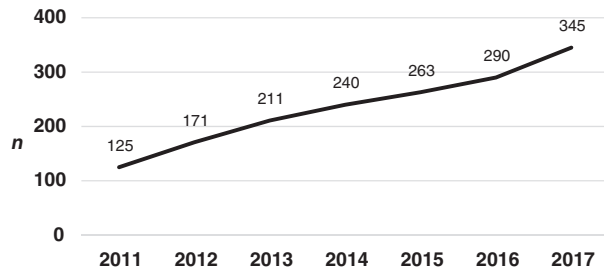
clinics have reduced while new referrals including patients discharged from RBWH with IBD related admissions have increased (Table 2). Over time, the number of patients under active review by the RBWH IBD telehealth clinics increased from 125 patients in 2011 to 345 patients in 2017 (Fig. 2). Correspondingly, the number of OOS has doubled from 351 in 2011 to 702 in 2017. This was mainly driven by the nearly threefold increase in follow-up appointments from 214 in 2011 to 621 in 2017 (Fig. 3).

### Patient satisfaction and uptake of the RBWH IBD telehealth clinics

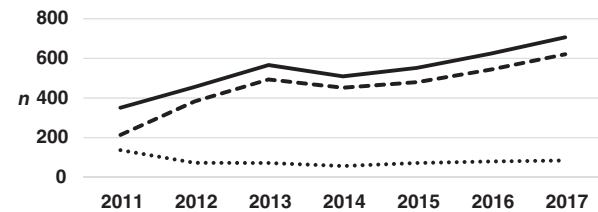
A total of 153 patients new to the RBWH IBD telehealth clinics completed the patient satisfaction survey between

**Table 2** Referral source of new patients to the Royal Brisbane and Women’s Hospital (RBWH) inflammatory bowel disease (IBD) telehealth clinic by year

	2011	2012	2013	2014	2015	2016	2017
New referral	40	47	36	29	43	54	56
New post RBWH discharge	0	1	6	8	9	13	16
Transitioned	97	25	30	20	20	13	13
From RBWH IBD clinic	34	12	7	10	16	12	7
From Bundaberg IBD clinic	63	13	23	10	4	1	6
Total new patients to telehealth	137	73	72	57	72	80	85



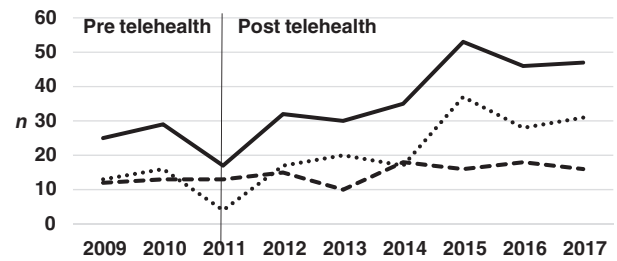
**Figure 2** Patients under active review by the Royal Brisbane and Women’s Hospital inflammatory bowel disease telehealth clinics by year.



**Figure 3** Total occasions of service, new patient visits and follow-up visits by year. (.....), New patient visits; (----), follow-up visits; (—), total occasions of service.

March 2011 and March 2012. The response rate was 95%. Ninety-nine percent of patients surveyed chose to continue with telehealth. Ninety-four percent rated the telehealth experience as very good or excellent. Eighty-five percent indicated that they would have to travel to another town for their IBD appointment if the telehealth clinics were unavailable. Of these, 60% would have to stay overnight.

Two hundred and thirty-one patients were discharged from the RBWH IBD telehealth clinics over this period. The most common reason for discharge was patients moving away from Wide Bay and Central Queensland ( $n = 71$ ; 31%) followed by lost to follow up ( $n = 70$ ; 30%), having a non IBD diagnosis ( $n = 61$ ; 26%), for local physician follow up ( $n = 15$ ; 7%) and death ( $n = 8$ ; 3%). 6 patients (3%) returned to face-to-face IBD clinic review.



**Figure 4** Total, planned and unplanned inflammatory bowel disease related admissions to Royal Brisbane and Women’s Hospital for patients living in Wide Bay and Central Queensland by year. (—), Total admissions; (----), planned admissions; (...), unplanned admissions.

