

Original Research

A qualitative analysis of colon capsule endoscopy using a novel GP-led, home-delivered service model in the Western Isles, Scotland

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Abstract

Introduction: A novel GP-led, home-delivered colon capsule endoscopy (CCE) service was developed and delivered in the remote Western Isles, Scotland. This service model may address issues faced by rural dwellers in accessing traditional colonoscopies. Staff perspectives on the development, delivery and impact of this service model may assist decision-makers and future researchers in understanding the nuances of CCE delivery models in rural areas.

Methods: An interview schedule was developed and participants were recruited from an estimated population of 27 staff members involved in the CCE service. Purposive sampling was used to ensure participants were from diverse job families and work

locations, capturing the service from different perspectives. Participants undertook semi-structured interviews on Microsoft Teams between July and September 2024. We used an iterative grounded-theory approach to theme generation using broad interview topics as a guide to ensure the analysis met the research aims. Data were analysed using thematic analysis five-stage approach.

Results: Eleven participants from Scotland's National Health Service (NHS) boards, including NHS Western Isles, NHS Highland and NHS National Services Scotland, underwent interview. Job families represented included medical, nursing and administrative. Participants identified unique enablers and barriers to the

development and delivery of the service. The island's remote geography, for example, was an enabler in the development of the unique service model but occasionally a barrier during service delivery. Advantages and disadvantages were broadly grouped into those for patients, staff and the healthcare system.

Advantages included reduced patient travel and improved job satisfaction. Participants did not identify significant risks with this service model. There was some uncertainty and disagreement regarding certain service impacts, including economic benefit and impacts on the endoscopy service.

Discussion: Other services may find participant reflections on the enablers, barriers and risk management strategies of this service useful when considering similar changes. Participant reflections on their own experiences, including advantages and disadvantages for

staff, can be taken at face value whereas reflections on the patient experience require further evaluation with patients themselves. There was uncertainty and disagreement about some of the impacts of the service and its economic benefit, where limited conclusions may be drawn without further research.

Conclusion: Our research identified key enablers and barriers to the development and delivery of GP-led, hospital-at-home delivered CCE in a remote part of Scotland. While participants expressed broad agreement about advantages and disadvantages of the service, including significant benefits for staff, some of these require further evaluation from the patient perspective. Similarly, there were areas where participants were uncertain or disagreed about the impact of the service, requiring further quantitative and economic evaluation.

Keywords

colon capsule endoscopy, colorectal cancer, diagnostics, hospital at home, primary care, qualitative, Scotland.

Introduction

Worldwide, colorectal cancer (CRC) is the third-most common cancer diagnosis and the second-most common cause of cancer death¹ while in Scotland it is the fourth² and third³, respectively. Research on the impact of rurality on CRC diagnosis and survival in Scotland is conflicting. Studies from the early 2000s suggested that patients living further from secondary care centres had later CRC diagnosis and reduced survival^{4,5}. However, recent Scottish evidence suggests the sociocultural attitudes of rural dwellers and healthcare providers may influence CRC diagnosis and outcome positively⁵. Still, access to cancer investigations like colonoscopies remains a significant barrier identified by rural primary healthcare providers⁶ so novel approaches are required to meet the needs of rural and remote populations. Colon capsule endoscopy (CCE) may represent such an approach. CCE involves the digestion and elimination of a camera that travels through the gut transmitting images to a data recorder for later review and diagnosis. It is a safe and well-tolerated procedure that may reduce the need for colonoscopy⁷. However, CCE is typically prescribed and administered within secondary care. The wait for referral from primary to secondary care can cause delays in the diagnostic pathway and, in remote and rural areas, travel times and staff vacancies further reduce the availability and timeliness of review. In the Western Isles of Scotland, a novel CCE service model that sought to address these obstacles was developed and delivered between 2022 and 2024. In this new model, patients with symptoms suggestive of colorectal disease, after stratification by a faecal immunochemical test, would be referred by their GP for CCE, with the procedure being carried out by the hospital-at-home (HAH) team and the report reviewed by a secondary consultant experienced with CCE. The findings and management plan would then be communicated to both the patient and GP. Previously, the GP would need to refer symptomatic patients to the secondary care consultant for review before CCE could be considered. The aim of this study was to examine the experiences and perspectives of staff involved in this innovative CCE service. Their reflections on the development, delivery and impact of this novel model could help decision-makers and researchers faced with similar challenges.

Methods

Participants and recruitment

This was a qualitative interview study using a grounded-theory approach to develop new theories about GP-led, home-delivered CCE. The eligible population was all NHS staff involved, irrespective of role, in the novel service from NHS Western Isles or two supporting NHS boards; NHS Highland and NHS National Services Scotland. Staff not involved in the service, or unable to participate in interviews, were excluded. A purposive sampling strategy was used to recruit participants from different NHS Scotland job families⁸ and working locations to ensure triangulation of different perspectives. Researchers aimed to recruit 12 participants, based on a small participant population and evidence that few new themes emerge after 12 interviews⁹.

Interviews

An interview schedule was developed by author TS based on a literature review. This was reviewed by the research team and piloted with the first two participants before final agreement. Job titles and workplaces were collected during the interview; however, demographic data (age and gender) were not collected as it was not relevant to the research aims. Interviews of 30-minute duration were scheduled on MS Teams between 31 July and 27 September 2024, covering five topics: service model development, advantages, disadvantages, unexpected consequences and lessons learned. Interviews were recorded and transcribed to Microsoft Word using a denaturalised approach, then analysed using NVivo v12 (<https://lumivero.com/products/nvivo/> [<https://lumivero.com/products/nvivo/>]). Any interview sections requiring clarification were followed up by email.

Analysis

Data was analysed using thematic analysis with a five-stage approach¹⁰. Familiarisation began with the transcription process to immerse the researcher in the data. Initial coding was conducted by author TS using NVivo and a sample reviewed by CM to ensure accuracy. The five (later six) interview topics were used as a framework to ensure analysis met the research aims. Within each topic, theme and subtheme generation were conducted iteratively by TS, following a grounded-theory approach. This inductive–deductive approach was taken to allow both the generation of new themes and to compare participant reflections to existing

knowledge, for example that CCE is low risk⁷. Following this, CM and TS reviewed the themes, ensuring these were representative of the data. After analysis of each interview, themes and quotations were reviewed to identify repetition between participants and determine data saturation. The process was concluded by the research team agreeing on a final definition and naming the themes. Throughout the process, interviewer notes and team discussions were used to ensure the integrity and trustworthiness of the analysis. The Standards for Reporting Qualitative Research¹¹ checklist was used to report this study's findings.

Ethics approval

Ethics approval was not required for this study from the University of Aberdeen or NHS Scotland as it was considered service evaluation by both organisations. Still, the study protocol followed the same standards as formal research, with participant identities, consent and contributions all stored in an anonymised, secure, password-protected data storage area.

Results

Twenty-two staff members, identified by the HAH team, were approached by the research team to take part. A further five staff were identified by AW. HAH did not keep a complete list of all staff

interacting with the CCE service so an estimated population of 27 staff members were eligible to be approached to take part. Job families⁸ represented included medical and dental (including GPs), nursing and midwifery, administrative services (including managers) and other therapeutic (pharmacy). No staff from the allied health professions, healthcare science or support services families were eligible. Eleven participants consented to take part in the study, with interviews conducted between 31 July and 27 September 2024. No participants withdrew from the study. Participant characteristics are shown in Table 1. Interview times ranged from 20 to 50 minutes. Data saturation was reached by 11 interviews, with no new themes identified after the eighth interview. Despite the interview schedule covering five topics, participant reflections on 'service model development', 'unexpected consequences' and 'lessons learned' were complex and resulted in discussions actually covering six topics: enablers, barriers, advantages, disadvantages, risks and uncertainties. The addition of 'enablers' and 'barriers' to the original five interview topics reflects their strong emergence during participant responses, and their subsequent identification and naming in early analysis.

Themes and subthemes can be seen in Table 2.

Table 1: Overview of study participants

Characteristic	NHS Scotland Job Family ⁷	Number of participants
Medical and dental	GP	<5
	Locum surgeon	0
Nursing and midwifery		<5
Administrative services	Secretary, manager, coordinator, analyst	5
	Senior manager	<5
Other therapeutic services (eg pharmacy)		0
Participant employer	NHS Western Isles	9
	NHS Highland and NHS National Services Scotland	2
Participant location of workplace	Lewis and Harris	8
	North Uist, Benbecula, South Uist and Barra	<5
	Mainland	<5

NHS, National Health Service.