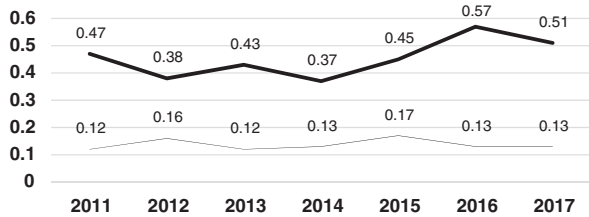
### IBD related admissions to RBWH and length of inpatient stay

Annual IBD related admissions to RBWH for patients living in Wide Bay and Central Queensland fell initially in 2011 with the inception of the RBWH IBD telehealth clinics but exceeded pre-telehealth totals in 2012 and have progressively increased with time. Figure 4 shows that annual IBD related admissions to RBWH was mainly driven by the number of unplanned admissions per year even though the number of planned admissions per year has also increased slightly with time. The annual total length of inpatient stay fell initially in 2011 but exceeded pre-telehealth totals in 2012 and have progressively increased with time (Table 3). However, the annual average length of inpatient stay has remained stable between 7–10 days pre and post telehealth clinic inception with the exception of 2013.

The progressive increase in RBWH telehealth clinic activity has been accompanied by a corresponding increase in IBD related admissions to RBWH for patients living in Wide Bay and Central Queensland. This was evidenced by a stable ratio between annual IBD related RBWH admissions and the annual number of enrolled RBWH IBD telehealth patients (Fig. 5). However, this observation could not be attributed to the presence of the RBWH IBD telehealth clinics alone as only 37–57%

**Table 3** Inflammatory bowel disease (IBD) related admissions to Royal Brisbane and Women's Hospital, total and average lengths of inpatient stay for patients living in Wide Bay and Central Queensland by year

	Pre telehealth			Post telehealth						
	2009	2010	2011	2012	2013	2014	2015	2016	2017	
IBD-related admissions (n)	25	29	17	32	30	35	53	46	47	
Total length of stay (days)	250	226	168	302	392	287	400	305	413	
Average length of stay (days)	10	8	10	9	13	8	8	7	9	

**Figure 5** Annual proportion of inflammatory bowel disease (IBD) admissions known to the Royal Brisbane and Women's Hospital (RBWH) telehealth clinics and annual ratio of IBD admissions to number of enrolled RBWH IBD telehealth patients. (.....), Annual proportion of IBD admissions known to RBWH IBD telehealth; (—), Annual ratio of IBD admissions to RBWH IBD telehealth patients.

of IBD related RBWH admissions for patients living in Wide Bay and Central Queensland were for patients enrolled with the RBWH IBD telehealth clinics (Fig. 5).

## Discussion

Telemedicine is increasingly being explored as a potential strategy for managing IBD outpatients with a number of randomised trials in recent years investigating the utility of several IBD telemonitoring systems.<sup>5–7,10</sup> Literature on the feasibility of teleconsultation/telehealth visits in managing IBD is limited.<sup>8,11,12</sup> Hommel *et al.*<sup>11</sup> reported improved medication adherence after telehealth behavioural treatment in their pilot and feasibility study of 9 teenage patients. Krier *et al.*<sup>12</sup> randomised 34 IBD patients with a mean age of 61 years to receiving either telemedicine encounter or standard encounter and found similar high level of patient satisfaction in both groups. More recently, Li *et al.*<sup>8</sup> described the telemedicine experience of patients attended by one IBD specialist at Dartmouth-Hitchcock Medical Center in New Hampshire, USA and showed no difference in the overall quality of care after initiating the telemedicine programme. However, the possibility of selection bias was raised as patients selected were known to a single provider. We report a well-accepted, fully functioning, real-world IBD

telehealth clinic model that delivers specialist IBD care to regional and remote Queensland. Potential selection bias related to a specific provider is unlikely to be a factor in our cohort as 8 gastroenterologists have contributed to the RBWH IBD telehealth clinics at different times between 2011 and 2017.