Table 2: Overview of interview topics, themes and subthemes for staff perspectives on development, delivery and impact of home-delivered colon capsule endoscopy service in the remote Western Isles, Scotland

Interview topic	Theme	Subtheme(s)
Enablers	Enablers to development of the unique service	Enablers related to health board strategy, eg commitment to trial new technologies, staff desire to minimise patient travel
		Enablers related to staff efforts, eg strong leadership, support from other health boards
		Enablers related to the setting, eg close-knit community, COVID-19 pandemic, reduced ambulatory care capacity, surgical staff vacancies, unique geography
	Enablers to delivery of the unique service	Community support
		Enablers related to the hospital at home team, eg administrative system, enthusiasm
		Support from NHS Highland
		Supportive management

Barriers	Barriers to development of the unique service	Bowel preparation
		Pathway design
		Health board approval
		Staff hesitancy
		Information technology systems
	Barriers to delivery of the unique service	Geographical challenges
		Surgical staff vacancies
		Bowel preparation
	Barriers to continuation of the unique service	Staff withdrawal
		Health board budget
Advantages	Advantages for patients	Advantages related to travel, eg bowel preparation, reduced distance
		Avoidance of colonoscopy
		Disruption to activities
		Home comforts
		Patient privacy
		Remote island access
	Advantages for staff	Assessment and referral
		GP time
		Job satisfaction
		Learning and development
	Advantages for the health board	Hospital at home development
	Wider advantages	Carbon footprint
		Social care
		Spread of learning
Disadvantages	Disadvantages for patients	Bowel preparation
		Extra diagnostics, eg additional investigations, potential to delay diagnosis
		Patient confusion
	Disadvantages for staff	Additional administration
		Equipment use
		Staff travel
		Surgical team
	Disadvantages for the health board	Hospital-at-home capacity
Risks	Risk management	Proactive risk management
		Reactive risk management
Uncertainties	Unclear costs	Central funding
		Conversion to colonoscopy
		Economic evaluation
		Health board costs
		Patient costs
		Unknown costs
	Unclear impacts	Bowel preparation
		Endoscopy service
		Patient feedback

NHS, National Health Service.

Enablers

Many enabling factors were identified for this service. During development, the health board strategy, supportive of innovative technologies and reducing travel, was seen as an important precursor for developing the service. Participants also identified efforts by staff, for example project management support from NHS National Services Scotland or leadership from HAH, as important enablers. Some also described features of the Western Isles setting as enablers. For example, a close-knit clinical community enabled diffusion of ideas, and the ability for clinicians across the archipelago to collaborate had been improved by

COVID-19. Two of these factors, surgical vacancies and limited ambulatory care capacity, enabled the two novel innovations, GP-led referral and at-home delivery, respectively:

Well I think that one of the things that drove the change is that we didn't actually have a consultant surgeon in a substantive post and we still don't. Which meant that when we were setting the service up we had to do it in a way that meant it wasn't dependent on there being a consultant surgeon about. (participant 3)

The second thing that happened over that prolonged development phase is that we'd originally planned for all patients to come to the ambulatory care unit and it was by

dint of them not having capacity that we decided to look at alternatives. And it was probably fortuitous that we had a very dynamic, developing HAH [hospital-at-home] service. (participant 5)

Participants also identified factors that enabled the delivery of the service. Management and community support, as well as clinical expertise from NHS Highland, meant that the service met few obstacles during delivery. Similarly, the HAH team, with their enthusiasm and ability to manage administration, provided momentum and operational expertise.

Barriers

Participants also described barriers for the service. During development, participants cited staff hesitancy, health board approvals, and establishing new IT and administrative processes as initial hurdles to overcome. A complicated pathway design process was also felt to have extended the timescales of development.

Once established, further barriers complicated delivery. The archipelago's geography, for example, could result in impassable weather. Similarly, some patients hadn't appreciated that bowel preparation was still required for CCE, which necessitated lengthy consultations to explain. A longstanding challenge was managing the ongoing surgical vacancies, seen as an enabler in service development:

We also lost the one substantive surgeon that we had at the time. He left midway through the process. So it was difficult. We were working with locum surgeons. So trying to get buy-in from the locum surgeon, trying to explain what the process is, for somebody that's here for two weeks at a time, it's really hard to get anybody to engage and to really understand the process. (participant 4)

Participants gave varying explanations for the service's discontinuation in March 2024. Some felt that staff became disillusioned because the potential impacts of CCE hadn't yet materialised. Others felt it was a decision taken by the health board based on budgets.

Advantages

The service's positive impacts were grouped into those for patients, staff, the health board, and wider community benefits.

Staff clearly felt that, compared to colonoscopy, patient experience was better with CCE because they had access to home comforts, increased privacy, and reduced disruption to activities of daily living. Linked to this was a view that patients might avoid uncomfortable colonoscopies by having CCE. Those from the more remote southern islands also highlighted that CCE restored local access to CRC investigations, which had ceased some years before. A strong subtheme that emerged was a view that the service reduced patient travel, particularly after having bowel preparation:

I think one of the issues has always been with referring people for the old colonoscopy patients would then have to go up to Stornoway and they would frequently have to have their bowel prep before they got on the plane which led to risks of having diarrhoea in the airport or on the aeroplane. Both on the way up and on the way back again, which wasn't ideal. It's quite

stressful to go through airport security having taken [bowel prep]. So it was quite a welcome thought that there might be an alternative. (participant 3)

For staff, participants explained that the service offered staff development opportunities as well as improved job satisfaction:

So when we're getting new things it's great for us. We just love it. We thrive on these new experiences that we're getting. (participant 7)

Primary care clinicians also felt the service improved their assessment and referral of patients with suspected CRC, and had minimal impact on their clinical time:

Using the FIT [faecal immunochemical test] has made a big difference. Everything used to go through as an urgent [referral]. If you ask the capacity manager we used to be rubbish. We used to say everything is urgent. And with it [FIT] we are much more thoughtful. So if we're getting negative FIT tests we're not referring and if we are referring we're doing them as routine. I think it's changed the way we refer probably. (participant 5)

I think the biggest, surprising consequence is how little impact it actually had on workload for all the clinicians involved. (participant 3)

The health board, meanwhile, was felt to have benefited because CCE developed HAH's capacity and scope, enabling the health board to utilise them more widely than previously.

In terms of wider advantages, some participants suggested the CCE service, compared to colonoscopy, could reduce carbon footprint and social care burden by keeping patients at home. There was also a suggestion that the service helped to spread understanding of the challenges faced by remote and rural areas through the collaboration of three boards.

Disadvantages

Disadvantages were grouped into those for patients and staff, with few disadvantages identified for the health board and no wider disadvantages.

Participants felt that the new service confused some patients expecting colonoscopy and that the bowel preparation regimen, even delivered at home, was still uncomfortable. Significantly there was also a feeling that CCE added additional investigations to the CRC pathway, which had the potential to delay diagnosis:

I'm thinking of two patients out of over a hundred that we did who had an adverse outcome and we probably instilled a bit of delay to get to the diagnostic stage by them having a failed capsule. Well in fact one failed capsule, one was a bit of a delay in delivery. (participant 5)

Disadvantages for staff, particularly the HAH team, included an increase in pre-existing duties like travel and administration, but also new phenomena like dealing with equipment malfunctions. Some participants also felt that the CCE service bypassed the surgical team, dislocating them from the CRC pathway:

I think one thing that maybe I found was that because it was HAH that was dealing with this and not the surgical secretary and the surgical side of it, it potentially kept them slightly out of the loop. (participant 8)

For NHS Western Islands, few disadvantages were identified, though some felt the CCE service put pressure on HAH's capacity during busy periods.

Risks

Throughout the interviews, participants perceived risk management as an important yet straightforward process. They did not highlight significant safety concerns that they felt were beyond mitigation. When safety risks were identified they were managed either proactively:

There was the bit about making sure that the governance process was in place. In particular, anyone potentially suffering a complication from a colon capsule so everything was in place for that. That was relatively straightforward ... (participant 2)

or reactively:

So the risk we mentioned briefly earlier on is delay to diagnosis. That's the main risk. And I think we didn't put things in up-front ... they weren't necessarily treating them as urgent because we were taking the lower risk patients. They were a bit slow, maybe, on the uptake initially. So we corrected that. (participant 5)

Uncertainties

Some impacts of the CCE service remained uncertain for participants. While anecdotal feedback from patients indicated strong support, participants reported an absence of formalised feedback supporting this. Some participants also felt the bowel preparation regimen used could have been more effective, and questioned if it had impacted on the rate of conversion from CCE to colonoscopy. Linked to this are conflicting assessments of the service's impact on traditional endoscopy. Some participants hesitantly felt CCE may have improved waiting times for routine endoscopy. Conversely, the waiting list for new and urgent referrals did not seem to benefit:

We used colon capsule a lot for the surveillance wait list as opposed to the waiting list for new referrals. And because there was an increase in referrals post-COVID it would be difficult, I think, to correlate a benefit from colon capsule to the waiting list. However, our surveillance waiting list certainly benefited from it. So we monitor the number of patients that are overdue their target date, and that did come down. But also it's difficult even there because we did several waiting list validation exercises and they heavily contributed to the waiting list coming down. (participant 4)

The financial implications of the service were also given conflicting assessments. Some participants felt CCE reduced travel costs for patients and, consequently, the health board, which was obligated to reimburse them. Others felt that cessation of central NHS funding for CCE had reduced its affordability. However, a thorough economic analysis was never completed, with participants feeling that a lack of available costings and variable outcomes would have made this technically difficult.