Our telehealth model has shown that telehealth visits could be undertaken by patients over a wide age range (i.e. from 16 to 87 years). That is because our telehealth visits were not dependent on patients' technology savviness as these were undertaken at public hospitals and these visits were attended by an IBD telehealth nurse at each satellite site who can troubleshoot if required. Telehealth is often discouraged for patients with specific physical complaints that would benefit from a physical exam (i.e. evaluation of perianal fistula).<sup>13</sup> Our model addresses this issue through collaboration with a designated physician or local medical practitioner at each satellite site who can assist with patient care delivery including performing a physical exam. We do not have accurate data on the local physician visits. In general, patients on a biologic would be reviewed by a local physician twice per year to help with physical examinations required as part of reapplication for their biologic whilst the occasional sick patient would have an *ad hoc* review. This collaboration is mutually beneficial as it empowers local medical practitioners by providing another channel of communication for specialist IBD advice. It also reduces barriers for local medical practitioners to contacting tertiary services which can be crucial especially in the setting of acute severe ulcerative colitis. We recognised that telehealth can be difficult and is sometimes inappropriate for new patients who have complex medical issues. Therefore, our telehealth model provides the option of an elective admission to RBWH following the initial telehealth consultation for further investigations and optimisation of IBD care followed by further telehealth follow up.

In our experience, telehealth visits were generally well accepted with positive feedback from patient satisfaction surveys undertaken in the first year of telehealth clinic commencement. This was supported by the increasing

number of patients under active IBD telehealth clinic review from 125 in 2011 to 345 in 2017. As our IBD telehealth clinics become more established, patients managed through the telehealth clinics have become more complex with a sevenfold increase in enrolled RBWH IBD telehealth patients on a biologic for IBD from 2011 to 2017. There was an emphasis on intravenous biologics especially from 2015 onwards because infliximab and vedolizumab became available on the Pharmaceutical Benefits Scheme for ulcerative colitis in November 2015 and vedolizumab was also listed for Crohn disease in November 2015. It is important to note that none of the patients on intravenous biologics had to travel significant distances to local infusion centres as we offered an infusion service in the satellite sites (e.g. Bundaberg, Hervey Bay, Rockhampton, Emerald) and that most of the population was centred around these sites.

Face-to-face consultations following IBD related admissions to RBWH for new patients living in Wide Bay and Central Queensland were increasingly being replaced with telehealth clinic visits as evidenced by more new referrals to telehealth post discharge in recent years. However, not everyone is comfortable with telehealth with 6 (1%) patients opting to return to face-to-face consultations and 70 (12%) patients lost to follow up. In our experience, three-way link telehealth consultations using patients' local health care or general practitioner facility worked well and encouraged shared care, as well as providing educational opportunities at both ends. In the COVID-19 period, this approach has moved towards a greater number.

The introduction of a chronic care model for IBD has been reported to reduce IBD related admissions.<sup>14</sup> In the present study, we observed a progressive increase in IBD related admissions with time following an initial decrease with the commencement of the RBWH IBD telehealth clinics. This observation is likely to be multifactorial and a direct causal relationship could not be made as IBD related admissions to RBWH for patients known to telehealth were the minority (37–47%) from 2011 to 2015 and only the slight majority (51–57%) from 2016 to 2017. Despite the continuous growth in our IBD telehealth clinic cohort, it is likely that there is still a significant number of patients with IBD living in Wide Bay and Central Queensland who have untreated or inadequately managed IBD, contributing to IBD

related admissions annually. A prospective study is required to fully explore the extent and the burden of untreated or inadequately managed IBD in outer regional or remote areas in order to improve patient outcomes by raising awareness and improving accessibility to specialist IBD care.

The present study has a number of limitations. First, the retrospective nature of our study is a weakness. Second, the patient satisfaction survey used was not validated. Third, the overall economic impact of the telehealth clinics is unclear as the cost of telehealth visits, disease monitoring, medications including biologic therapy and hospital admissions as well as the impact of telehealth on productivity gains and opportunity costs were not assessed. Last, given that IBD is a chronic condition, the impact of telehealth on patient outcomes in the longer term needs to be investigated. Prospective data collection with more detailed cost/benefit analyses and long-term follow up would provide further insights into the utility of telehealth in managing IBD.

Despite the successful implementation of our IBD telehealth clinics, important challenges lie ahead. With the exponential growth of the RBWH IBD telehealth cohort including more complex IBD patients receiving biologic therapy, further expansion of the telehealth programme needs to proceed with caution. Adequate staffing and resourcing are imperative in order to cope with this influx to ensure the sustainability of the programme without compromising on patient safety, staff morale and retention, as well as the quality of care provided.

## Conclusion

The RBWH IBD telehealth clinics have shown that telemedicine is well received and can be used successfully to deliver IBD care to patients living in regional or remote areas.

## Acknowledgements

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## Supporting Information

Additional supporting information may be found in the online version of this article at the publisher’s web-site:

**Appendix S1.** Patient satisfaction telehealth survey.

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