Discussion

In this qualitative study we interviewed participants who developed and delivered a CCE service with two novel features: GP-led referral and at-home delivery. Both features were enabled by unique staffing and capacity challenges in NHS Western Isles. Participant descriptions suggest that risk management in this unique service model was straightforward, but also that there was a concern that a delay to diagnosis was possible due to perceived non-urgency. These participant reflections, while broadly in alignment with evidence showing that CCE is low risk⁷, are not evidence of clinical safety. Further quantitative evaluation is required to demonstrate safety.

Some other suggested impacts also require further investigation. Staff reflections on patient experience, positive or negative, are second-hand and therefore require further evaluation with patients themselves. Other suggested impacts, such as a reduction in travel, carbon footprint and social care burden, are participant perceptions and require further quantitative substantiation.

Many uncertainties could also be resolved with further investigation. Notwithstanding the difficulty of assessing costs highlighted by participants, a comprehensive economic evaluation would enable understanding of the financial implications of this model. Also, the disagreement between existing research indicating that CCE reduces colonoscopy demand⁷ and contrary participant views could be similarly resolved using quantitative analysis of the NHS Western Isles CCE and endoscopy data.

Many participant reflections, however, will be useful to decision-makers and researchers. Publications on the barriers and enablers of CCE implementation are currently limited to patient perspectives¹². Our participants highlighted new barriers including staff hesitancy and complications adapting traditional CCE services to the remote and rural context. Further, varied perceptions about why the new model was discontinued indicates that clear criteria to determine when and how to continue/discontinue this service model should be developed and communicated. Important enablers included project management support and clinical expertise from external NHS boards, as well as cultural factors such as positive staff and community relationships, and organisational support for innovative technologies. These findings may provide a framework for further research into the staff-side barriers and enablers of CCE implementation.

Our most robust and least bias-prone findings are participants' first-hand reflections on the impact on staff. Decision-makers could consider findings such as improved job satisfaction, development opportunities, improved GP management of suspected CRC and limited GP time commitment as possible outcomes of adopting this service model. Similarly, they should take into account possible staff disadvantages such as increased staff travel, equipment management, administration and the implications of bypassing traditional surgical pathways.

Strengths and limitations

One strength of this study is the use of purposive sampling to segment the study population by job title and health board. This ensured data triangulation, reducing the risk of exclusion bias from ignoring some staff perspectives. In addition, the interviews were transcribed and coded by a single researcher (TS) without prior

experience researching CCE. This aided immersion in the data and might have limited interpretation bias from having multiple, experienced researchers.

This study's limitations include that, despite the sampling strategy, only 11 of 27 possible staff members participated and we did not recruit a general surgeon and pharmacist. It is therefore possible that our study suffers from selection bias and we may be missing some important insights from particular staff groups. Similarly, this study did not capture patient perspectives first-hand. These absences weaken our efforts to avoid exclusion bias. Finally, our inductive deductive analysis approach conflicts with inductive-only grounded-theory methodologies¹³. However, this approach allowed testing of participant perceptions of the novel service model against pre-existing data showing traditional CCE is safe and effective⁷.

Conclusion

The development and delivery of a GP-led, HAH-delivered CCE service in NHS Western Isles was in response to unique challenges faced by that health board. Despite some inconveniences, staff were broadly supportive of this service model, feeling it improved job satisfaction and their ability to manage CRC investigations without a significant impact on GP time. Further triangulation

using qualitative and quantitative data will be beneficial. Staff descriptions of improved patient experience require verification of complementary patient perspectives, while quantitative research would help to verify proposed wider benefits for society and resolve uncertainty about the impact on endoscopy services. A comprehensive economic evaluation would benefit decision-makers, and similar healthcare systems, in assessing the viability of this service model in both NHS Western Isles and further afield.

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Conflicts of interest

The authors have no conflicts of interest to declare.

AI disclosure statement

No artificial intelligence tools were used in the design, conduct, analysis or writing of this study.

Disclaimer

The views expressed in the submitted article are those of the authors and not an official position of the institutions with which they are affiliated.

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